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F-32
The simulation based practical training in healthcare education

The problem-based learning as a new practical method of skill development in the health sciences higher education

Doctoral (PhD) thesis

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INTRODUCTION

The European Union has set the objective to establish the strongest education system in the world by 2020. There is strong competition, however, with the American and Far-Eastern forms of learning. The Prime Ministers of the EU Member States were of the opinion that a convergent education structure was needed to achieve this. This purpose is served by the Bologna and the Copenhagen Declarations. Why do we need a shift in knowledge? Vocational knowledge becomes outdated in five years. Information relevant to knowledge can increase on the Internet even thirty two fold a year. The number of Internet links doubles year on year. The available band width widens all the time. All these aspects contributed to our inability to absorb knowledge using the traditional forms of learning. A number of experts on pedagogy realised this problem already years ago. Moust et al (2010) pointed out in recent years how processing the increased amount of knowledge could be made easier for students by problem based learning and training. The purpose of Life Long Learning is to include continuous skills and interdisciplinary competences in European education and learning, as well as digital literacy, intelligent learning (e-learning, PBL), problem solving skills, communication skills, social and lifestyle competences. In traditional education, there is just one basic skill: reading and writing. This is not enough today; there are new challenges in education, therefore we need interdisciplinary knowledge. This learning process is being supported by info-communication technologies, including, as vital elements, IT knowledge, digital literacy and foreign language skills. A shift in paradigm is needed. We must be aware of our opportunities of formal (streamline) and non-formal education. The EU Memorandums are basically to support the development of such info-communication (ICT) skills.

AIMS

It may seem paradox that the study focuses on a period of problem-based learning that is not taken into consideration as the so far revealed period of health science researches. The paradox – which as far as we are concerned is just seeming –, however, can be dissolved relatively easily if we can answer the question whether the research of problem-based learning offers something new compared to the previous knowledge and to the domain. The answer is given in the objectives, attitude and methodological considerations of the study.

The choice of the subject and period is based on three basic recognitions. The **first** is that there are no traditions of students and teachers' views on problem based learning or of the

researches aiming at the social relations of PBL in Hungary, and the social factors of institutional higher education has only raised the researchers' attention recently. The **second** recognition is related to the form of problem-based learning, which internationally (the United States, Australia, Canada, Mexico, the United Kingdom, the Netherlands, China, Finland, Slovenia, Belgium) could rely on significant traditions in the past decades.

The **third** approach: the American Joint Commission study R3 report focusing on patient safety of 2011, which defines the development of communication tech-niques of transferring knowledge in the field of clinical care since in the clinical field 70% of the „mistakes" regarding the patients occur due to transferring wrong information. Health care has to include the practical application of the joint results of several disciplines. The means of this might be the development of the stand-ardized interdisciplinary, info communication techniques, the aim of which is to enhance the quality of clinical care and to facilitate the safety of the patients. The students taking part in healthcare trainings (nurses, doctors, members of healthcare team) arrive at the clinical practice not quite prepared after having finished their training (Joint Commission R3 report, 2011). The basic objective of the research is to reveal the students and teachers' views on problem-based learning (PBL), and the social aims as it wishes to help us see the place, role and social embedding of PBL and in connection with this the education policy concept on learning in the Hungarian society of the 21st century clearer compared to our previous knowledge.

In harmony with this objective the study follows a socio-historical – and educa-tion policy – approach, in which it considers higher education as one of the possi-ble institutions of social control. The frame of the study shows synchrony with this theory: the first part demonstrates the way from the international appearance of the problem based learning to its national application, the following greater structural unit, however, covers the analyses, dimensions, and the application of the adaptation, the benefits, drawbacks and the analyses of the international judgment of problem-based learning. The last structural unit of the study includes the national and international methods of the applicability of PBL, our research re-sults, conclusions and professional recommendations.

The subject of the research

It examines what the personal relation of the nursing, physiotherapist students of the University of Pecs Faculty of Health Sciences and the nursing students of the Lahti University Faculty of Healthcare, Finland is to problem based learning, and according to their views and judgment how their class motivation, activity, problem solving ability, behavior samples and

their responsibility in self-governed learning are influenced by the teacher- and student-centered teachers being present.

The aim of our research is the possibility of introducing the international practice and the Hungarian application of problem based learning in higher education.On the one hand by revealing and analyzing the international and national professional literature, on the other hand by empirical data collection received from the nurs-ing students of the University of Pecs Faculty of Health Sciences and nurses working in practice, as well as from the nursing students of Lahti University Faculty of Healthcare, Finland and the nurses working in practice: with quantitative and qualitative test methods – with cluster analysis, chi2 test, data analyses collected by ANOVA test – we were looking for the answer to the following hypotheses:

Within the current test the following hypotheses have been phrased, that is we tried to eliminate them by applying the respective, statistical procedures introduced later.

1.We suppose that the students who learnt the practice of resuscitation with problem-based learning method accomplished their exams of resuscitation with a better grade than the students who were prepared by the conventional learning method.

2.We suppose that at the tested institutions we experience a significant difference between the closing exam results of the students having been prepared by problem-based learning and by conventional methods.

Saunders and his colleagues at Newcastle Medical University carried out impact assessments on PBL method in 1982. In the course of operacionalization they studied which dimensions of PBL lead to the students' satisfaction at the training output.

METHODS

In the course of elaborating methodological research we have applied *inductive* and *deductive* research strategy as major strategic principles. Within the strategic principles we have carried out descriptive, coherence-testing analyses, research strategies and tests. In case of deductive or analytical research strategy we have reached the results useful for pedagogical practice through the analysis of general principles, regularities, international experiences and other scientific research results. Within the deductive strategy we have applied the curriculum document analysis. We tried to explain the learning view and behaviour attitude of healthcare students, the phenomenon of national and international higher education as well as the relevant achievements for PBL of other sciences from the conclusions of PBL (Problem

Based Learning) theoretical theses. Before creating the instruments the first step was the research plan followed by the research of national and international PBL literature. The tested problem was determined, the instruments were created, which are our own instruments of data collection: in the first and third research phases a 6 stage attitude scale of more dimensions, and a 9 stage Likert-scale of one dimension summing / interval scale for measuring attitude. On the Likert-scale of one dimension summing interval scale the respondents express the strength of the stages of agreeing / disagreeing on a topic, person or situation with the help of different statements. The one dimension summing interval attitude scale is based on the seemingly equal interval method. Its essence is: the statements on attitude topic spread from the least favourable to the most favourable, generally in 11 scales being in equal distances from each other. In the second research phase the Osgood-scale of 5 stages. The semantic differential scale: (Osgood-scale) an attitude scale of more dimensions developed by Osgood, which serves as the measurement of the connotative meanings of concepts. The subscales can be categorized in one of the dimensions – value, strength, activity – that can be proved by statistical methods as well. After having prepared the measuring instruments of data collection 5 Hungarian research experts in pedagogical and care research were involved in the quality control. Based on the experts' suggestions and opinions the applicability of the scales increased to 87%. The reliability test of the evaluation scales were carried out with Cronbach alpha coefficient test. The reliability was 0.79 among the full-time nursing student, and 0.82 among the practicing correspondent nursing students who took part in our test. The phases and process of the research steps are shown in figure 1.

