Reflections on our second English number of 2016

Since the beginning of 2015, our review has from time to time been issued in English, as well. As international sciences mainly use English for communication, ***Opus et Educatio*** has been striving to offer a quality framework for domestic authors on one hand and the authors willing to appear in the Hungarian publication field on the other. Of course, in this case, too, the previous judgement and reading of the papers is a basic condition. This year, we have made great steps forward: our online digital issue has been transferred to the interface of the Open Journal System, and besides, in harmony with the growing number of the articles, we are now issuing the second foreign language number of this year. It is also pleasing that, stepping into the third volume of this review, is is exactly this issue that surpasses the border (300 characters which is app. 7.5 sheets) that indicates the impact of willingness to publish and of thematic development.

Of course, in this number, as well, we have made efforts to strengthen thematic features. In case we wish to demonstrate the connection between the articles published, we can say that, implicitly, the basic dimension is the development if higher education. Under the heading ***Studies***, the papers by a Brazilian researcher, *Marilia Ramos* and Hungarian authors – *Enikő Baróthi, Attila Mészáros and Dániel Gergő Pintér* – analyse the cultural embedment of higher education and possibilities of its international comparison and within that the special role played by teacher training in this system. ***Main Topic***, offering a newish formal frame, connects to this bloc. It introduces the lectures presented during the scientific symposium titled *Co-creative problem solving* and organized together by the Budapest University of Technology and Economics and the Tampere University of Applied Sciences in May this year. The Finnish speakers – Pirjo Jaakkola who is an author of our review and his colleagues: Päivi Karttunen and Sami Suhonen – and our Hungarian colleagues playing an important role in inter-institutional cooperation: György Magyar, Anikó Kálmán and Judit Reményi present innovation processes the higher education importance of which lean beyond the direct and successful cooperation of the two institutions. All this is particularly interesting, and proved with evidences when necessary, in the series of reports some elements of which have already been published in our review, and the core objective of which is to summarize the experiences gained by the participants and leaders of teachers' domestic professional further education during their search and study of the Finnish education system. With their analysis adopting several professional standpoints, Zsolt Csutak and Lászlóné Nagy-Czirok lend a colourful, and not dark, tone to the valuable materials of the symposium. All this, in the selection containing nine papers, give an undoubtedly special character to this number.

We carry on with the section titled **Projects** which offers information on the *Open Content Development (OCD)* project that supports a methodological innovation in VET and teacher training during a period of four years and is implemented within the frames of the Methodological Tender Call announced by the Hungarian Academy of Sciences. Since the project adopts openness not only in its title but also in the whole development process, we have great hopes that the report on the start of the project will generate further interest and

partnership. During research and development, it is a basic task to create the active partner participation of the VET partner institutions and their teachers in the first phase of the project (2016-2018) in the indicated VET institutions undertaking professional collaboration.

This number of the review, too, is finished with a recension. Thematic feature is also indicated by the fact that the book by Anikó Kálmán, titled *Learning – in the New Lifelong and Lifewide Perspectives* and published in Tampere is introduced by *Marc Groossens*, an internationally acknowledged researcher; this reminds us that LLL is a real global phenomenon, and the **good practices introduced demonstrate this tendency**.

Finally, this is the sixth number of this year, two of them published in English. These facts show an inter-connection of development which we highlight because in the future we wish to publish more and more numbers and more and more of them in English. In addition to the usual Christmas wishes, we would respectfully like to say: in accordance with the several-centuries traditions of our University, our Editorial Board is continuously engaged with quality, and intends to meet the requirements of scientificity at the highest possible level while keeping the basic norms of providing information in sight. We welcome Readers' feedbacks as well as interesting and valuable articles in English so that our review can join the international scientific flow of information more and more deeply.

Our Editorial Board wish our Readers Merry Christmas and a Happy New Year!

Budapest, December 2016.

András BENEDEK

Chief Editor

of ***Opus et Educatio***

Marilia RAMOS

The impact of cultural capital on undergraduate students' performances in Brazil

Introduction

The article brings forth results obtained through research that verified the impact of exterior cultural elements in the performance of students at the undergraduate level in Brazil. The students in question, participated in the 2008 ENADE exam, which is coordinated by the Ministry of Education (MEC).

The Exame Nacional de Desempenho de Estudantes (National Student Performance Exam - ENADE) evaluates the performance of undergraduate students, in their first and last year of university, in relation to the contents of the courses they are enrolled in. The National Student Performance Exam is, in addition to the analysis of courses and institutions; one of the means used to evaluate the quality of higher education in Brazil. Students' participation is mandatory and a requirement for graduation, as the exam is part of the academic record.

Created in 2004, the ENADE substituted the Exame Nacional de Cursos (National Course Exam, also known as *Provao*). Its objective is to analyze not the individual performances *per se* but to generate a general evaluation about the courses. Besides the scores of tests, ENADE measures the socioeconomic profile of students and their achievements on specific courses. Until 2009, a sample taken from the registered students was made by the Instituto Nacional de Estudos e Pesquisas Educacionais Anisio Teixeira (Inep).

The total number of students registered on the 2008 ENADE was 824,804 (among first year and graduating students); they were researched in the end of their first academic semester and in the end of their last academic semester.

The main **research question** was: How does familial and personal cultural capital of university students from Brazil, influence their academic grades? Considering a series of other factors such as economic conditions, what is the weight of university students' familial and personal cultural capital on undergraduate students' grades? Our hypothesis was based on Bourdieu and Passeron's idea that students with higher volume of personal and familial cultural capital and with greater access to information have a tendency of achieving superior performance in relation to those who possess less cultural capital. Through this research, our objective is to empirically verify the influence of undergraduate students' cultural capital in their performances, measured by the 2008 ENADE, taking into account the differences that may exists among students, as well as academic environments (different institutions) and professors, and if they live or not in rural areas.

We consider that the relevance of this study relies in the fact that public policies in the area of higher education focus primarily on issues related to the academic environment; they are important policies, but don't take into account the reality of students outside the University.

It seems pertinent to promote studies that focus on questions related to cultural capital and issues of performance in academic institutions. In societies with high levels of inequality, like Brazil, where social mobility opportunities are scarce, it is justifiable to investigate if exterior variables reproduce social inequalities inside the universities.

According to the philosopher Zygmunt Bauman, education reproduces privileges instead of contributing to the betterment of society. He reminds us that, in the US 70% of university students come from higher classes, while only 3% are from the lower economic strata. Bauman contends that "this is a way of reaffirming social inequality", which is the topic of his book (August 2015).

One of education's duties is to guarantee to all peoples the opportunity of acquiring knowledge, which should then be used to benefit society. This objective however, is not achieved nor is it a priority in many places.

Cultural Capital and the Reproduction of Inequalities

There are many researches and sociological theories that help us navigate through the academic world. One of them seeks to explain the relationship between social inequalities and the performance of students. In this scenario, even if focusing on different aspects, it is important to note the work of Coleman (1997), Bourdieu (1982; 1998) and Bernstein (1997), among others. In a similar line of research, in Brazil Silva and Hasenbalg (2000), Barbosa (2009), Nogueira, Cunha,Viana and Resende (2009) are references in the topic.

The educational institutions were considered influential in the results presented by their students, but their social baggage was not excluded from the process.

In this paper we do not argue that the Educational Institution doesn't matter to students' academic performances. But we seek to shine light to the importance of certain characteristics students bring from home.

In relation to Cultural Capital, it is fundamental to take into account the different types it can be found. According to Bourdieu, a set of resources and abilities inherited from the dominant culture is considered **incorporated cultural capital**. Those are likes and esthetic dispositions originated from the dominants and translated through the *habitus* (systematic dispositions and perceptions frames). Bourdieu (2007, p. 76) highlights that the presence of cultural items in the household reinforces the education basis.

The other two types of cultural capital are the **Acquired one**: the possession of cultural items; and the **institutionalized cultural capital**, which is formed by the possession of academic titles.

Specifically in the studied case, the incorporated cultural capital is the one which is acquired in the familial environment. It is part of secondary socialization, such as the habit of reading books, to appreciate art etc… The acquired cultural capital is the one materialized in the form of learning a second language, cultural belongings etc. and the institutionalized cultural capital is the one sanctioned by the State in the form of diplomas, qualifications and credentials (Bourdieu, 1998). There is an interesting relationship between incorporated cultural capital and institutionalized cultural capital, since in order to obtain both, economic capital is necessary.

The objectified cultural capital has some facets that are engendered only in their relationships with the corporate state. In its materiality, through books, paintings or sculptures, for example.

In addition, due to the direct contact with cultural heritage and a kind of family training, the young people of the privileged classes inherit knowledge, taste and distinctive arrangements that fit the requirements of institutionalized education.

Dataset, Study Variables and Methodology

ENADE's data set used in this research is from 2008 and was taken from MEC/INEP's website. The data set has the information of 824,804 students. 2008's data was chosen over 2010's (the most recent one available) because it utilizes a more complete socio-economic questionnaire, which was used in our research.

Certain questions are necessary in order to adequately measure the cultural capital of university students in Brazil, such as languages spoken (besides Portuguese) and at what level. What means do students use to access information and news; news papers, magazines and television, can be used as means to acquire knowledge and culture. The utilization of computers today, is a clear dividing factor since it is an important mean by which students can find additional information, and it is a useful tool in academic settings. In addition, cultural activities such as going to the theatre and cinema, attending concerts and shows are also taken into account.

All of the above criteria, are not mentioned in the 2010 ENADE but are present in the 2008 one. This clearly shows the importance of utilizing a more wholesome questionnaire when trying to understand how university students' cultural capital affects their academic performance, without being directly related to the academic environment.

