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PRODUCTIVITY OF STUDYING PROCESS USING IT
STUDIJU PROCESA PRODUKTIVITĀTE, IZMANTOJOT INFORMĀCIJAS TEHNOLOĢIJAS (IT)

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Abstract. *It is possible to involve students in learning process more actively using the new information technologies, research method and co–operation. The paper contains theoretical base of student research work as a component of studying process in higher education establishments using IT. The research investigates student personality development and interconnection with productivity of studying process. The author analyses researches on productive interaction in the context of computer–supported collaborative learning in science, computers in the community of classrooms, a sociocultural perspective on the human–technology link and computer–mediated communication. The paper contains empirical research results about productivity of studying process on an experimental base increasing a part of the research work and problem solving using IT and collaboration in studying process of Computer science course in Vidzeme University College.*

Introduction

Computers have become almost ubiquitous over the last years of the twentieth century and one thing that is clear about the twenty–first century. Computers will play an increasingly significant role in our working lives and leisure environments. The question is what the computer has to offer as a technology for supporting education more generally. Information technology (IT) is the study or use of processes (esp. computers etc) for storing, retrieving, and sending information *(Oxford Dic. 1994, 327)*. Many psychologists and educators have a view that IT is the beginning of radical upturn in the education *(Light P., Colbourn C., Light V. 1997)*. But here we can see different tendencies. A great deal of software developed for school use has one way: breaking desired learning goals into small steps and relying on reward, repetition and contingent depending of different levels to impart various skills. It is software developed specifically for individual use *(Howe et.al 1992)*. The next are 'Intelligent Tutoring Systems', which shape a teaching strategy. But these are only small part how to use the IT in the learning process. It is necessary for students in studying process not only to learn special courses, but also acquire skills for professional work, different forms of co–operation and communication. It contains many formal and informal communities, group work in the classroom for special problem solving. There is a way for free education and we need to talk about social dimension in learning process using IT *(Cakula S. 1998)*

Using IT in learning process

It is popular to use the computer as a tool in learning process. One of the most effective tasks in learning process is the research. IT could be used in individual work searching for information, writing papers, using practical programs to develop special knowledge and skills. Recent interest to

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learning suggests the possibility of integrating sociological and psychological approaches to the notion of learning as activity *(Henfridsson O. 1999).* Hence IT could not be used only as information source but also to make interactive collaboration computer – student or student – computer – student *(Light, Light, 1999).* When students solve a problem together in pairs or small groups they think more effectively than when they work alone *(Kruger, 1993).* When working in groups instead of writing essays computer could be used as a tool for producing multi–media presentations involving graphics, sound and text, for producing a resource (e.g. data file) to be used by other students or for producing a case for their peers. These new goals are too great for an individual student to meet, but co–operative work is essential if we are to take opportunities offered by classroom computers *(Underwood, Underwood 1999).* Sometimes IT is seen as a threat causing cutting learning off from the interpersonal context that gives it meaning and usefulness. A counter– argument might be offered that the community practices of student life are actually more threatened from other directions *(Light, Light 1999).* Some of more interesting applications of information technology in higher education are those involving computer–mediated communication. This technology affords a possible means of providing for interaction between tutors and students and between students themselves *(Light, Light 1999).* The term 'co–operative learning' refers to learning environments in which small groups of students work together to achieve a common goal *(Crook C. 1994, Littleton K., Light P 1999).* The co–operative learning can take place in two different ways. One is when the members of the group may choose to take responsibility for sub–tasks and work co–operatively, the other is when they may collaborate by working together on all parts of the problem. If the learners collaborate and share in the decision – making process then the level of social interaction is necessarily high while it is not so for co–operative workers. Some positive effects in co–operative work can be that learning under positive contact conditions can facilitate interpersonal relationships which may in turn have positive effects on student motivation, self–esteem, academic learning. Such positive effects have been noticed in all age ranges, ethnic groups, classes and ability levels. Students are more relaxed working with other partners. The role of computer in collaborative work can be not only that of a tool. When problems are well defined and the computer serves as a tutor, the students often play the role of motivational facilitator, providing psychological support for one another. On the other hand, when problem is ill defined and the computer serves as a simulator or information – processing tool the students may co–construct solutions and resolve conflicts by collaborative discussions. Such groups of student work most effectively as a result of conflict mechanism as in Piagetian's model or constructive process as in model of Vigodskij *(Piaget J. 1976, Vygotskij L. 1978, Inhelder 1976, Rosa A., Montero I. 1990).*