Sampling

2006 persons of the ages 18-48, students of the University of Pécs, Faculty of Health Science, Zalaegerszeg and Szombathely, and full-time nursing, physiotherapist students, and practicing correspondent nursing students of the University of Lahti, Faculty of Health Science, Finland took part in our test. The selection of the participants in the test was at random, exclusion was defined in case of a difference below 70%. *The students of the University of Pécs Faculty of Health Science and the University of Lahti Faculty of Health Science getting into sampling was at random, volunteer and outside class period. Before filling in the data collecting instrument they got individual information that they can recede any time in the course of filling in the evaluation scale, they can get acquainted with our research results and we count on the debate of their opinion in a public forum.* The extent of the sample is representative both on national and international level. Data collection was carried out in several phases and continuously. The reason for this was that we aimed at

gaining as extent sample and students' opinion as possible. It is worth mentioning that the fact that few relevant research results have been published is considered to be one of the disadvantages of the problem based learning. There was no appropriate sample size for interpreting the results. We hope that the results of our own tests contribute to the strengthening of the research results of national and international PBL.

Methods of research phases

We complemented the research of literature with several research data collecting means. We used scale techniques of several types, with which attitudes can be measured. The scales include questions or series of questions the answers to which not only enable the attitudes to be categorized into types but even their order, and in cases of some scale techniques the distance of the attitudes from each other can be defined. From the descriptive methods we carried out written questioning according to the Osgood-scale and Likert-scale procedure. Data collecting instrument: 5 scale Osgood scale – semantic differential scale (included 9 questions), 6 scale Likert-scale / Likert, one dimension summing / interval scale – attitude scale (included 13 questions), and the 9 scale Likert-scale / Likert, one dimension summing / interval scale – attitude scale (included 9 questions). In the six and nine scaled Likert-scale test carried out by us 1775 college students of ages 18-48 took part among the the full-time and correspondent I. and IV. year nursing and practicing nursing students of the University of Pécs Faculty of Health Science, Zalaegerszeg, and Szombathely, and of the Lahti University Faculty of Health Science, Finland. We processed the research data and research results of all the three phases in Excel and SPSS ® 16.0 and Microsoft Windows programs. *In the process of data collection our data can be categorized into the following types* (Babbie, 2004):

Interval scale – we applied this form in the first and second research phases, and in the third research phase we complemented this data collecting instrument with the results of the CPR exam grades in both countries (Hungary – Finland).

Explanation: since significantly more methods can be applied on measure stages of higher level, it enabled us to apply the *cluster analysis* in the second research phase. *Statistical methods:* we applied the chi-square test, the two-sample t-test, the analysis of variance, the correlation analysis, the ANOVA test, and the cluster analysis for the test of our research data. In the frame of the descriptive statistics we applied variance indicators, the help of which we measured the average difference from the average of the certain answers according to the certain attitudes and students' answers. In my thesis **in the first research phase** the practical applicability of the problem based learning was introduced with descriptive statistic method. We applied independent sample t-test for the test of our hypothesis. We applied ANOVA test of