In this study, the dependent variable is the proficiency of students in the ENAD 2008 and the main independent variable is cultural capital.

The proficiency of students is measured by the score obtained in the ENADE exam, which can range from 0 to 100; in the data set the overall average was 39.38 with a standard deviation of 14.60.

The objectives of ENADE include the building of two kinds of measurements; one refers to the quality of the national education system, through the students' proficiency and the other

relates to the components of the social context of students, which can be related to their performances.

In order to operationalize the complex dimensions of the cultural capital of the students, using the variables from the contextual questionnaires of 2008 ENAD, a cultural capital scale with 12 questions and answers was created (see Table 1), by adding up their score a new point scale was made that goes from 0 to 33 points . The scale had 7 questions with four answer choices from 0 to 4 (28 points maximum) and 5 questions with two answer options, 0 and 1 (maximum 5 points). All responses were coded so that higher values correspond to responses that indicate greater cultural capital. Figure 1 below summarizes the items that composed the cultural capital scale.

Figure 1 Questions composing Cultural Capital scale

Incorporated Cultural Capital	
1- What is your father's level of education?	0 - None 1 – elementary (up to 5th grade) 2 - elementary up to 8th 3 –high school 4 – higher education
2- What is your mother's level of education?	0 - None 1 – elementary (up to 5th grade) 2 - elementary up to 8th 3 –high school 4 – higher education
Acquired cultural capital	
3- What is your level of knowledge in regards to the English language?	0 - Practically zero 1 read , but do NOT write NOR speak 2 - I read and write but NOT speak 3 - read and write fairly

	4 - I read , write and speak well
4- What is your level of knowledge in regards to the Spanish language?	0 - Practically zero 1 read , but do NOT write NOR speak 2 - I read and write but NOT speak 3 - read and write fairly 4 - I read , write and speak well
5- How often do you read the newspaper?	0 - Never 1 - Rarely 2 - ONLY on Sundays 3- Sometimes a week 4 - Daily
6- **Do you participate in extracurricular cultural activities outside of HEI?**	0-No 1-Yes
7-**How often do you use a laptop computer?**	0 - Never 1 - rarely 2 - Sometimes 3 - often 4 -always
8- How many books have you read this year, not including mandatory books for University?	0 - None 1-2 Maximum 2 -between 3:05 3 -between 6:08 4 -over 8

9- Do you have access to internet?	0-No 1-Yes
Institutionalized Cultural Capital	
10- Which period of the day did you most often have classes?	1- Day time 0- Night time
11- Which type of high school did you attend for the majority of your studies?	1-private 0-public
12- Type of education	1- preparatory 0-thecnical

The scale average found was 19.83 with a standard deviation of 4.10 The reliability coefficient (Cronbach's alpha) was 0.734. The correlation between the score achieved in the ENADE and the cultural capital scale was 0.664.

The model of analysis used had the measure of student proficiency in ENAD 2008 as its dependent variable, cultural capital scale as their main independent variable and the remaining as their control variables. The control variables refer to sex, marital status, work, income, number of kids, hours of studying, use of library, research activities and cohabitation.

The analytical strategy used was the multivariate linear regression; analysis of this kind allow for predictions of the effects of an independent variable to one dependent, taking into account the presence of other independent variables. The existence of these other independent variables works as a kind of control of the influence of the main independent variable. This is, given that students and schools do not have the same exact characteristics, we must take into account (or statistical language, "control") these differences so that we can capture the independent effect of cultural capital on student performance. Also, you can see how much of the variation in the dependent variable can be explained by the set of independent variables allocated in the analytical model.

First we present some descriptive analyses that allow us to view the profile of the students surveyed regarding cultural capital and also their average in ENADE by cultural capital indicators analyzed separately. Only after these descriptive analyses we present the results of our regression model.

The Brazilian university student's profile related to cultural capital

Regarding the cultural capital levels and the student's sex, it was found by Table 1 below, that male students have significantly higher averages than female students.

Table 1 Sex

	Sex	N	Mean	Standard Deviation
Cultural k	Male	131109	20,4083	4,06029
	Female	159963	19,3680	4,07486

p<= 0,01

Regarding marital status, as expected unmarried students have significantly higher scores than non single students, as can be seen in Table 2 below.

Table 2 Marital Status and cultural capital

	Marital status	N	Mean	Standard Deviation
Cultural k	Single	211039	20,4575	3,99656
	Not single	80033	18,1993	3,91836

p<=0,01

Students who do not work have significantly higher averages of cultural capital in relation to students who work, as we can see in Table 3 below.

Table 3 Work and cultural Capital

	No work=1	N	Mean	Standard Deviation
Cultural k	No	82693	20,6292	4,09525
	Work	208379	19,5221	4,06076

p<=0,01

Students who self-declared as white, showed cultural capital averages significantly higher than students who self declared as black, as seen in Table 4, below.

Table 4 Color and Cultural Capital

	color	N	Mean	Standard deviation
Cultural k	White	183070	20,2752	4,04972
	No white	108002	19,0932	4,08046

p<=0,01

Regarding cohabitation, those living with family members have significantly higher averages than those who do not, although the difference is not as significant according to what we see in Table 5 below.

Table 5 Cohabitation and Cultural Capital

	Cohabitation	N	Mean	Standard deviation
Cultural k	Wihout relatives	47181	19,6756	4,13142
	W/relatives	243891	19,8678	4,09447

p<=0,01

The relationship between cultural capital and performance in ENADE exam

As mentioned earlier, the correlation between scores in ENADE and the scale was 0.664. Analysis of the variables that make up the cultural capital scale separately showed us that those students whose fathers have higher level of education (higher) have an average mean grade in the ENADE greater than those whose fathers have lower educational levels. The same trend was found when the analysis was done for maternal education levels. These results were obtained by analysis of variance technique and the post hoc Tukey test. This shows that all differences in means of scores in all categories which involved parental and maternal education levels, were statistically significant at p < = 0.05. The Tables 6 and 7 below show the results.

Table 6. Means ENADE's grades by father's education

	N	Mean	Standard deviation
0 - None	20490	38,3972	13,69259
1 elementary(up to 5th grade)	94545	30,1113	14,22592

2 - elementary Up to 8th	52222	39,4207	14,45594
3 –High school	82380	39,6443	14,69426
4 -Undergrad	51632	41,2605	15,25413
TOT	301269	39,9443	14,55830

Table 7. Means ENADE's grades by mother's education

	N	Mean	Standard deviation
0 - None	16784	38,1931	13,70752
1 elementary(up to 5th grade)	84337	30,2389	14,19523
2 - elementary Up to 8th	53038	39,5678	14,44600
3 –High school	88690	39,6389	14,69867
4 -Undergrad	59628	40,8354	15,11673
TOT	302477	39,9494	14,56019

With regard to knowledge of languages and the score in the ENADE, the research found that in spite of the fact Variance analysis were significant, differences in averages by level of language knowledge were not all statistically significant. Specifically in regards to knowledge of the English language, those who can read, write and speak well, had the highest average in the ENADE. However, there is no significant difference between those who declared they could read but not write nor speak and those who declared read, write and do not speak. Table 8 shows the averages of the notes in ENADE by level of knowledge in English.

Table 8. Means ENADE´s grades by English Knowledge

	N	Mean	Standard deviation
0 - Practically zero	118306	39,4544	14,58632
1 read , but NOT write and speak NOR	53186	39,1960	14,31391

2 - I read and write but NOT speak	31076	39,0412	13,98744
3 - read and write fairly	71106	40,3255	14,35134
4 - I read , write and speak well	28906	43,4327	15,43091
Total	302580	39,9513	14,55724

In relation to knowledge of Spanish, the highest averages of scores in the ENADE were found in the category of those who declared they could read and write reasonably. However, there is no significant difference between those who declared read but not write nor speak, and those who declared read, write and speak well . Table 9 shows the averages of the notes in ENADE by level of knowledge in Spanish.

Table 9 Means ENADE´s grades by Spanish Knowledge

	N	Mean	Standard deviation
0 - Practically zero	86444	41,0175	14,74820
1 read , but NOT write and speak NOR	17280	39,0831	14,38250
2 - I read and write but NOT speak	43750	40,4042	14,58316
3 - read and write fairly	9721	41,6310	15,66886
4 - I read , write and speak well	144973	39,1737	14,32304
Total	302168	39,9532	14,55837

p<=0.05

As for the frequency of books read per year and the average in ENADE those who reported reading more than 8 non-academic books a year had the highest average score in the ENADE as we can see in Table 10

Table 10. Average scores in ENADE and books read per year, not counting mandatory academic readings

	N	Mean	Standard deviation

None	48887	36,3790	13,71161
2 maximum	98164	38,6469	14,10714
Between 3-5	94489	41,1564	14,52929
Between 6-8	27795	42,5601	14,72838
Over 8	31183	44,0536	15,34576
Total	300518	39,9900	14,55763

p<=0.05

With regard to newspaper reading we did not find the expected difference would mean the highest score among those who read more often. In fact the biggest average score is in the group of those who reported reading newspaper only on Sundays. We think that today, young people tend to access information more through social networking sites and the internet than by newspaper reading itself. Table 11 illustrates the relationship between journal read and note the ENADE.

Table 11. Average scores in ENADE and newspaper reading frequency

	N	Mean	Standard deviation
0 - Never	13220	38,9057	14,61400
1 - Rarely	101065	40,3684	14,44171
2 - ONLY TO Sundays	22371	40,6236	14,74582
3 Some times a week	108237	40,1457	14,53025
4 - Daily	57041	38,8609	14,67123
Total	301934	39,9586	14,56010

p<=0.05

With respect to computer use those who reported alwaus using had the highest Mean in ENADE scores as we can see in Table 12 below.