Models of collaborative work

Some collaborative groups may be efficient because of conflict based mechanisms as Piagetian model *(Пиаже Ж. 1978)* and others due to co–constructive *processes (Vygotskij, 1978).* Howe develops Piagetian model that when pairs of students differ not only in their predictions about problem outcomes but also in their underlying conceptual understanding then collaboration facilitates learning *(Howe et al.,1992).* O'Malley has shown that when a computer program makes different predictions then the human learner is more likely to show evidence of conceptual change than they do when that program either makes similar predictions or show similar conceptions *(O'Malley 1992).* Learning in groups and with peers may be a more effective way of achieving some educational goals that individualised instruction especially when working with computers but here discussion plays a very important role. There are some researches that explore whether individual learning is facilitated in computer environments by interaction between students whose conceptions differ and whether the

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benefits are directly attributable to interaction *(Howe et al.,1992).* There are also some concepts that the computer may facilitate productive interaction in a way that other media cannot, due to its capacity to maintain a clear task structure and to provide feedback. However, the studies also showed that in some contexts interaction could be of marginal significance, with shared action being crucial instead. It would appear that such context could be defined by a variety of factors, not all of which are readily controllable. It is thought that the computer may still have a central role to play.

Problem solving using IT communication

There are some ways of problem solving using IT: conferencing system, discussions between students themselves or interaction between students and tutors. Interest in the use of electronic mail and computer conferencing in the context of distance education has been considerable because this is a new direction in our education using IT, but it can be used also for full time students and school pupils, too. Some researches reveal the negative effects of IT conferences compared to face – to face conferences *(Light, Light 1999).* In computer – mediated exchanges students may feel less obligation or pressure to respond than when interacting face to face. Mercer and Wegerif concluded that weaker and 'less verbal' students are disadvantaged by computer–mediated communication *(Mercen, Wegerif 1999).* At the same time many researchers acknowledge that using IT in studying process involve students more effectively – increases a quality of discussions, group dynamic alongside with work in classroom, increase of collaboration, more democratic ambience and increasing of motivation. There are several positive effects on IT conferences:

- students might participate more equally in electronic than face to face communication,
- students can feel safer in case they if they say a silly thing,
- messages can be carefully prepared, lacking in spontaneity and immediacy,
- students may ask simple questions to the tutor rather than offer opinions or enter into arguments,
- communication using IT may reduce the differences of physical and social character (*e.g.* gender),
- IT communication can provide opportunities for those students who are too inhibited to speak out in face to face situations,
- female students tended to start with lower levels of computing experience but equally positive in their response to computer–mediated communication can take a more active part in these conferences,
- students who have not so much practise in English take part more actively in IT conferences than in face to face conference in the English language *(English S., Eazdami M. 1999; Underwood J., Underwood G.1999; Littleton K., Light P. 1999).*

Communication using IT is preferred by students, who:

- have problems in relationship with other students or teachers (they feel themselves not so aware, slow, not so clever);
- are composed in temperament, silent;
- need more time for making decision;
- operate only with legitimate, valid facts;
- want to get more detailed answer from teacher *(Light P., Light V. 1999).*

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Outcomes

It is very important to find more effective tools for studying. Basing on theoretical research and experience of other researchers computer science ourse in Vidzeme University College is going in non traditional way. The course is focusing to get knowledge, skills and acquirement using IT for research work. Course content includes basic principles of making research and using computer programs such as *MS Word, MS Excel, MS PowerPoint* and *SPSS* for data analyses and presentation. Teaching methods are focusing on traditional lecture (about 10% of hours in contact with students), co–operative research together students with teacher (about 30% of hours in contact with students), co–operative exercises (about 40% of hours in contact with students), seminars and control tests (about 20% of hours in contact with students). All the time of studying course after contact hours students and teacher collaborate using e–mail. It goes in three directions: student – teacher, teacher – student and student–student. At the end of course students make research on singly choosing theme.

Experiential results

The productivity of action can see how contentment of process and subjective result, it is an attitude to objective product (knowledge, skills, values, the level of accountability) *(Кветной М. С 1974)*. Productivity is knowledge, skills, attitudes what appear in goals of life and persistence to achieve them. Author analyses student's contentment with computer science course. More than 83 % of students are content with course content focused to research using IT (*table 1*).

How you rate the content of course? Table 1.

	Frequency	Valid Percent
decently	96	83,5 %
partly decently	19	16,5 %
dissatisfactory	0	0 %
Total	115	100 %

There was a big part of course using different co–operation and we got a good result of students contentment appreciating course methods: it is more than 76 % of students who like these methods and only about 2 % of students who do not lake co–operation in learning process (*table 2*).

How you rate teaching methods using in course? Table 2.

	Frequency	Valid Percent
decently	88	76,5 %
partly decently	25	21,7 %
dissatisfactory	2	1,7 %
Total	115	100 %

On question about methods which students like to use for studying author got an apportionment where the biggest part is about 55 % co–operative exercises and research what can do by face to face with teacher and using IT as a tool. The next part about 38 % is students research on singly choosing theme. Only about 11 % of students prefer lectures (*figure 1*).