two directions for the test of the differences between the PBL *and the traditional educational institutions.* We applied a 5% margin of error. The analyses were carried out with the SYSTAT SigmaStat 3.5 Windows version[1]. In case of the number two hypothesis we applied the ANOVA test of two directions to test the interaction (*interaction between the educational method and the institution*). We chose a 5% significance stage in both statistic tests. Considering the certain number of elements we calculated the rates of frequency, relative frequency, average, and average differences, the modus as well as the median according to the certain variances. I prepared the mathematic test with 5% significance stage in order to decrease the possibility of the development of second rate error – our aim was a valid and objective user method where we decreased the role of coincidence to 5% besides the 95% reliability. The two-sample t-test was anticipated by the F-test, which analyzed the variance of the tested samples. If the variances differed significantly we applied the hetero-scedastic testing method and instead of the two-sample t-test we carried out the Welch statistic comparison with 5% alpha (significance) rate. ***In the second research phase*** we carried out the analysis of quantitative variances with correlation analysis with the calculation of the determination coefficient. We analyzed the complex mathematical effect mechanism of the variances on each other with correlation matrix and cluster analysis, where the primary aim was the selection of the certain clusters, clusters and variances. In the second research phase the analysis of quantity variables was done by correlation analysis by calculating the determination quotient. The compound complex mathematical impact mechanism of the variables on one another was analysed using correlation matrix and cluster analysis, where the primary objective was to select the different clusters and variables. Besides cluster analysis, we also used a multi-dimensional ANOVA test for clusters. The Dendogram shows the outcome of the second research phase (Figure 2.) The advantage of the cluster analysis for us was that it could be used as qualitative assessment to explore the learners' attitudes. We attempted to sort a multi-variable set of data using cluster analysis and the correlation matrix in such a way that we could explore the structure of the correlations between learners' and teachers' behaviour. We tried to create behaviour clusters and groups whose elements are linked as closely as possible to one another and are relatively distinct from the elements of the other clusters (Falus and Ollé, 2008). We used the descriptive statistical method to present the characteristics of the sample. In our quantitative study we used the 5 scale Osgood scale and studied 9 questions. The attitude towards learning, views on
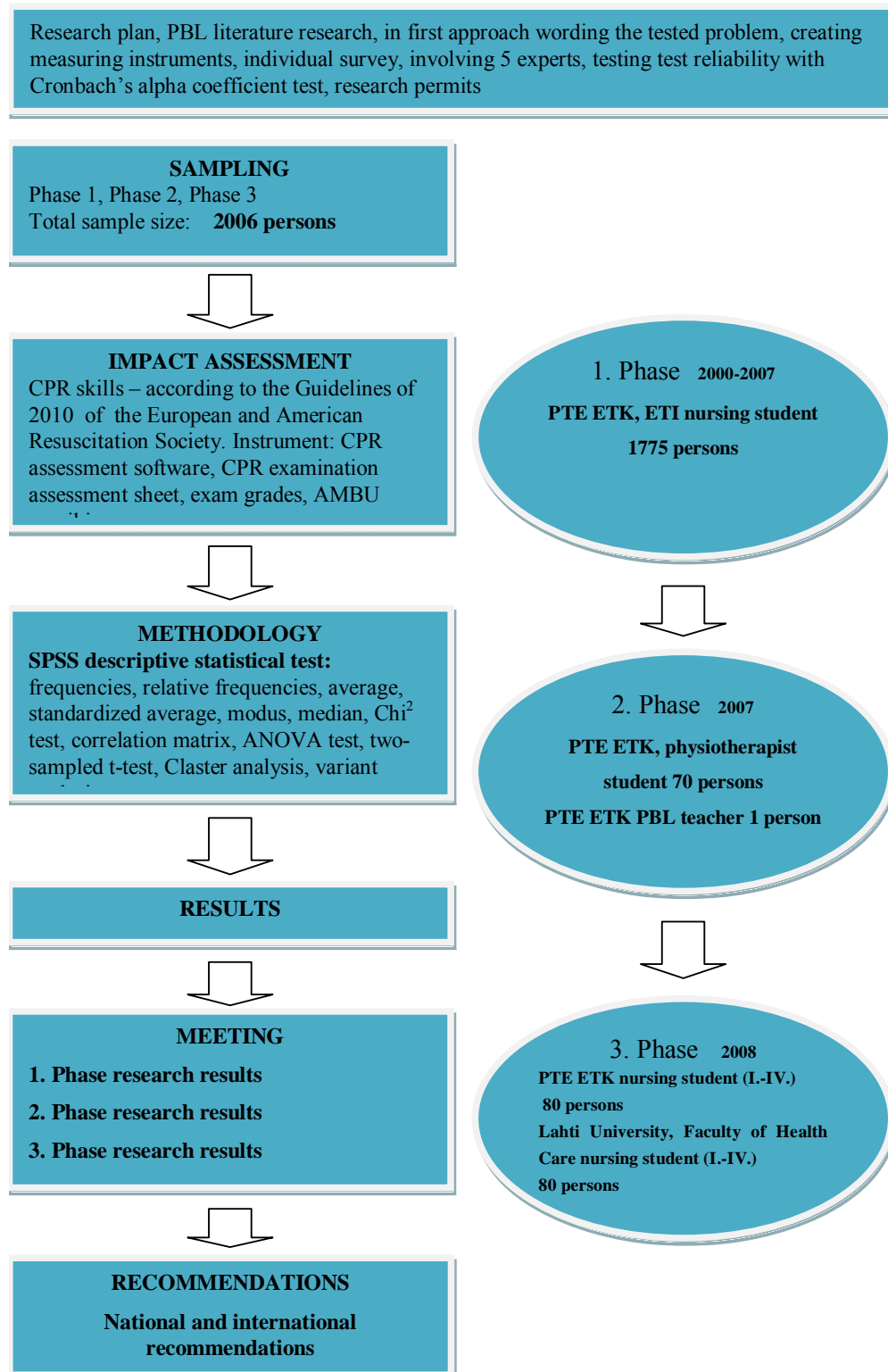
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[1] The sample size calculations were carried out with Gpower 3.0 software; http://www.psycho.uni-duesseldorf.de/aap/projects/gpower/

learning and communication of 1st year physiotherapy students of PTE Faculty of Health Sciences, Zalaegerszeg, were studied, where 70 18-30 year old anonymous volunteers participated. The study also covered how the 1st year physiotherapy students of PTE Faculty of Health Sciences, Zalaegerszeg evaluated the teachers' work using Problem Based Teaching and their teaching attitudes. This was a real challenge for us because we could see the level of knowledge they had had when they entered this educational institution, how their learning views changed due to PBL and what private views they held on learning, on "knowledge construction", and what they felt about the path leading to "acquiring knowledge". The same 5 scale Osgood scale was used when the 70 students evaluated the PBL teacher, and when one teacher applying the PBL method evaluated the attitude of the 70 1st year physiotherapy students. *In the third research phase*, within inductive research strategy, from the group of descriptive methods: comparative pedagogical experiment was used as a multi-group natural research method exploring the correlations. Our questions focussed on presenting, within the frameworks of a 160 participant Hungarian-Finnish comparative pedagogical experiment, and analysing the presence of one or more variables of (22 standardised) variables and the frequency of their occurrence. We analysed the correlation study, the Chi-square test and the standardised values using two-dimensional studies. We studied on day nursing students and correspondence practicing nursing students of the PTE Faculty of Health Sciences and the Finnish Lahti University Health Sciences Faculty: What learning problems the students faced during Problem Based Learning? How did their learning views change after Problem Based = CPR Learning? We collected data on two groups of the variables for the same studied person. *Dependant variable*: students' views on learning. *Independent variable*: Problem Based Learning. *The independent variable in this case can be external or internal* (Falus, 1996). *An external independent variable we chose can be a new, consciously changed teaching and learning method whose efficiency was studied by us, where we wanted to find out the impact on students behaviour. As for the internal independent variable, we wanted to explore the pedagogical regularities of impact of students' personalities and their learning abilities on the dependent variable.* The comparative pedagogical experiment was done in several groups of the same level; we allowed several independent variables and one dependent variable to affect the groups: we could see form the nature and extent of the changes which of the independent variable (PBL, PBL/CPR learning methods) caused the most relative changes. *The exact rating of the extent and nature of the changes in this form of experiment was presented upon completion of the comparative study in a two-dimensional figure. The structure of the experiment:* natural experiment carried out in several institutions. *Assessment methods*: First

Aid tests, students' views, Likert-scale (levels 6 and 9). *Processing method used*: experimental structure enabling multidimensional comparison and complex statistical analysis.