Table 12. Average scores in ENADE and computer use

	N	Mean	Standard deviation

Never	5176	35,2337	13,32703
Rarely	10496	36,1452	13,18611
Sometimes	28143	37,9995	13,66176
Often	74759	39,9381	14,33829
Always	181846	40,6470	14,81018
Total	300420	39,9720	14,56312

p<=0.05

With regard to the use of the Internet we observed that those who use it present greater averages in scores in the ENADE than those that do not. This result may support the findings above on the newspaper reading. Table 13 illustrates this information.

Table 13. Internet Access and Mean in ENADE Exam

Do you have Access to the internet?	N	Mean	Standard deviation
Yes	278765	40,1579	14,59690
No	17625	38,3264	13,98987

p<=0.05

Regarding the type of school attending during high school, those who did all or most of their studies in private schools showed slightly higher averages than those who did most or all public school as we can see in Table 14 below.

Table 14. Average score in the ENADE test and type of school studied

School	N	Mean	Standard deviation
Private	205455	39,6038	14,33371
Public	212062	39,1782	14,86507

p<=0.05

With regard to participation in cultural extracurricular activities, those who reported participating, had averages in the ENADE significantly higher than those who did not participate in accordance with Table 15 below.

Table 15. Average the test note ENADE and cultural activities

Do you participate in cultural activities?	N	Mean	Standard deviation
Yes	279749	40,2203	14,56910
No	137768	37,6968	14,53933

p<=0.05

The average score in the ENADE also varies significantly among those who study mostly during the day compared to those who studied mostly at night. Those who studies during the Day had averages in the ENADE higher in those who reported studying in the night as shown in Table 16 below.

Table 16. Average score in the ENADE and turn of classes

Turn	N	Mean	Standard deviation
Day	112929	40,7947	14,97673
Night	304588	38,8659	14,43347

p<=0.05

Regarding the type of high school attended, those who made technical education had slightly higher average in ENADE that those who made preparatory school as seen in Table 17 below. This may be explained by the advent of federal technical schools, which have the highest level of quality.

Table 17. Average in ENADE exam and type of education attended

Type of education	N	Mean	Standard deviation
Preparatory	202224	39,8310	14,55423
Technical	215293	38,9711	14,64525

p<=0.05

The Conditioners to the students` academic performance on the ENADE exam

We can see in our multivariate model, which included the cultural capital scale as the main independent variable and the other ones as control, that all variables were statistically significant. Specifically among the 12 variables included in the cultural capital model, cultural capital was among those with greater explanatory power (magnitude of the coefficient b)

Specifically for each unit cultural capital score in the ENADE grew on average 1.22 points. Regarding the other variables with the greatest impact we highlighted in order of magnitude, participation in research activities was responsible for, on average 1.94 more points in ENADE than those who do not participate. Unmarried presented in average 1.87 points lower at ENADE than married. Those who do not attend library present in average 1.87 points lower at ENADE that those who use. Students from families with low income (less than 3 salaries to less than 10 minimum wages per month) have on average 1.42 points lower at ENADE than those with higher incomes (from 10 to more than 30 salaries per month). Finally those studying during the day have on average 1.02 points higher in ENADE that those who study at night.

Table 18. Multivariate Regression Model

Independent Variables				t	Sig.
	B	Std. Error	Beta		
(Constant)	29,856	,231		129,515	,000
Cultural K	1,221	,207	,062	6,141	,000
white=1	,680	,057	,023	11,963	,000
single=1	**-1,871**	,080	-,057	-23,302	,000
w/o relatives=1	-,336	,074	-,008	-4,528	,000
No work=1	-,260	,065	-,008	-4,010	,000
Low income=1	**-1,423**	**,057**	-,048	-24,976	,000
Number of kids	-,853	,047	-,049	-18,275	,000
Age	,160	,005	,086	32,549	,000
No use Library=1	**-1,870**	,109	-,032	-17,088	,000
Hours of studying	**1,520**	**,025**	,114	60,214	,000
Research activity=1	**1,947**	,056	,065	34,709	,000
Day classes=1	**1,022**	,061	,033	16,759	,000

a. Dependent Variable: Grades on ENADE (0-100) R2=13,2

Conclusions

After performing the statistical multivariate analysis, some variables are expressed among the most important to explain the students` performance. Participation in research, not going to the library, marital status, the number of hours of study, family income and cultural capital were characterized as variables with the greatest impact on student test scores.

The cultural capital occupied an important place among all the variables that made up the complete analytical model. Every unit that increases the cultural capital students´ grades grow 1.22 points on average.

The gap analysis presented here is related to the individual components of each student, this macro analysis cannot (or should) reach with the available instruments. It was not possible to deepen the types of books accessed by students, the quality of education of the family, in short, an entire indisputable complexity as the specificities of each family, of each student. Also the daily relationships that trigger this or that ability, this or that incentive for studies, or the very facets of the obstacles that only a qualitative monitoring can light were absent in the course of this article.

Finally, it was proved that Bourdieu's theory is relevant, in the question of the influence of cultural capital in the proficiency of Brazilian undergraduate students . Even if the scope of all your settings should be qualified, as the University Institution also has its importance, not only reproducing inequalities, cultural capital still has an impact that needs to be taken into consideration mainly to help to build educational public policies.

References

- ANDRADE, Dalton; TAVARES, Heliton; VALLE, Raquel. **Teoria da Resposta ao Item**: Conceitos e Aplicações. SINAPE 2000.

- BARBOSA, M. L. O. & Randall. Desigualdades Sociais e a Formação de Expectativas Familiares e de Professores. In: **Caderno CRH**, vol 41, 2004. Pp. 299-308.

- BARBOSA, Maria Ligia de Oliveira. **Desigualdade e desempenho**: uma introdução à sociologia da escola brasileira. Belo Horizonte: Argumentum, 2009.

- BERNSTEIN, Basil. Estrutura social, linguagem e aprendizagem. In: PATTO, Maria Helena Souza. **Introdução à Psicologia Escolar**. 3ª Ed. São Paulo: Casa do Psicólogo, 1997. p. 145-169.

- BONAMINO, Alicia; ALVES, Fátima; FRANCO, Crespo. Os efeitos das diferentes formas de capital no desempenho escolar: um estudo à luz de Bourdieu e de Coleman. **Revista Brasileira de Educação**, volume 15, número 45, setembro/dezembro 2010. Pp. 487-499.

- BOURDIEU, Pierre. **A Distinção**. Porto Alegre: Zouk, 2008.

_____. **A Reprodução**. Rio de Janeiro: F. Alves, 1982.

_____. **Escritos de Educação**: Pierre Bourdieu. Petrópolis: Vozes, 2007.

_____. **Los Herederos**: Los Estudiantes y La Cultura. Buenos Aires: 2002.

_____. **O Poder Simbólico**. Rio de Janeiro: Bertrand Brasil, 2010.

_____. **Os Usos Sociais da Ciência**. São Paulo: UNESP, 2004.

_____. **Razões Práticas**: Sobre a teoria da ação. Campinas: Papirus, 1996.

- BRASIL. MINISTÉRIO DA EDUCAÇÃO. Exame Nacional de Desempenho de Estudantes (ENADE), 2005 (Banco de dados). Brasil, 2006. In: Consórcio de Informações Sociais, 2007. Disponível em: <http://www.cis.org.br>. Accessed on 03/24/2011.

- COLEMAN, James. Social capital in the creation of human capital. In: **Halsey et al. Education Culture Economy Society**. Oxford: Oxford University Press, 1997.

FORQUIN, Jean Claude. **Sociologia da Educação**: Dez anos de pesquisa. Petrópolis: Vozes, 1995.

- GAMBOA, Luis; WALTENBERG, Fábio. **Inequality of Opportunity in Educational Achievement in Latin America:** Evidence from PISA 2006-2009. CEDE – Centro de Estudos sobre Desigualdade e Desenvolvimento, Discussion paper, n 49, july 2011.

- INSTITUTO NACIONAL DE ESTUDOS E PESQUISAS EDUCACIONAIS ANÍSIO TEIXEIRA. **Relatório Nacional ENAD 2005**. Brasília: INEP, 2006. 266 páginas.

- LAHIRE, Bernard. **Sucesso Escolar nos Meios Populares**: As Razões do Improvável. São Paulo: Ática, 1997.

- MORRISH, Ivor. **Sociologia da Educação**. Rio de Janeiro: Zahar, 1973.

- NOGUEIRA, Cláudio Marques; CUNHA, Maria Amália de Almeida; VIANA, Maria José Braga; RESENDE, Tânia de Freitas. A influência da família no desempenho escolar: estudo de dados da geração escolar 2005. In: **Revista Contemporânea de Educação** (UFRJ). Rio de Janeiro, vol 4, n 8, august/december 2009.

- ROSEMBERG, Fulvia. Race and gender inequalities in the Brazilian educational system. **Paper presented at the Conference on Ethnicity, Race, Gender and Education**, PREAL/Lima, Peru, 28/29, October 2002.

- SEABRA, Teresa. Desigualdades escolares e desigualdades sociais. **Sociologia**. [online]. jan. 2009, no.59 [cited 28 Junho 2011], p.75-106. Available in World Wide Web: <http://www.scielo.oces.mctes.pt/scielo.php?script=sci_arttext&pid=S0873-65292009000100005&lng=pt&nrm=iso>. ISSN 0873-6529.

- SILVA, Nelson do Valle; HASENBALG, Carlos. Tendências da Desigualdade Educacional no Brasil. In: **Dados**, vol. 43, n. 3, 2000, p. 423-445.