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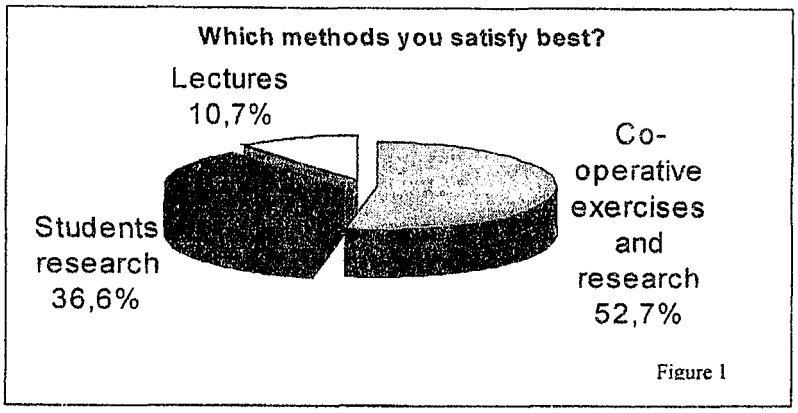

Figure 1

The next innovation was collaboration using e–mail in time of studying the course after contact hours, sending home works, pre–tests, exams and questions to teacher and get a teachers evaluations and answers. More than 75 % of students are satisfied using e–mail to contact other students and more than 80 % like use e–mail to collaborate with teacher. Sometimes students have technical problems using e–mail and it was unsatisfactory factor, but only about 4 % of students do not like to use e–mail (*table 3, table 4*).

What about collaboration using e–mail with other students? Table 3.

	Frequency	Valid Percent
I am comfortable	82	75.9 %
I have technical problems	22	20,4 %
I do not like it	4	3,7
Total	108	100,0 %

What about collaboration using e–mail with teacher? Table 4.

	Frequency	Valid Percent	Cumulative Percent
I am comfortable	46	42,6 %	42,6 %
I like to get quick personally answer	17	15,7 %	58,3 %
I like quick answer	22	20,4 %	78,7 %
I like to send documents without printing	2	1,9 %	80,6 %
I have technical problems	20	18,5 %	
I do not like it	1	0,9 %	
Total	108	100,0 %	

For evaluation productivity of learning process author uses interconnection table (*table 5*).

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Interconnection: approach to study and productivity of learning Table 5.

Productivity		Approach to study				*Total*	
		Surface	More surface	More deep	Deep		
		5 4,4 %	33 28,9 %	44 38,6 %	32 28,1 %	114	
Your study goal	I have clear my study goal	2	17	24	12	55	50,5%
	I have partly clear my study goal	2	12	17	17	48	44,0%
	I have not clear my study goal	1	2	2	1	6	5,5%
Your persistence to go to goal	I am very persistent	2	8	8	6	24	21,1%
	I am a little persistent	3	23	35	24	85	74,6%
	I have not persistence		2	1	2	5	4,4%
Knowledge	1st level – can realize course tasks		24,2 %	13,6%	2 6,3 %	16	14 %
	2nd level – can use knowledge in like situations	4	19 57,6 %	25 56,9 %	18 56,3 %	66 57,9 %	
	3rd level – can use knowledge in different situations	1	6 18,2 %	13 29,5 %	12 37,5 %	32 28,1 %	
Skills	1st level – can execute course exercises				1 3,7%	1 3,7 %	
	2nd level – can execute different exercises	3 60 %	23 69,7 %	25 56,8 %	17 53 %	68 59,6 %	
	3rd level – can use skills in different situations	2 40 %	10 30,3 %	19 43,2 %	14 43,8 %	45 39,5 %	
Your accountability	Always I do what I promise		8 25,8 %	12 28,6 %	10 34,5 %	30 28 %	
	Sometimes I do what I promise but sometimes not	5 100 %	23 74,2 %	30 71,4 %	19 65,5 %	77 72 %	
	I can not do what I promise						

First year students learn computer science course and there are only some few month to study in higher educational establishment. It explains the situation that only a half of students awake their study goals on one's own of approach to study. Also persistence grows very slow and only 21% of students characterize themselves as very persistent, 75% – a little persistent and 4,4% who have not persistence, but situation is better if we analyse how students characterize others. These results shows that 47% are very persistence and 53%. – a little persistent. Nobody have not persistence. In all other categories results shows that research using IT and co–operation in studying process gives better outcomes for students who have more deeper approach to study.

Conclusion

Vidzeme University Computer course model shows good results. The productivity of learning process is determined by individual differences (gender, ability, thinking and practice skills, needs) and depends on the environment (group size, kind of task and organisation, working room and

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environment, study programme, teacher's attitude). Unified model of productive group work needs to be adapted to each individual case in order to find the most effective and positive way of sharing experience. Both social or contextual factors and individual processes of cognition should be observed. Social exchange and joint action are crucial for group performance and individual learning, while individual perceptions, reflections and knowledge are key determinants of the process and the results of interaction.

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