Figure 1. Research process of problem based learning

Research plan, PBL literature research, in first approach wording the tested problem, creating measuring instruments, individual survey, involving 5 experts, testing test reliability with Cronbach's alpha coefficient test, research permits

SAMPLING
Phase 1, Phase 2, Phase 3
Total sample size: **2006 persons**

IMPACT ASSESSMENT
CPR skills – according to the Guidelines of 2010 of the European and American Resuscitation Society. Instrument: CPR assessment software, CPR examination assessment sheet, exam grades, AMBU

1. Phase **2000-2007**

PTE ETK, ETI nursing student

1775 persons

METHODOLOGY
SPSS descriptive statistical test:
frequencies, relative frequencies, average, standardized average, modus, median, Chi^2 test, correlation matrix, ANOVA test, two-sampled t-test, Claster analysis, variant

2. Phase **2007**

PTE ETK, physiotherapist

student 70 persons

PTE ETK PBL teacher 1 person

RESULTS

MEETING
1. Phase research results
2. Phase research results
3. Phase research results

3. Phase **2008**
PTE ETK nursing student (I.-IV.)
 80 persons
Lahti University, Faculty of Health Care nursing student (I.-IV.)
80 persons

RECOMMENDATIONS

National and international recommendations

RESULTS

THE PHASES OF THE RESEARCH

I. PHASE:

AIM: to find out whether the problem-based learning method is more efficient than the conventional education method, with special regard to the differences shown at the resuscitation exams.

METHODS: the research has been carried out with retrospective and comparative test methods. The data originated from exam results of students trained by conventional and problem-based learning methods. The survey sample was 1775 students taking the exam between 2000 and 2007, who graduated from nursing at three different Hungarian institutions of higher education. The comparison was made between problem-based and conventional learning methods on the one hand, and between the institutions on the other hand.

Group	N (sample size)	Mean	Standard deviation	t value	Difference between group means	Significance (p)
PBL	837	4,453	0,354	**3,569**	0,373	**<0,001**
Traditional training	938	4,081	0,457			

Table 1. T-test between PBL and conventional education (Years 2000-2007 Hungary).
95 per cent confidence interval for difference of means: 0,165 to 0,581

RESULTS: the comparative independent-sample t-test carried out between prob-lem-based and conventional learning methods showed significant difference (t=3.569; p<0.001) for the benefit of problem-based learning, that is problem-based learning method was the most efficient (the results of the students trained by this method was significantly better). In the course of comparing the institutions there was a difference only in the problem-based learning method, whereas in case of the results of the students trained by conventional method there was no significant difference. In line with expectations, students learning using the PBL method performed significantly better than those studying using the traditional method. Their achievements concur with the results published by Polglase et al (1989) and Wang et al (2008), who confirmed that PBL is a more efficient learning method than the traditional one.

CONCLUSION: the problem-based learning method in the current sample was a more efficient training form than the conventional methodology. The students taking part in the problem-based

training achieved significantly better exam results than their peers trained conventionally. Regarding resuscitation both their academic and practical preparedness were better than their peers being trained conventionally. To decide whether problem-based learning is more efficient in real resuscitation situations than conventional teaching methods needs further research.

II. PHASE

AIM: with the help of cluster analysis we tried to organize a multivariate data set in order to reveal the context structure of student and teacher's behavior not known by us earlier. We tried to create behavior groups, clusters the elements of which are connected to each other as close as possible and relatively differ at a greater extent from the elements of other clusters.

METHODS: we applied a 5 grade assessment satisfaction scale as cluster analysis control, which was adapted in the United States but completed by us. The advantage of cluster test was that it can be applied as a qualitative test that reveals student's attitude. The site of the test in 2007: University of Pécs Faculty of Health Sciences, Zalaegerszeg. First year physiotherapist students took part in the test. Sample size: 70 persons. The metric for data collection: 5 grade own scale.

Dendrogram
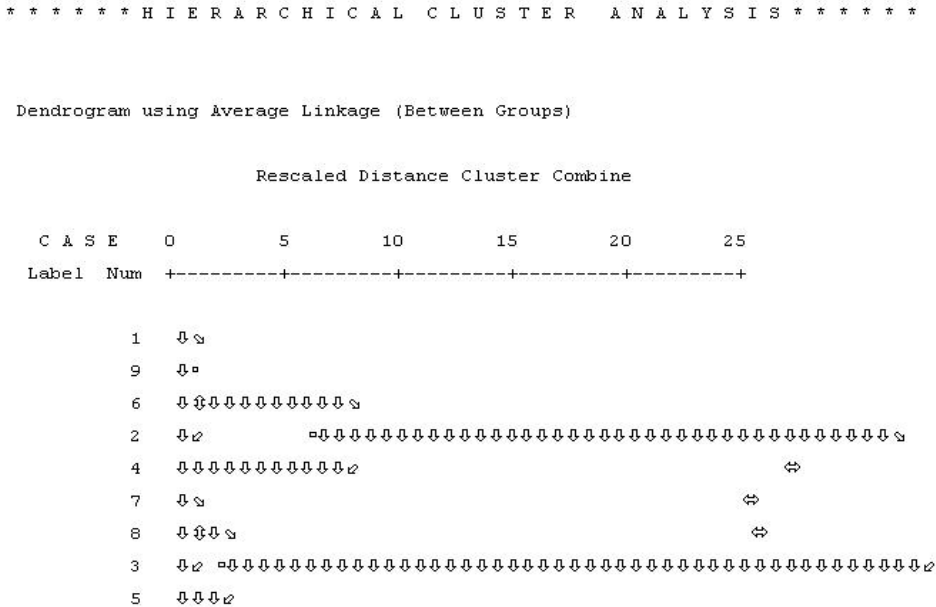
Figure 2. Source: Szögedi (2007)

RESULTS: result of student assessment on teacher's attitude forming of PBL

- According to the views of the students answering in the test the largest deviation can be seen in the teacher's preparedness and professional attitude: they estimate it 0,731

strong. Between the teacher's ability to act and professional attitude there is: 0,680 moderate relation. The students estimate the communication and ability to act within the group: 0,593 moderate.

- The teacher's critical thinking, active participation in the class shows: 0,633, moderate relation. This proves that the teacher is able to transfer his/her professional knowledge to the students regarding the PBL method. In the critical assessment of subject knowledge / research results it applies reasonable conclusions. It helps to improve the students' reasoning skills.

- Between the responsibility and critical thinking of the teacher: 0,594 moderate relation. The students' views gave the value between the teacher's critical thinking and group forming, capacity to conduct: 0,623 moderate. The students' assessment between the teacher's critical thinking and professional attitude: 0,605 moderate.

- Between the teacher's professional attitude and ability to act there is a strong relation of 0,680, which prevails in the personal and classroom interviews with the students. This is proved by the ability to act preparedness: 0,640 and the teaching ability to act: 0,578 moderate attitudes. The teacher's preparedness and self-control: 0,600 reflects its moderate strength that he/she carries out tasks with the students outside classroom with pleasure.