- SILVA, Tadeu Tomaz da. **O que produz e o que reproduz em educação**: ensaios de sociologia da educação. Porto Alegre: Artes Médicas, 1992.

_____. As contribuições de Bourdieu para a análise do campo educacional. In: **Veritas**, Porto Alegre, vol 41, n162, 1996. Pp. 243-248.

- SOARES, José Francisco; ALVES, Maria Teresa G. Relações raciais e desempenho escolar: as evidências do sistema da avaliação do ensino básico – SAEB. **ANPOCS – XXVI Encontro Anual**, Caxambu, MG, 2002.

- SOARES, José; COLLARES, Ana. Recursos familiares e o desempenho cognitivo dos alunos do ensino básico brasileiro. In: **Dados – Revista de Ciências Sociais**, Rio de Janeiro, vol 49, n 3, 2006. Pp. 615-650.

Enikő BARÓTI, Attila MÉSZÁROS

The development of quality higher education abroad

1. Changed university cultures

How does a supporting university culture similar to this one look like? The research team of Prof. Dr. Dieter Frey. (Department of Social Psychology, LMU) have tried to answer these questions in the recent years *(Frey, D., Peus, C. & Traut-Mattausch, E. (2005))*. As a good employer an excellent university has a value-oriented workplace and management culture, it creates an environment where the employees are motivated and it encourages and appreciates the professionals. According to the analysis the universities need to create so-called 'Centers of Excellence'. These centers can help the operation of other groups, departments and organizations. These centers are not stated by the law, but those universities where they are realized can have an advantage over the competitors.

1.1. „Center of Excellence"

Let's see what kind of 'Center of Excellence' fields and cultures can appear at the universities.

1.1.1. Team culture

We need to create the cooperation culture of the university in order to stand out from the average. The positive team culture can be characterized with the ability of the organization to identify and use its own synergy. At an ideal place the departments and organizational units are created in a heterogeneous way and their work is completed according to common rules. This is an important principle, so the new employees should be selected in an appropriate way or a new research team should be set up. At a higher level, research teams based on multidisciplinary and organizational networks, departments, and even universities can join their forces, solve their problems and in this way they can also step forward. The innovative ability is essential in the cultures like this, and it can also overcome the boundaries of the conventional subjects. Moreover, it can give way to the new development.

1.1.2. Problem solving culture

The problem solving culture is an attitude to be able to understand that the problems are an opportunity to improve and a good way to innovation. This point of view is essential at the universities where the new ideas and research methods are not only based on the actual tenders, but also a search for a solution-oriented approach based on a planned system. According to this way of thinking the solutions must be advanced actively by the different organizational units in a way that they should not only identify the problems but also develop suitable solutions.

1.1.3. Creativity and learning culture

The problem solving culture can be closely associated with the creativity culture. Einstein once stated that his work is based on imagination. 'Imagination is more important than knowledge. Knowledge is limited.' Creative work requires the employees to get the adequate trust and the opportunity to be able to try out new, unusual ideas. It is obvious

that one should be involved in the principles of a university to be able to provide a field, to encourage the employees to be creative. It means that the mistakes are not punished but they are realized as the basis of development and innovation. The analysis of the reasons for malfunction can often bring a new point of view to the future development. This brings along a new learning culture, so that the teachers and students can get the courage to be confident and creative without putting too much emphasis on the mistakes

1.1.4. Management culture

One of the most important tasks of a 'Center of Excellence' is the improvement of the management culture. This is a management model which is able to motivate the employees with the help of the following points:

- Appropriate mediation of the visions
- Intelligibility(information and communication))
- Autonomy and participation
- Constructive feedback (praise and constructive criticism)
- Fairness
- Professional and social integration
- Growth (self-improvement and future prospects)
- Personal progress and decent working conditions
- Management precedent(human and professional)

To sum up, we can say that the secret of success is the combination of an excellent management style with an intelligible performance requirement system and respect. The creation of such a management style is essential at the university for the employees to be able to make progress. So far several universities have not been able to step forward because the scientific leaders and professors have not been not familiar with these kinds of competences. In the following university examples it is obvious that at the places where the above cultures appeared an incentive atmosphere came into existence which motivated the prominent professionals, and they started to attract talented employees, teachers and top managers from the labour market as well.

One of the most important goals of the 'Centers of Excellence' is that the university should provide the best conditions, the teachers can keep pace with the constant changes and they can also develop their methodological and pedagogical and last but not least their human qualities. Let us have a look at three foreign universities, where the education and trainings are organized according to the principles mentioned above.

2. Quality improvement efforts at the University of Houston

The university was established in 1927. Its predecessor was the Houston Junior College (HJC). This university has become the most successful research and educational institution of the state. At present over 35000 students participate in the undergraduate and postgraduate trainings. The aim of the university is to attract students from all over the USA and the world with outstanding teachers. At the university they deal with the teachers and researchers based on a standardized system which includes several elements.

2.1. The statements of the handbook of the employees

During the analysis of the document which is known and followed by the teachers we could find a lot of references to the importance of teacher training. It is mentioned in the handbook that they improve the quality of the university education and culture with the help of experts.

The university operates according to 8 strategic principles *(University of Houston - staff-handbook (2012)- page 8)*:

- First strategic principle -University excellence
- Second strategic principle– Student access to all of the university services
- Third strategic principle – Appearance of diversity
- Fourth strategic principle– Research support and involvement
- Fifth strategic principle – External partnerships
- Sixth strategic principle – Teacher quality
- Seventh strategic principle– Partnership between universities
- Eighth strategic principle- Responsibility and effectiveness

I would like to emphasize the sixth principle. According to this principle the teachers and the workers form the most valuable factor of the university. They need to be offered career opportunities which make the university more competitive than their counterparts. The concrete forms of realization are the following:

2.1.1. College program

The College Program is an educational opportunity for everyone and with the help of its teachers are encouraged to self-improvement. *(University of Houston - staff-handbook (2012) – page 9)* The program makes it possible for the employees to take part in any kind of university training, courses in connection with their work, thus they can make professional progress. 3 lessons per week can be used for this purpose. Registration is required.

2.1.2. Individual assistance

The university teachers are provided with the development of competences (personal, professional, innovative, communicational and cultural awareness) necessary for their jobs in the frame of trainings and interactive presentations. This is a strategic part of the performance assessment system of the university.
There is a performance management center where the teachers are helped to get to know the most important goals of the organization and they are encouraged to take part in it. The most important elements are the following:

- The introduction of the university and department goals to the teachers
- The introduction of performance goals and its measurement systems
- Career and skill development of the employees

Once a year the above mentioned organizational units and the workers carry out a performance assessment,and state the aims of the following period.
Thinking the tasks over, there are a large number of services at the university which would be necessary at the domestic universities.

3. The development of the educational quality at the Duisburg-Essen University

3.1. Educatonal and organizational development services at the university

The learning and changing process of the employees is performed inside the university. They are carried out according to the needs of every participant, with individual or group methods. Important trainings and services. *(Universität Duisburg-Essen – Personalentwicklung (2013))*:

Figure 1: The chart of self-improvement of the university (Source: https://www.uni-due.de/peoe/personalentwicklung.php)

3.1.1. Structured recruitment process

The personal decisions about a new employee are the most difficult and important decisions in the life of the university *(Universität Duisburg-Essen - Das strukturierte Auswahlverfahren (2013))*. The recruitment of the planned and well-qualified personnel is a prerequisite of the professional personal decisions. We can find an application of a structured recruitment here and it is always compulsory. The main phases of the process:

- The elaboration of the measurement system belonging to certain jobs
- The set-up of the recruitment committee (in the case of teachers there is always one person from the teacher-training department)
- The announcement of the application
- Structured interviews in front of the committee
- Assessment and announcement of results

3.1.2. The training of new employees at the university

Similarly to the University of Houston each new employee gets to know the structure of the university, opportunities and further trainings with the help of e-curriculum and personal assistants. There is a webpage and 2-3 assistants at his/her disposal.

3.1.3. Mediation service for the employees

There is an opportunity for the employees and their leaders to communicate with each other with the help of a mediator in a protected environment. The service needs to be ordered two weeks in advance so that the mediator has enough time to prepare. He/she creates a suitable, calm atmosphere for the discussion and provides enough time to talk about different topics and problems.

3.1.4. Annual employee assessment

Similarly to the University of Houston the employees assess their work annually and they agree on the most important fields that are necessary for them to achieve their individual goals.

3.1.5. Development of the organizational units

All the changes taking place at the universities influence the life of the organizations. Therefore it is very important to organize team building trainings and support paying attention to the efficiency of the organizational units. Thus they can help the organizational units to become successful adapting to the constant changes.

3.1.6. Leadership support

The management has to face several complex tasks in all the fields of the university. To support it, the university provides different devices and methods.

3.1.7. Teacher coaching

There is a special helping support for the university teachers. They can use it to be able to handle their problems with the help of two experts. They must make an appointment at them electronically. Then they are given personal advice and development during the consultations.

3.2. Teaching and studying professionalization programs – Collaboration between the universities

The Heinrich Heine University in Düsseldorf and the Duisburg-Essen University offer one-year professional further trainings in cooperation with each other in order to develop university education. The participants of this training (belonging to different sciences and subjects) deal with expert counselling, the specialties of university education, the creation of learning programs and university development.

4. Summary

According to the introduced examples we can state that the basis of university development is the regular training of the employees. Without decent human resources development there is no chance to achieve good results in the international competition, so the students may look for other institutions. It can be stated that prosperous universities engage resources for the training of their workers. This is mostly true for the technological tertiary

education institutions as here the outstanding teachers are attracted by excellent job opportunities from the labour market.

We can find out that the introduced institutions created similar, but country-specific structured educational systems. The central realizer organizational unit of this system is the university itself.

References

[1] Frey, D., Peus, C. & Traut-Mattausch, E. (2005). Innovative Unternehmenskultur und professionelle Führung – entscheidende Bedingungen für eine erfolgreiche Zukunft? In D. Kudernatsch & P. Fleschhut (Hg), Management Excellence (351-376). Stuttgart: Schäffer-Poeschel.

[2] Hochschuldidatik – Terminplan (2014) - https://www.uni-due.de/zfh/events/index.php%3Fid%3Dveranstaltungsliste&usg=ALkJrhgR2yUcr7N--8Ht1ItCEjMkQvAakw

[3] Molnár György: Collaborative Technological Applications with Special Focus on ICT based, Networked and Mobile Solutions WSEAS TRANSACTIONS ON INFORMATION SCIENCE AND APPLICATION 9:(9) pp. 271-281. (2012)

[4] Universität Duisburg-Essen - Das strukturierte Auswahlverfahren (2013) - https://www.uni-due.de/imperia/md/content/pe_oe/personalentwicklung/strukturiertes_auswahlverfahren.pdf

[5] Universität der Potenziale - Strategielinien zur Entwicklung der Lehre an der Universität Duisburg – Essen (2013) - https://www.uni-due.de/imperia/md/content/qualitaet-der-lehre/ude_strategiepapier_lehre.pdf

[6] University of Houston - staff-handbook (2012) http://www.uh.edu/human-resources/for-employees/policies-prodecures/staff-handbook.pdf

[7] The University of Houston's Work/Life Program (2012) - http://www.uh.edu/work-life/

[8] http://www.uhsa.uh.edu/

[9] https://www.uni-due.de/peoe/pe_grundlagen.php

Dániel Gergő PINTÉR

Various Challenges of Science Communication in Teaching Genaration Z: an Urgent Need for Paradigm Shift and Embracing Digital Learning[1]

„Back in my time!" – Instead of Introduction

> „*The children now love luxury. They have bad manners, contempt for authority; they show disrespect for elders and love chatter in place of exercise."*
>
> */Socrates, 469-399 BC/*

As the intentionally provocative quote shows, Socrates was dealing with the generational conflicts already two and a half thousand years ago. although ancient Greece was featured by cultural productivity and economic prosperity (Hall, 2007) The period when the philosopher lived can be considered as the dawn of classical Hellenic civilisation: that time the Athens society was not suffering of crisis of values, the life of the inhabitants of the polises was organised along solid moral conventions. Despite of this Socrates named Greek youngsters as a frivolous gang. The dissatisfaction of adults towards teenagers – irrespectively to the socio-cultural environment and ideology – occurs in social history from time-to-time.[2] In this respect humanity seems to be a homogenous group, since it can be sensed as a general tendency that the following generation is held liable for any changes experienced on the field of human cerebrality. "*Back to my time*" – say our grandparents; this sigh shows implicit valuation and accusation: as if everything were better, more accepted, more „normal" in their youth. And who else could be liable for cessation of "normality" than the youth breaking up with morals and traditions?

This study does not intend to deal with this subjective and hard to evidence scheme of thinking. Rather it tries to call attention to that the success of handling the problem is definitely influenced by the knowledge on the factors behind the phenomenon and the ongoing reinterpretation of the definition of „normality". It is not a secondary standpoint at all whether the changes to the attitude between generations - different characteristics, skills, competencies – are identified as deviancies, taken out from their context, or they are

[1] This work was realized in the frames of OTKA K-109456 "Integrated reasoning"

[2] During the past decades several researchers analysed the generation conflicts and the challenges related to coexistence of the older and younger generations (Esping - Andersen, 2002), its theoretical basis is defined on one hand by the classical sociological thesis of *Mannheim* describing the generations as social phenomena (Mannheim, 1952), and on the other hand by the definition of individual habitude given by Bourdieu (Bourdieu, 1977). On this field changes to the attitude is also measured by quantitative sociological methods.(Andres et al., 2007), but the gap created the deviating characteristics of generation X and Y (Yelkilalan & Ayhun, 2013), the distribution problem (Asheim & Tungodden, 2004), challenges represented by teaching students of different age (Billing, 2004), identity and values of diversified employees (Joshi et al., 2010; Parry & Urwin, 2011) and the successful economic cooperation of heterogeneous teams (Karp & Sirias, 2001; Glass, 2007) are also popular topics.

considered as borderline between sections and handled as a possibility offering new perspective. (Ng et al., 2010)

In my study I am reasoning for that since adoption of changes, tolerating and teaching each other are key elements of coexistence of different age-classes (West et al., 2002), it is reasonable to find the way for bringing the new possibilities of youngsters to the surface, for teaching them, and use their different competencies for the benefit of the development of the society. To achieve this the older generation is required to be open to digital catch up (Kolin, 2002), while they should not condemn the values of the youngsters and they should not prevent fulfilment changed of demands for obtaining knowledge. According to my thesis from the perspectives of economic, educational, political, labour market and cultural challenges of our days, recognition and conscious application of the possibilities hidden in mutual assistance and transfer of skills, viewpoints and experiences are unavoidable. Therefor in everyday life – moreover in pedagogical work – it is vital to find response to the following questions:

1. Is the way of thinking and behaviour of the younger generations form basis for worries indeed?
2. What are the main reasons of causing changes between the generations; who or which processes can be held liable for the transformation of values and attitude?
3. How did we handle these changes, how do we face the challenges resulting from such changes?

The study analyses these topics, primarily approaching the characteristics of generation Z deviating from that of the previous generation from science communication and educational aspects. Based on international and Hungarian research the paper gives brief review on the impact of our current time, the development of information society and technology on the world view and discrepancy of the different age-classes. I attempt to identify those characteristics of transferring knowledge, consumption and media usage, which are definite to development of the relation of persons born after 1995 to science, then I summarise the models of *Public Understanding of Science* (hereinafter referred to as PUS)[3] relevant to generation Z. In the second part of this study I reason for paradigm shift in formal education and I give recommendation on the methodological framework of a progressive educational system, which is able to successfully meet the demands of the analysed age-class, and which can play a definitive role in forming the interest in science and preparedness of the digital generation.

[3] The field of PUS is in seek of answer to the question how the population is related to the scientific product, what image media communicates about science, how and on what channels, with the help of what devices the relation between the non-professional publicity and the science community is created. (Bauer, 2009) The definition includes either the "*normative and practical definitions related to social understanding of science, or the main principles of this area of science, or the social and educational commotion, which rose after bringing up the problem; at the same time, the term is a position profile, and area of research and practise for academics and communicators.*" (Pintér, 2013a:23)

Coexistence of Generations in the Information Society

Formation of the *information society*[4] has completely rearranged the access to the social resources and information (Beniger, 1986), what has significant technological, economic, employment and cultural aspects (Webster, 1997). While in the industrial era the devices and natural resources were definitive, nowadays knowledge provides the majority of the produced and consumed goods, the work defined by information processes become definitive versus the direct physical work. (B. Tier, 2014) The development taken place on the field of information processing, storage and transmission on one hand led to wide scope of application of digital technologies, while on the other hand to the convergence of telecommunication and IT in all segments of the society.

In the 2000s technology forms each and every segment of our life; accordingly it exercises a formerly unknown extent of stimulation and information pressure on the society accompanied with acceleration generational differences. (Rückriem, 2009) The structure of the world has become network-based, where internet, information technology and telecommunication have turned into a faith defining experience of the younger generations. (Castells, 2006) This process not only detached the younger generations from the traditional, direct human communication media, but it has substantionally changed their relations, cognitive and learning methods. (Nyíri, 1999) Digital experience, network-based interaction and unlimited communication have become a basic experience and daily need of those born on the turn of the millennium. (Castells, 2006) the value of knowledge and media, and knowledge vital to self-maintenance in the knowledge society built on lifelong learning intruded into the expediential values. (Gergátz, 2009) Therefore the borderline between childhood and adulthood is less sharp: a child browsing the internet consciously makes his way in the same media as an adult; this results in interflow of the scope of entertainment and work. (Nyíri, 2004)

It is an elemental principle of sociology that each and every generation lives history in its own characteristic way: the events and features of the era get built in its identity. (Howard, 2000; Urick, 2012) While formerly the generation forming impacts were nurtured mainly by history, nowadays they rather start up from the direction of technological development. (Csepeli, 2006) While – on the contrary to the former technologies – the technology of the information society has deeper and more comprehensive impact on our life, thus the distance between the approach of younger and older generations, between the "*old*" and the "*new*" is growing. (Gergátz, 2009) Basically this is the main reason of the generation gap; and this is what initiates the generations to start conversation with groups maintaining other identity.

[4] Closely related concepts are the *post-industrial society* (Bell, 1974), *post-fordism, post-modern society, knowledge society, telematic society, information revolution, liquid modernity*, and *network society.* (Castells, 1996; 1997; 1998)

Considering that the newly appearing mechanisms of obtaining knowledge has totally transformed the relation of the new generation to the world and the former generations (Combi, 2015), from the 2000s identification of the reasons of the conflicts between the generations and specification of the general characteristics of the different age-classes are the most important tasks of generation research. (Masnick, 2013) in the course of developing the methodology, in addition to exploring the phenomena, finding the practical aspects of the generational conflict, and selection of the methods for problem management successfully serving social interests are also important viewpoint. (Lengyel, 2003) Yet before giving exact methodological recommendations on alteration of the former education system, in the next chapter I define the generation Z and I will briefly describe its relation to technology.