The students expect the following priorities from the teachers in the teaching-learning process of PBL:

1. Consistently well-prepared for the lectures/consultations: 85.7%
2. Active participation in the lessons: 84.3%
3. Highly developed professional attitude: 82.9%
4. Accepts responsibility for his/her own professional improvement: 80.0%
5. Shall have efficient teaching skills/methods: 71.4%
6. His/her communication: sensitive to non-verbal and verbal messages: 68.6%
7. Efficient group skills: 67.1%
8. High level of self-consciousness/self-control/competency: 65.7%
9. Appropriate critical thinking: 65.7%

Assessment carried out by PBL teacher on students' PBL attitude-forming learning habits

Students' attitudes carried out by PBL teacher assume a relation of positive strength in the following cases:

- Between the students' preparedness and professional attitude to fulfill their classroom and consultation tasks: shows a strong relation of 0,731, which proves that their participation was continuous, 80% on average, and voluntary on the problem-based

interactive lectures/consultations. This equals to the level of the professional attitude of the teacher's preparedness. The strength of communication-preparedness: 0,541 moderate.

- The students' participation and critical thinking show a moderate relation: 0,633; this strengthens the students' ability which in the field of critical literature searching they are able to share with their peers in the analysis of information/research results, in the reasonable conclusions of the hypotheses, as well as the application of evidence-based-nursing in the field of clinical praxis.

- Between the students' responsibility towards their own learning and critical thinking the achieved value was moderate: 0,594, which motivates them in their responsibility towards their future profession. The development of professional attitude and their critical thinking shows a moderate value of 0,605. The transfer of their knowledge / teaching the patients and the critical thinking is moderate: 0,557. Critical thinking – preparedness is of 0,535 strength regarding the students.

- The 0,525 level of students' communication-professional attitude, the 0,558 of patient training/teaching and professional attitude, and the 0,600 moderate relation of self-control and preparedness makes it possible for them to successfully conduct the patient training: the patients shall be able to handle the problems in the learning process in the form of personal, individual and small-group patient training in clinical praxis, and in small group with their peers (preparing milieu study in the patient's home).

CONCLUSION: it is clear from the answers of the students and teachers that there are three cases when the students are able to change their learning attitude radically:

1.If they prepare appropriately for the interactive lessons and consultations, i.e. they are ready to change their attitude.

2.If they feel enough responsibility and personal motivation to achieve their learning goals, are active participants, partners with the teacher, with the group in the common work.

3.If they are able to transfer and apply their knowledge of rarity value in the practice of their future profession during clinical practices; this gives them a confident self-control.

A well qualified, motivated training team is necessary who are able to motivate so that the teachers can influence the students' negative attitude at the expected extent and in the appropriate direction and thus the quality of teaching shall match with student satisfaction and the teacher can fulfill his/her desire respectively.

III. PHASE

Our results of 2000-2007 published in the journal of "European Journal of Cardiovascular Nursing" in 2010 were confirmed again internationally together with our research results in the Hungarian-Finish comparative test carried out in 2008.

AIMS: our test proved the efficiency and reliability of resuscitation with the help of PBL method in pedagogical practice. Test questions for the Finish nursing students: what are their learning habits on resuscitation like, what are their present and future professional goals, what they think of their own knowledge, how do they experience the process of gaining and deepening knowledge, what motivates them in learning.

METHODS: a total of 160 persons, first and fourth year full-time and correspondent nursing students took part in the Hungarian-Finish test of 2008. We analyzed our research results with chi-squared test, completed it with frequency testing and compared the standardized averages gained on the tested variables by countries.

In the comparative test of the two nations we tested a total of twenty-two variable items with SPSS 16.0 Windows statistic analysis, chi standardized variables, two dimension test.
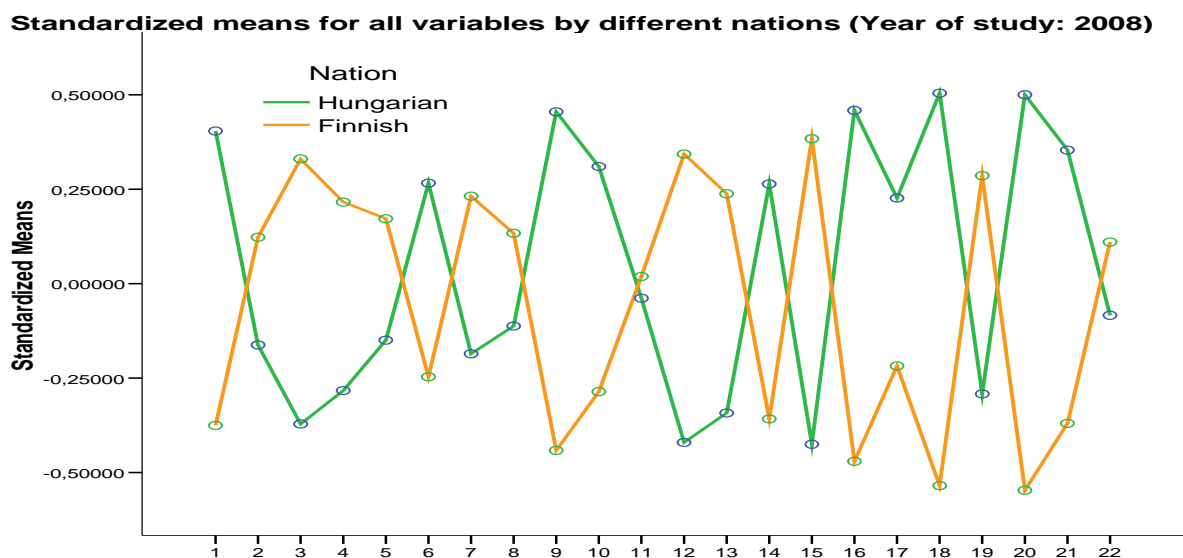
Figure 3. 1=Teacher centered educational method; 2=Student centered educational method; The ratings of effectiveness of the PBL-educational method on the following variables: 3=Problem-solving skills; 4=Interdisciplinary skills; 5=CPR skills; 6=Intubation skill; 7=Teamwork; 8=Quicker development of professional identity; 9=Professional competence; 10=Argumentation skills; 11=Elaboration of the curriculum; 12=Committing fewer errors; 13=Self-knowledge skills;14=Fewer failure; 15=Thinking skills; 16=PBL as a burden; 17=Be more accepted in the higher education; 18=Reaching professional successes; 19=Learning-motivational level; 20=Reform the subject requirements; 21= Choosing the PBL-method repeatedly; 22=Satisfaction with the PBL-teacher's achievement

RESULTS:

Analyzing the averages of the two nations' resuscitation test the Fins assessed the improvement of their resuscitation skills significantly higher ($\chi2=29,844$ f=8 p <0,01) due to problem-based learning and the new pedagogical method.