Media Usage of the Digital Natives, their Characteristics and the Technology

The basis of generation research is that the certain generations have different so-called *cohors experiences* – characteristics defining the attitudes of the persons born at the same time and similar needs. (Simon, 2007) Due to the different socio-cultural background the common experiences and values – join the members of a given age-class in a loose, but definitive way. Despite heterogeneity e definitive trend can be observed along the formation of value preferences; this provides possibility for the social scientists to connect individual decisions and identify the differences between youngsters and elder people. (Pilcher, 1994)

Although the literature related to the field of science is not uniform in respect of the terminology for different generations and dates of birth, the majority of research deals with analysing primarily the Baby Boomers born between 1946-1960 (Howe & Strauss, 1991; Landon, 1980; Owram, 1997; etc.), *generation X* born between 1960-1980 (Miller, 2012; Markert, 2004; etc.), *generation Y*, also called *millenary generation*, born between 1980-1999 (Horovitz, 2012; Strauss-Howe, 2000; etc.), and generation Z, also called *iGeneration*, *Pluralist* or *Digital Generation*, bringing up the most of interdisciplinary problems nowadays, born after 1995 (Horovitz, 2012; Turner, 2015; Dupont, 2015, etc.)[5] Since this study approaches the impact of information society on the characteristics of generation Z deviating from those of the former generations from science communication and educational aspects, I will discuss more detailed the characteristics and media usage of the ones born at the end of 1990s.

Generation Z is a new type generation; either in its content consumption, socialisation or identity the developing info-communication technology plays a significant role (Ipsos MediaCT, 2013) According to the findings of a Hungarian research (TÁMOP-4.2.3-12) analysing the costumer behaviour of young people aged 15-25, this age-class spends 5-6 hours daily with use of media; basically the use of mobile carriers, smart phones and tablets is the most typical (Ipsos MediaCT, 2013), while in media usage at home the dominancy of

[5] Naturally the analysis of the next, so called Generation Alpha or *Generation Glass* also raises several questions from the aspect of terminology and sociology as well; this means a more and more definitive focus of research for the sociologists. (McCrindle, 2010; Williams, 2015; Sterbenz, 2015; etc.)

computers can be observed. (Guld & Maksa, 2013) Popularity of these devices can be related to the Internet: from the web 2.0 applications available through the network the social sites, blogs, video sharing sites, chat programmes, news sites and file sharing sites are the most important. However, classical mass media were not crowded out from the daily routine of young people, yet their role was revaluated and their consumption has become more superficial: radio and television can be related to background media usage, while the loss of importance of newspapers and magazines is reportable. (Guld & Maksa, 2013) The members of generation Z set up the world surrounding them via mutually edited contents, shared info and comments; they take part in discussions catching their attention assertively and actively. (Tari, 2011) Of course not only they form the environment, but also the environment is greatly forming the cognitive, affective, conative and social senses, daily routines and social relations of the ones born after 1995. (Tari, 2011) As a consequence, while in the life of former generations the real offline and online presence existed marginally separated, for the first global and digital age-class these two things are harmonically joined: technology interweaving the entire life and being permanently present has become one of the most important device of expressing ones identity. (Ujhelyi, 2013)

The Basic Problem of Educating Generation Z

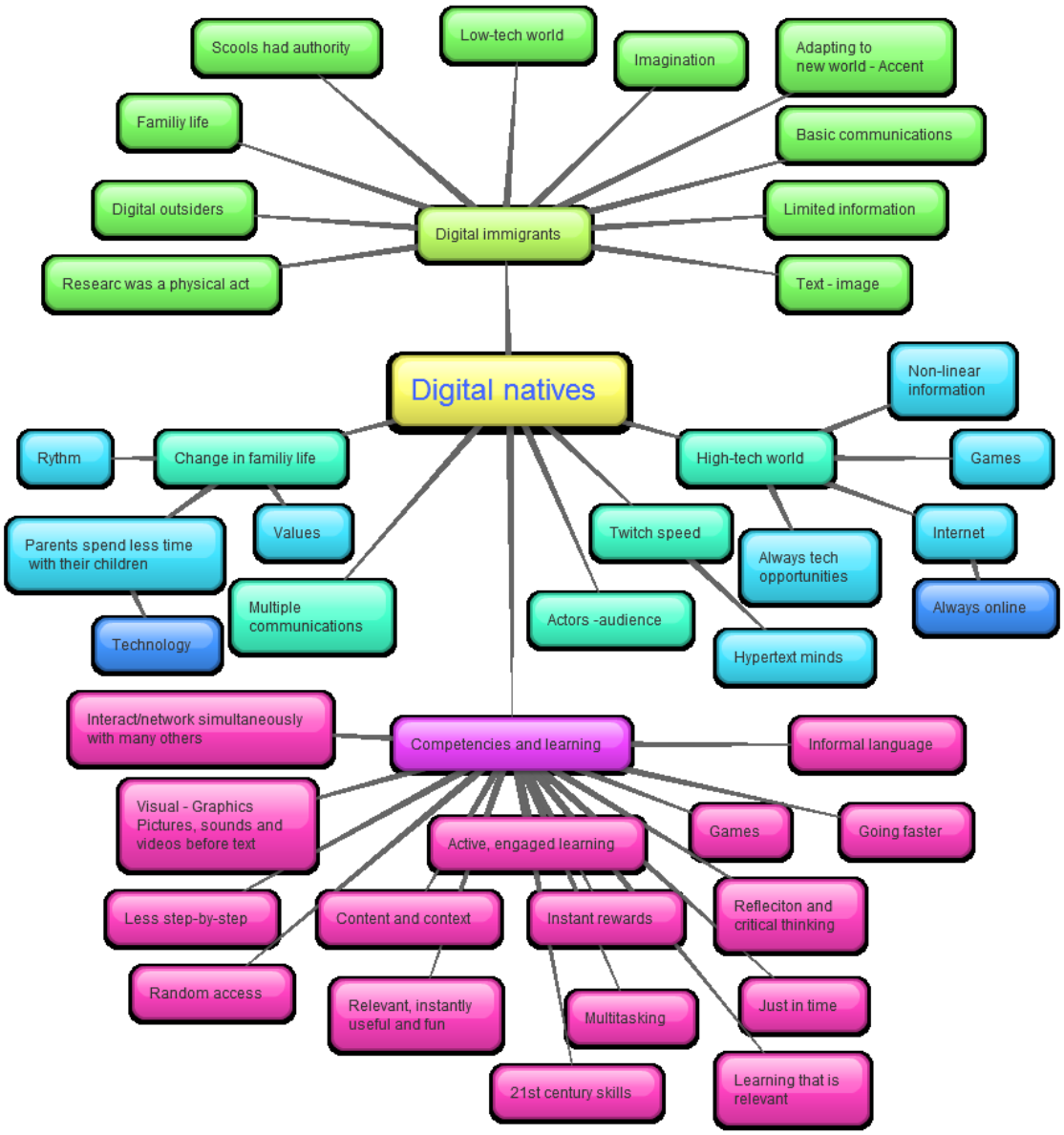
From the viewpoint of science communication the basis of successful education of generation Z lies in the professional discretion that its members – on the contrary to generation Y or X – did not start to adjust to the digital word in a certain section of their life on the effect of professional pressure, but they were born in a dynamically changing environment, which offers the most developed hardware and software solutions to resolve everyday problems. That is why *Mac Prensky* calls this age-class as *"digital natives"*, whose demand on receiving information has changed pragmatically. (Prensky, 2001:1) The brain of the members of generation Z has not only developed in a different way than that of their ancestors (Trunk, 2009), but due to the frequency of their interaction with the environment they also process the information differently (Presnky, 2001). While the older ones adjusted to the changing digital environment through individual learning mechanisms, generation Z has no learning "accent", its members speak "digital language as their native language. According to *Prensky* the teachers and researcher who are active in our days can rather be considered *"digital immigrants"*, since they are learning the new "language" only now.[6] (Presnky, 2001:2).

Thus generation Y or X in a certain extent unavoidably lives in the past: it will be only an umpteenth idea of its members to refer to the new technology whenever they need solution and they adapt the phenomena of the digital world less naturally than the ones born at the end of '90s. (Prensky, 2001) For illustration of the conflicts influencing the education in its entirety I use the below chart of *Kristiansen* (Kristiansen, 2011), which schematically

[6] According to the basic principle of socio-linguistics any language knowledge, which we obtain otherwise than our native language, i.e. during our life, is stored at other parts of our brain, and can be recalled in other – sometimes less successful – ways. (Gass & Selinker, 2008)

compares the different characteristics, skills and competencies of the digital immigrants and the digital natives.