			Likert-scale-9									
			1	2	3	4	5	6	7	8	9	Total
Nation	Hungarian	Count	19	12	14	2	4	1	11	1	14	78
		%	24,4%	15,4%	17,9%	2,6%	5,1%	1,3%	14,1%	1,3%	17,9%	100,0%
	Finnish	Count	6	12	5	7	15	9	18	0	10	82
		%	7,3%	14,6%	6,1%	8,5%	18,3%	11,0%	22,0%	,0%	12,2%	100,0%
Összes		Count	25	24	19	9	19	10	29	1	24	160
		%	15,6%	15,0%	11,9%	5,6%	11,9%	6,3%	18,1%	,6%	15,0%	100,0%

Table 2. Evaluationof the CPR – skills in accordance to the different nations (Year of study: 2008)

The Finish nursing students assessed the growth of the level of their learning motivation significantly higher ($\chi2=20,627$ f=5 p=0,001) due to problem-based learning (PBL).

|			Likert-scale-9						
			2	3	4	5	6	9	Total
Nation	Hungarian	Count	1	2	16	38	20	1	78
		%	1,3%	2,6%	20,5%	48,7%	25,6%	1,3%	100,0%
	Finnish	Count	0	0	3	37	42	0	82
		%	,0%	,0%	3,7%	45,1%	51,2%	,0%	100,0%
Total		Count	1	2	19	75	62	1	160
		%	,6%	1,3%	11,9%	46,9%	38,8%	,6%	100,0%

Table 3. Evaluation of the increase of learning – motivational leveli n accordance to the different nations
(Year of study: 2008)

The students of both countries/nations unambiguously stated in their views a greater international acceptance of PBL form in higher education. The nursing students of the University of Pécs Faculty of Health Sciences assessed this variable significantly higher than the nursing students of the Finish Lahti University Faculty of Healthcare tested with chi-squared test ($\chi2=9,551$ f=2 p=0,008).

			Likert-scale-6			
			4	5	6	Total
Nation	Hungarian	Count	2	16	60	78
		%	2,6%	20,5%	76,9%	100,0%
	Finnish	Count	5	33	44	82
		%	6,1%	40,2%	53,7%	100,0%
Total		Count	7	49	104	160
		%	4,4%	30,6%	65,0%	100,0%

Table 4. The PBL method bemore accepted in the higher education-variable evaluation
in accordance to the different nations (Year of study: 2008)

CONCLUSION: the validity of the test results between 2000 and 2008 and the sample size of 2006 persons confirm that the resuscitation skills and the action in practice of the nursing students studying in national and international higher education and trained by problem-based learning are more efficient and confident. The improvement of these resuscitation skills is supported by the application of our own 7-step resuscitation model in the teaching-learning process. The total average of the comparative PBL-CPR marks in our 2008 Hungarian-Finnish pedagogical experiment (4.42) in the third research phase shows significantly better learning results than the PBL exam average of the two groups in CPR education of the 2011 international transplant team (4.35) published by German researchers Kadmon et al, in 2011. The students applying problem-based learning method: they have better skills in problem solving, decision making, teamwork, expressing their opinions than the students who learnt with a different learning method.
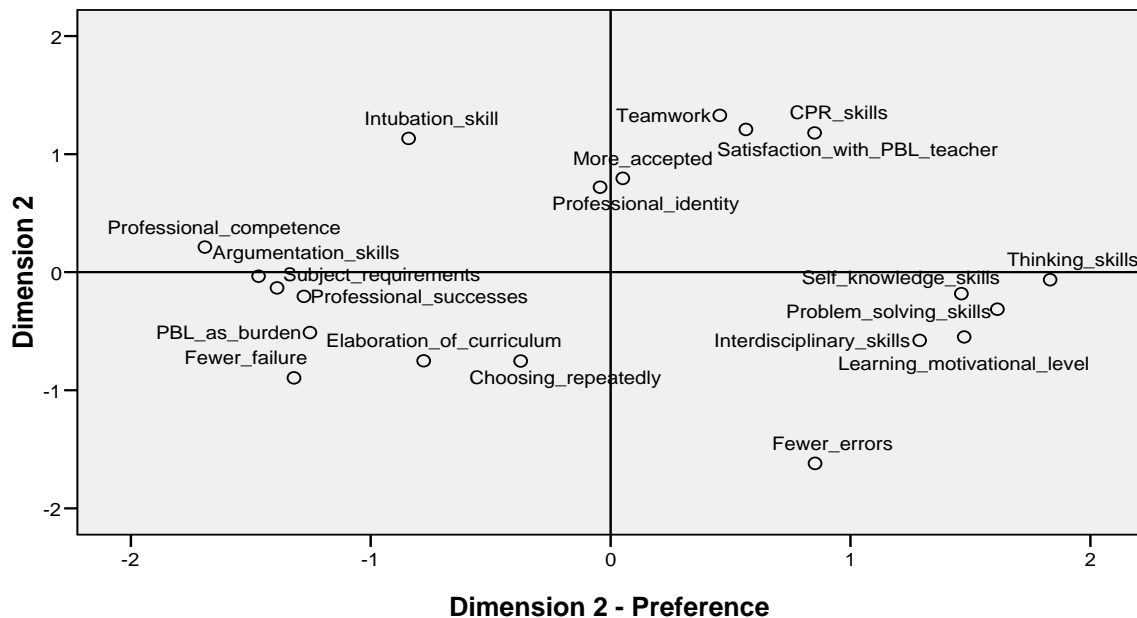
Figure 4. The efficiency of the PBL-method: the standardized variables in 2- dimensional figure (Year of study: 2008. Hungary-Finland)

The variables can be displayed better in two dimensions. The fit of the model is better. We can see in the second dimensional figure that, the preference dimension is now on the horizontal axis. The applicability of the pedagogical practice of problem-based learning, the improvement of students' skills and the measurability of their skills, the application of differentiated nursing – medical curriculum, the actuality of cost efficient, innovative and marketable educational tools in national and international higher education have been evidenced by the results of our three research tests.

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IMPORTANT RESEARCH RESULTS

1. *The comparative independent-sample t-test carried out between problem-based and conventional learning methods showed significant difference (t=3.569; p<0.001) for the benefit of problem-based learning, that is problem-based learning method was the most efficient (the results of the students trained by this method was significantly better). In line with expectations, students learning using the PBL method performed significantly better than those studying using the traditional method. Their achievements concur with the results published by Polglase et al (1989) and Wang et al (2008), who confirmed that PBL is a more efficient learning method than the traditional one.*

2. *PBL evaluates first and foremost the acquired knowledge (explicit) and students' rational problem solving skill, and not students' ability to write tests. In order to prove the model, we worked out our own seven step learning model in the last few years for a more efficient acquiring of resuscitation skills (Szögedi et al, 2010).*

3. *For self-awareness and communication development, the value of 6.623 of the variance analysis is the most important, implying the diversity of students' answers. It reflects the students' view that the precondition for their self-awareness development is the development of the right communication skills (Szögedi, 2010).*

4. *The total average of the comparative PBL-CPR marks in our 2008 Hungarian-Finnish pedagogical experiment (4.42) in the third research phase shows significantly better learning results than the PBL exam average of the two groups in CPR education of the 2011 international transplant team (4.35) published by German researchers Kadmon et al, in 2011.The students applying problem-based learning method: they have better skills in problem solving, decision making, teamwork, expressing their opinions than the students who learnt with a different learning method.*

   The advantages of PBL, based on our findings
   ❑ Student-focussed, supports active learning, increased understanding and remembering, as well as the development of the skill of Life Long Learning.
   ❑ General competences; PBL allows the students to develop general competences and attitudes that are beneficial for the students in practicing their future professions.
   ❑ Integration; PBL contributes to and supports the integrated core curriculum.

❑ Motivation; PBL is an experience for students and teachers alike, and the process requires for every student to be tasked in the joint learning process, both at the individual and at the group levels.

❑ Deep Learning; PBL facilitates deep/thorough learning (students interact with the curriculum, they compare principles/hypotheses with daily activities, their understanding becomes deeper).

❑ Constructivist approach/method; students activate their former knowledge and they built upon the acquired conceptual knowledge.

The disadvantages of PBL, based on our findings

❑ Teachers who cannot "teach"; teachers enjoy transferring their knowledge and find PBL facilitation frustrating, find it difficult to live with at the beginning.

❑ Human resources; more trainers need to participate in the education process.

❑ Data bases, assets need to be increased; more students need to be able to simultaneously access library data and computer sources.

❑ Role models; students might have little access to motivating/inspiring teachers; more PBL teachers need to be trained.

❑ Information overload; students might be uncertain initially regarding how much self-controlled learning they are to do, which information is relevant or useful.

SUGGESTIONS

The international researches and publications of 2011 strengthen the fact that the PBL learning form can be complemented with other infocommunication learning techniques, such as simulation based learning (Simulation Based Learning), which increase the efficiency of PBL in reaching training output objectives (Szogedi et al, 2011). *As a summary I wish to share the message and objective harmonizing with the latest international publications*: „the simulation teaching and learning method mainly serves as a "bridge" between classroom learning and the students gaining real clinical experiences. Due to its usage the students are virtually able to get acquainted with real physiological and pathological medical settings of simulation technologies in an interactive "clinical environment", with the form of simulation based learning. The students will be able to adapt the new knowledge and skills to their current knowledge freely (Szogedi et al, 2011). „Then they develop their existing skills, before they meet real patients in clinical environment and face real patient care problems at the clinic, in order to reach the clinical skills that they will use in practice after having

finished the training. The simulation teaching and learning serve the safety of the patient: for the patients, hospitals, students and the service centres carrying out the training." (Gaba, 2004, Stracke et al, 2006, Pawlowski, 2007, Amstrong, 2007, McGaghie et al, 2010, Cook, 2010, Arafeh, 2011, Teixeira Ferreira, 2011). The same expectations and objectives were published by Newman in 2004. The elaboration of more efficient techniques as transferral of factual knowledge, greater emphasis on the use of limited financial resources in producing reusable training tools, the willingness to experiment with the differentiated healthcare nurse-doctor curriculum that prioritize the graduates' combined skills – all these play a role in the higher education reform becoming a positive and operating adaptation process in the future (Newman, 2004).

SUGGESTION AT A NATIONAL AND INTERNATIONAL LEVEL

1. Problem based education and learning in the context of PBL experts' answers available in international literature: we drew the conclusion that "our research has proven that even at the highest theoretical-practical level of PBL theoreticians, practically there is no single *accepted* professional view on the relationship between PBL and higher education" (Epstein, 2005). *In order to solve this problem, additional national and international studies and research findings on higher education of nurses, including solutions, need to be published.*

2. *Implementation of a PBL based network, platform programme and project to be developed in line with international and national requirements.*

3. *The Hungarian-Finnish comparative study student opinions could serve as a sources of information for additional "international exchange of experience"* for decision makers and experts making recommendations for Hungarian problem based, student focussed education development (international PBL experts, researchers and national decision makers, curriculum developers, leaders of public education, possible cooperation of future national PBL experts).

4. *Participation in international PBL/SBL research projects.*

5. *Competent, professionally trained PBL curriculum developers and PBL teachers are needed.*

6. *The joint application of SBL and PBL methods would significantly develop bio-statistical data collection, enlarging the methodology pool, the analysis and*

publishing opportunities of nursing and medicine. Contacting higher educational institutions working with the PBL method, possible cooperation.

7. Problem based learning and the conclusions that can be derived form it for nursing, medicine and andragogy *can encourage teachers to revitalise their mentality and practice, as well as to develop innovative ICT learning tools.* Therefore it seems to be worthwhile to create *PBL/SBL centres, to launch PBL/SBL tutorial training, and to re-educate teachers teaching in healthcare education. Active participation in teachers' mobility programmes.*

8. Promotion of *university teachers, nursing managers, emergency experts, nursing researchers, curriculum developers* and PBL learning in post-graduate training; *the use of PBL training for Life Long Learning with the help of international experts. Launching accredited international EU training on PBL.*

9. Considering the international and national theory trends presented in the first half of the study we can state that the higher education elements of problem based learning and simulation based learning are not alien from the mentality or even practice of Hungarian higher education experts with a perspective view on their practice. With this in mind we can only welcome the intentions to set up seven national "skills" laboratories. These labs will be suitable for the *study of the above hypothesis in the wider context and roll out the outcome to the entire country. The design of the future study covering the seven centres and publishing the outcome* is recommended *in order to validate the above hypotheses and the outcome of this study.*