Figure 1 – A Thinking map of Digital Natives



The conflict resulting from the above chart – supplemented with the paradox situation that as regards to great basic formulas the society can already be considered as information society, yet the superstructure of public education still follows control structures of the industrial era (B. Tier, 2014) – represents one of the greatest problems of science communication. Since the digital immigrants – who in their own time learned slowly, coherently, individually and profoundly – are less rewarding to those new skills which the natives naturally own resulting from the everyday interactions. (Prensky, 2001) If we add up this with that the scope of expertise transformed due to the structure of knowledge society, the ratio of mental workers grow on the labour market, and the significance of skills related to information and communication technologies (ICT) (Hinrichs, 2000), the urging need of

reworking the education becomes evident. In the 21st century emphasis is placed on fast, accurate and productive work: increasing complexity of the tasks expects creativity, flexibility and ability for team work from the youngsters becoming professionals in the 2010s. (Cisco, 2009)

Changing demands for learning

When finding any problem to be resolved the "dotcom" kids living in virtual community already to not expect response from pedagogues and schoolbooks which were formerly considered as primary source of knowledge, but – since they have natural skills to operating telecom devices, excellently navigate on the internet and easily establish relations – they get solution from each other or browse the internet to seek for it. (Duga, 2013:3) This is also supported by the *EU Kids Online I-II* research: the time spent with browsing the internet by the young generation is not spent only for entertainment, communication and consumption of contents, but, subject to the type of the tasks their presence on the web promotes the process of learning as well. (EU Kids Online II., 2012)

Also *Dunkels* and *Zipernovszky* discusses the possibilities of learning via internet in details; their research discovers that social sites, such as *Facebook*, *Skype, LinkedIn, or Google+* offer new forms of learning for common work. (Dunkels, 2007; Zipernovszky, 2008) Besides social sites the microblogs – *Twitter, Tumblr* –, and also the video, photo or sound sharing sites , such as *Youtube, Picasaweb, Flickr, Ustream* or *iTunes* are also popular. Generation Z uses presentation applications, such as *Prezi, Slideshare, Googledocs*, etc., as well, but on the contrary to generation X or Y also the use of different framework systems, online learning communities and virtual environments are not unknown to them. (Duga, 2013:11) There are several reasons for what the sites are successful; on one hand the "hyper" mass of text on the web stimulates the *natural, individual* learning, the process of obtaining knowledge resulting from instinctive curiosity and internal motivation without the control of any professional. On the other hand it improves both logics and collective informal learning, what is based on permanent exchange of experiences featuring the virtual communities. (Duga, 2013:6)

The ones born at the end of 1990s actively create informative contents, since they prefer multimedia communication to written texts; accordingly also their processing methods are non-linear. According to a survey of the *Budapesti Üzleti és Kommunikációs Főiskola* the members of generation Z - primarily resulting from the speed of search drives – prefer the fast obtainable information (HVG, 2014), they like to see the result of their work immediately and expect instant feedback. Interaction and empathising experiences are important to them. They are able to deal with several things simultaneously and they are effective in organising their work, they get the information what is in their interest in diversified channels and quickly. (Bessenyei, 2007) At the same time the survey also highlighted the processing of longer text and verbal restoring of the knowledge text cause difficulties to them; they consider the lessons supplemented with spectacular visual elements as easier to remember. One-direction communication causes problem to them,

therefore they find it difficult to follow theoretical deductions and tangible, practical examples are important to them. (NOL, 2014)

Thus technical development has greatly changed media usage and characteristics of the digital natives, what led to a more and more defined student-attendee requirements and transformation of values on the labour market, while this has impact on the educational system as well: members of generation Z require substantially different methods and curriculum. (Jukes & Dosaj, 2006) Moreover the gap between the capacity hidden in the digital generation and the available professional, device and solution environment is growing (Z. Karvalics, 2013), this gap gives new tasks continuously to the ones wishing to modernise the formal education. Before oi start to discuss the particular professional aspects of the science communication conducted with the ones born after 1995 and my methodology developing recommendations, I summarise the aforementioned based on the table of *Jukes* and *Dosaj* (Jukes & Dosaj, 2003), particularly the major differences between the digital immigrant teachers and the digital native learners.

Table 1 – The Differences between Digital Native Learners and Digital Immigrant Teachers

Digital Native Learners	Digital Immigrant Teachers
Prefer receiving information quickly from multiple multimedia sources.	Prefer slow and controlled release of information from limited sources.
Prefer parallel processing and multitasking.	Prefer singular processing and single or limited tasking.
Prefer processing pictures, sounds and video before texts.	Prefer to provide text before pictures, sounds and videos.
Prefer random access to hyperlinked multimedia information.	Prefer to provide information linearly, logically and sequentially.
Prefer to interact/network simultaneously with many others.	Prefer students to work independently rather than network and interact.
Prefer to learn „just-in-time.”	Prefer to teach „just-in-case” (it’s on the exam).
Prefer instant gratification and instant rewards.	Prefer deferred gratification and deferred rewards.
Prefer learning that is relevant, instantly useful and fun.	Prefer to teach to the curriculum guide and standardized texts.

The gap between the competencies of students and solution environment of schools

Due to the changing learning demands of generation Z the importance of the role of internet and digital technology in education is unquestionable nowadays. Internal learning motivation features the self-development of the members of this generation, their interests are diversified, what is reasoned by that an enormous quantity of impulse influence them since the day they are born. (Turner, 2015) They are attracted by several scientific – mainly technological – topics; they seek for them more purposefully than those borne before the '90s. Their approach to learning, getting informed and to knowledge itself has also radically changed. (Oblinger & Oblinger, 2005) An increasing ratio of their knowledge results from other media than schools: beginning with different traditional media, through museums, scientific festivals to meetups, events popularising science and other non-traditional science communication sites.[7] Although the so-called *edutainment*, i.e. obtaining knowledge in an entertaining form is an important demand on their side (Demers, 2005:143), yet they are critical users of media, they avoid advertisements and are aware of the general hazards of media. In their knowledge obtaining mechanisms they prefer simultaneous interaction and relevant, promptly usable knowledge having practical significance. (Bessenyei, 2007)

These changed generational characteristics result in that an effective education must revaluate its current situation, it must consider that from the several learning environments it represents only one – and not even the best – option, and that science communication must adjust to the cognitive changes going through in the mind of youngsters and their consumer demand, also in its methodology. As the today students are not the same as the ones for whom the current education system was set up (Prensky, 2001), therefore in the education of generation Z it is vital to establish an environment and information channels, where development similar to that unnoticeable learning of their childhood can be implemented. (Papert, 1996)

As the *Netgeneráció 2010* international survey reveals, since the members of the age-class get to resolution of problems individually, not on a uniform and previously defined route, the educational institutes must review the input and output requirements an carrier milestones set up for the students several decades earlier. (Hartyányi, 2010; Anderson 2011:126) The traditional basic skills – writing, reading, counting – were added up with several new kinds of skills, the development of what would be worth to be inserted in the curriculum. (Z. Karvalics, 2014) The key to generation Z's understanding of science is the development of dynamic, colourful, creative projects providing the joy of success through partial results. I improving the learning attitude of the age-class – besides visualisation –

[7] Non-traditional scientific sites provide the experience of active observation and build also on the technical skills, practical common sense, attention sharing and troubleshooting skills of those born at the end of 1990s. Until meeting-up of the pedagogical work going on in schools, the potential hidden in environmental, informal education provided out of school lessons is able to compensate – even if only partially and temporarily – this generation. While the quantity of marketable knowledge obtained in normal education is decreasing due to the often outdated methods, the other channels used by the students provide them growing knowledge.

involving the students and cooperative methods allowing more effective transfer of knowledge also have important role. (Fehér & Hornyák, 2010)

What model should be followed to educate students born after 1995?

It is a fundamental principle of political economy that scientific and technical knowledge is the main drive of social development: without up-to-date information the knowledge of human civilisation could hardly improve. As it is also shown in this study, accurate definition of knowledge is not easy, since it units not only epistemological, philosophical, pedagogical, psychological and economic viewpoints, but the term seems to have different meaning for the different age-classes. As a general definition it could be stated that knowledge is the mass of systematised gnosis created about the world surrounding us, obtained mainly by experience, accumulated since the dawn of civilisation and transferred from generation to generation. A kind of product, what has clear, but not always quantifiable values, and as such it is marketable, i.e. can be understood along the rules of market demand and offer. (Palugyai, 2012)

In case the characteristics of generation Z are also taken in consideration the above definition requires a plastic timely interpretation: the world surrounding us is continuously changing, and these changes impact us as well. Due to the use of info-communication technologies the ones born at the end of 1990s understand knowledge "*obtained by experience*" in a different way than generation X or Y, moreover the labour market, which is getting digitalised considers expertise on other fields as marketable than before. One of the characteristics of the knowledge-based society is that in order to successful self-assertion its members must face the mass of information surrounding them, and must become able to select and find the relevant information (Molnár, 2008), than apply the knowledge obtained this way properly for their purposes.[8]

The continuously expanding mass of information from the information boom and appearance of the new type students represent a great challenge for the existing knowledge systems. Since labour market integration and everyday decisions of generation Z is significantly impacted by the quality of education and the channel of scientific interaction, it is worth that pedagogues, scientists and curriculum developers to give up on the former teaching methods and work out such training and information transferring and educational environment, which are customised to the requirements of this generation. (Oblinger & Oblinger, 2005) On comparing the differences in methodology of educating generation Z and the traditional teaching paradigm, it occurs that the ones born before the 1990s obtained their qualifications fixed to a place, based on fixed teacher and student roles. Education of generation X or Y was primarily based on transferring universal, fact-focused, isolated masses of knowledge and summative valuation, while the cognitive tools of the students characteristically included memorising and subsequent recall. (Brown, 2005)

[8] *Lewenstein* uses the *Rational Choice Theory* for this process, what focuses on the problem that from the uncountable amount of knowledge which are the ones average people should inevitably know so that they can positively influence the quality of their life in a world interwoven with science. (Lewenstein, 2003)

Public Understanding of Science uses the term *Deficit model* for this one-direction information transfer, what was formed based on the idea that the head of everyday people is empty. According to this model scientists and teachers can be considered as the main source of knowledge, they are the umpires to decide on what extent it should be intermediated to the audience, the students. This situation leads them to a clear action programme: their task is not else than "fill those heads", i.e. teach the possible most science to the students, the laymen in order to improve the social opinion on science. (Gregory & Miller, 1998:11)