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PUBLICATIONS

I. List of ow, original publications related to the topic of the dissertation (3 pieces) Impact factor: 1,348

1. Müllerné Szögedi I.: *The effects of problem-based learning on the attitudes of students and teacher.* Nővér, 2006. 19. évf. 6. szám p. 38-43.(article)
2. Müllerné Szögedi I.**:** *The effects of problem-based learning on the attitudes of students and teachers*. Pedagógiai Műhely (Nyíregyháza),2007.1. szám 14:28.(article)
3. **Ildikó Szögedi**, Miklós Zrínyi, József Betlehem, Adrienn Siket Újváriné, Helga Tóth (2010) **Training nurses for CPR: Support for the problem-based approach,** European Journal of Cardiovascular Nursing Volume 9, Issue 1, Pages 50-56 **IF 2010: 1,348** – accepted for publication 28.09.2009. (article)

II. List of own citable lecture or poster abstracts related to the topic of the dissertation (16 pieces) - Impact factor: 9,405

1. Müllerné Szögedi I.: *The description of a problem based learning project (study).* SONIC (Students On - line in Nursing Integrated Curricula) 2003.1:18. www.uclan.ac.uk/sonic2002
2. Müllerné Szögedi I.:*The importance of student feedback in higher education.* III. Országos Neveléstudományi Konferencia, 2003.Október 9-11. Budapest, Tartalmi összefoglaló, p.61. MTA. Pedagógiai Bizottság.(lecture)
3. Müllerné Szögedi I.: *The importance of problem based learning in national and international higher education: a comparison of Hungary and Finland*. IV. Országos Neveléstudományi Konferencia, „Tanulás, kommunikáció, nevelés" Magyar Tudományos Akadémia, Budapest, MTA. Pedagógiai Bizottság; 2004.Október, 20-22. Absztraktgyűjtemény, 18:19:227. (lecture)

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5. <u>Müllerné Szögedi I.</u>: ***The effects of problem-based learning on the attitudes of students and teachers.*** VI. Országos Neveléstudományi Konferencia, „Tanul a társadalom" MTA. Budapest, 2006. Október, 26-28. Program, tartalmi összefoglalók: 18: 165: 168.(plenary lecture, and poster)

6. <u>Mullerne Szogedi</u>: ***The effects of problem-based learning on the attitudes of students and teachers.*** V. Southbohemian nursing days, 2006. 19th-20th September (plenary lecture)

7. <u>Müllerné Szögedi I.</u>: ***The effects of problem-based learning on the attitudes of students and teachers.*** VII. Országos Neveléstudományi Konferencia, „Változó tanulási környezetek, változó pedagógusszerepek" MTA. Program és összefoglalók, Budapest, 2007. Október, 25-27. 43: 44: 45.(lecture)

8. <u>Müllerné Szögedi I.</u>: ***The effects of problem-based learning on the attitudes of students and teachers***. PTE ETK XIII. Kari Tudományos Diákköri Konferencia,2007. Április, 28. Zalaegerszeg, Absztraktgyűjtemény: 10. (lecture)

9. <u>Mullerne Szogedi</u>: ***Problem-Based Learning Student Workshop***, LAHTI University of Applied Sciences. Faculty of Social and Health Care. 05. May 2008. Finland.(lecture)

10. <u>Mullerne Szogedi</u>: ***The roots of constructivism. Teachers Workshop***, LAHTI University of Applied Sciences. Faculty of Social and Health Care. 06. May 2008. Finland.(lecture)

11. <u>Mullerne Szogedi</u>: ***The effects of Problem – Based Learning on the attitudes of students and teachers***. LAHTI University of Applied Sciences. Faculty of Social and Health Care.08. May 2008. Finland. (lecture)

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15. <u>Szogedi I</u>[1], Campos T[2], Kukla A[3], Donnelly P[4] ***PBL (Problem Based Learning) as a method of learning, how SBL (Simulation Based Learning) improves the efficiency of output goals in healthcare education.*** 17th Annual Meeting Of The Society In Europe For Simulation Applied To Medicine. SESAM 2011. Simulation: a limitless training methodology June 2-4, 2011. Granada, Spain. Abstract book 146.page (lecture, and poster)

16. <u>Ildiko Szogedi</u> [1], Teresa Campos [2], Armando Romanos [3], Peter Donnelly [4], David Riley [5], Miguel Castelo-Branco [6] ” ***SIMBASE – Simulation Based Learning and how it Develops the Efficiency of Healthcare Centers by Using the ICT***

Method of a European Project", International Conference „ICT for Language Learning" 4th edition Florence, Italy 20-21 October 2011.(lecture, and poster)

III. List of further own publications (16 pieces) - Impact factor: 14,192

1. <u>Mullerne Szogedi</u> – J. Betlehem: ***The options of disaster care education at the University of Pecs, Faculty of Health Sciences, Zalaegerszeg Training Center.*** 6th ISDM, Nemzetközi Konferencia, Budapest, 1996.(lecture, and poster)

2. <u>Mullerne Szogedi</u> – J. Betlehem. ***Evaluation of student performance through Orem's Model of Nursing.*** Ist. International Conference on Nursing Theories, Nünberg, 1997.(lecture, and poster)

3. <u>Müllerné Szögedi I.</u>: ***Anxiety and mental hygiene*** *(MSc.dissertation)* JPTE Bölcsészettudományi Kar Pedagógia Szak 1997. http://iqdepo.hu/dimenzio/18/18-01-14.html[2008. 12. 05.] http://kerikata.hu/publikaciok/text/!kek/kozokt/kozokt10.htm[2008.12.0I.]

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5. <u>Müllerné Szögedi Ildiko</u>*: **The influencing factors of interpersonal communicatio, Media – Information and Technology - Communication*** konferencia Veszprém. 2001.Szeptember 13-15.MTA Veszprémi Területi Bizottság. Konferencia Tartalmi összefoglaló. 1:23. oldal (lecture)

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IN HEALTH Volume: 13 Issue: 3 Pages: A87-A87 DOI: 10.1016/S1098-3015 (10) 72414-1 Published: MAY, 2010 (lecture, and poster)

13. Adrien Siket Ujvarine; Miklos Zrinyi, PhD; Helga Toth; <u>Ildiko Szogedi;</u> Ilona Rimar Zekanyne; Jozsef Betlehem: ***The role of faculthy and clinical practice in predicting why nurses graduate in Hungary***: Nurse Education Today, **<u>IF 2010:1,113</u>**. – accepted for publication 26.04.2010. (article)

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15. Vízvári László, <u>Szögedi Ildikó,</u> Bethleni Zsuzsanna, Huller Gabriella, Erdélyi Gábor: ***Multilingual Virtual Simulated Patient***. V. Critical Care Day sin Pécs.1-2 October, 2010.(ISBN:978-963-7178-64-1) (lecture, and poster)

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