As also the researchers of science communication admitted in the '90s this model failed at three points. Firstly, when the information is questionable within the science community, thus is in the course of formation. This is a problem primarily because the knowledge required by the society – especially by generation Z – less belongs to theoretical physics, history or biology, but they are rather conceptualised on the level of everyday practical decisions, e.g. on the technology being continuously "*on the conveyor-belt*" or on the field of medicine what is accompanied by passionate professional disputes. (Harlick & Halleran, 2015) Secondly, the Deficit-model discusses the scientific problems without defining the context, what – as we have formerly seen – is a basic factor of the interest of generation Z.[9] Thirdly, the digital generation rather demands a custom-made science communication adapting the changes of the world, offering abundance of possibilities and based on interaction, than an outdated pressurising education model, which is rigid and independent of the technological environment. (Brown, 2005)

Instead of isolated facts generation Z requires the joy of discovering, micro-level understanding and knowledge embedded in context. Since "*information*" and "*knowledge*" do not mean the same: Knowledge is information understood in its context. (Nyíri, 2004) Therefore this age-class prefers diversified relations based on mutual cooperation instead of fixed roles. It takes teachers as experts or mentors; it seeks flexibility and diversity also in the educational sites, devices and calling for account. (Brown, 2005) PUS also built this age-class specific need and the critics raised against the Deficit model in its methodology; its second model already considers that the meeting of science an publicity takes place embedded in everyday situations, socio-cultural and technological environment, thus also the scientific interest of laymen takes is aligned to the entirety of the problems related to finding guidance in the world. According to the C*ontext model* the head of people is full of strategies for obtaining knowledge; primarily they do not seek general education, but need scientific expertise in exact situations requiring decision. (Gregory & Miller, 1998:88) According to this approach the aim of education is to establish common forum for scientific and everyday interests, i.e. building out high quality and up-to-date relation between the science being prepared – and not only in terms of schoolbooks – and the youngsters. (Pintér, 2015) According to Hamza & Wickman the learning in science need to be approached more as a

[9] According to the basic theory of *pedagogical constructivism* students learn that knowledge easier in what they are directly involved, what is tangible for them, with what they meet in living situation. (Nahalka, 2002)

contingent process than as something that progresses along one particular dimension. They show "*how students appropriate the sociocultural tools of science and how how they situate what they learn in both the particular features of the activity and in the relevant science."* (Hamza & Wickman, 2013:113) The below table shows a summary of the differences between the traditional learning and teaching paradigm and the two science communication models. (Brown, 2005: 12.6)

Table 2 - Differences between the Traditional Learning and Teaching Paradigm

Traditional teaching	Teaching of generation Z
based on Deficit model	based on Context model
memorising	understanding
recall	discovery
universal, fits for everyone	customised, rich in possibilities
repetition	transfer and creation
learning of isolated facts	facts + systematised conceptual framework
teacher = master, the source of knowledge	teacher = mentor, expert
fixed roles	mobile, changing roles
fixed classroom	mobile, transformable classroom
localised site of teaching	different sites of teaching
summative evaluation	summative and formative

As it is shown in the above table science communication must be an ongoing reconciliatory process, and teacher must give up on one-direction information transfer and the idea that they have no other task than fill empty heads. (Gregory & Miller, 2006:199) If we also add that through their impact on the life of publicity the results of science are becoming more and more social, it becomes understandable that it is vital for the pedagogues to adjust to the requirements of laymen and they should openly face the possibilities of science communication and its practical limits. Accordingly information must be intermediated to generation Z on routes, which take the social and technological factors and the knowledge the students originally possess into account.[10]. (Gregory& Miller, 2006:203)

[10] *The Lay Expertise Model* of science communication is built on this idea; it supposes that the existing practical knowledge is at least of the same importance as the theoretical scientific knowledge. (Lewenstein, 2003) According to the scheme there are experts also in excess of scientists and teachers; e.g. on the field of info-

According to this study science communication is able to promote the undertakings of laymen in the disputes in course on the field of science or in political decision-making related to science, only in case it is customised to the generation and embedded in context.[11] Although generation Z primarily has no demand for engagement in respect of public life, but in respect of education, raising interest of its members towards scientific news and disciplinary literature is the most important task of pedagogy. As science consumption of the net-generation is more pragmatic than that of the former generation, in addition the socialisation of the "*digital immigrant*" teachers and the "*digital native*" students resulted in different view of world, therefore it is reasonable to see education as a mutual recognition process; as a dynamic exchange-mechanism, in what social groups of different attitudes and different needs take part. (Gregory & Miller, 2006:203) In this dialogue confidence and trust are key factors (Smetana et al., 2016: 89), and in order to this all age-classes must be open, ready to assist and compromise with the different generations. Progressive education can hardly be implemented through authoritarian statements of facts, declarative transfer of knowledge and punitive call for accounting. (Gregory & Miller, 2006:204)

Tasks to be completed in order to establish a progressive education system

As the research findings summarised in this study show, the educational and scientific institutes must examine how they can adjust to the changing demands of the generation and their customer behaviour. (Duga, 2013) Science communication conducted with the digital generation can be successful only in case it builds – besides exploiting the technology – on flexibility in time and space, teamwork, diversity and the already existing knowledge and activity of students. (Harlick & Halleran, 2015) In order to make education progressive it is vital that the teachers and students shall set up partnership, what is based on respect shown for each other, to facilitate placement of competency-based approaches in the forefront against the content-based approaches. (Duga, 2013)

While the traditional model apostrophes learning as a work done with sweat and along facts and curriculum fixed to rules, obtained according to strict time-table, the progressive learning environment provides the experience of integration of knowledge elements gained from diversified sources. (Harlick, 2015) It presents obtaining information as an interesting venture; it inspires setting up internal rules instead of following external ones. (Komenczi, 2009:2) A system successfully serving the education of generation Z prefers project-based development gained in free time frame. Instead of conformism it builds on individual creativity, self-criticism and innovation. Students do not meet up the requirements of teachers, but standards set up based on different disciplinary standpoints (Anderson, 2011: 126), while the work is carried out in smaller groups of heterogeneous composition, in what the older generation is adult, and successfully motivates the creation of the ability of lifelong learning.

communication the members of generation Z can rather be considered experts than the pedagogues belonging to generation X or Y.

[11] This process is described in more details in *Public Engagement of Science model)*. (Lewenstein, 2003)

Response to the question how such learning environment can be established among the traditional schools is given by the so-called *emphasis-transfer model*, which says that the desired learning environment of information society can also be approached by contrapositioning the characteristics of traditional environment organisation, built primarily on instructions and one-direction knowledge transfer, and the characteristics of the progressive, rather constructivist one. Naturally, the statements in the below table are not contrapositions excluding, but supplementing each other, which serve to show in what direction should the current education system move on in order to suitably serve the demands of generation Z. (Komenczi, 2009:2)

Table 3 – The Differences between Traditional Learning Environment and Progressive Learning Environment

Traditional Learning Environment	Progressive Learning Environment
Teaching of facts, rules and ready solutions	Establishment of skills, competencies and attitudes
Transfer of closed and ready knowledge	Establishment of ability for lifelong learning
The source of knowledge is the school, teacher and the curriculum	Integration of knowledge elements gained from different sources and perspectives
Dominance of teacher's instruction during obtaining knowledge	The student build his knowledge individually in an inspiring learning environment
Fixed curriculum, strict time-table	Project-based learning, free timeframes
Learning is a tiring work	Learning is an interesting venture
Learning in a classroom	Learning at diversified sites
Learning in a class	Learning in smaller, altering groups
Teaching in homogeneous age-class	Learning in heterogeneous age-class
Learning groups within the school	Learning groups between schools
Adaption, conformism	creativity, critics and innovation
Due observance of external rules	Establishment of internal rule
Compliance to teachers	Compliance to standards
Closed, linear, mono-medial learning environment	Open, multi- and hyper-medial learning environment

Implementation of the methodology summarised in the above table requires application of the technology what is able to fulfil the device requirement of progressive learning environment. Within this scope several solutions, customised for the characteristics of generation Z, might get role from the interactive boards through the so-called *Learning Management* (LMS) technologies, through e-Learning framework systems and multi-user educational games to smart phones (MLearning) (Brown, 2005) In education it is necessary to provide space in growing proportion for those different web 2.0 applications, which are used by the students already in their free time: besides multimedia, information and video sharing sites (YouTube, Flickr, Google), social sites (Facebook, Linkedin, MySpace), virtual worlds (River City, Atlantis, Whyville, etc.) and multi-player games (Rich Man Game, ChangeMaster, Quest Ardene, etc.) are vital to be built in the course of education in the 2010s. Furthermore Olympiou and Zacharia pointed out that experimenting with blended combinations of Physical Manipulatives (PM) and Virtual Manipulatives can be able to enhance students' conceptual understanding in the domain of various scientific topics more than the use PM and VM alone. (Olympiou & Zacharia, 2011:38)

If traditional teaching and curriculum is combined with innovative teaching methods, multimedia elements and modern devices that facilitate an interactive, flexible learning process involving several sensual organs. (Molnár, 2007) Because of experimental lust, target and success-oriented approach and strong network dependence it is important that the institutions shall provide rooms suitable for work in ethnically diversified small teams. Since youngsters are pragmatic and inductive information processors, it is worth to provide them media promoting cooperation, where they can gather knowledge from several sources, by the use of integrated devices and in the course of training-like situations. This, besides charming and challenging materials needs analysing, and presentation applications, divided screens, databases, programs necessary for editing multimedia and access to online helper. (Brown, 2005) Thus adaption of the everyday education activity to the technical environment would make the curriculum not only more interesting and easier to follow up, but it would enhance the learning lust and success of the students.

Naturally, besides transformation of the environment pedagogues expert in info-communication technologies are also vital. Since the knowledge, attitudes and skills of the net-generation is expressly limited by the current educational system, paradigmatic alterations would be necessary also in the preparation of the pedagogues.[12] Collaborative, problem- and project-based education (Pease & Kuhn, 2010) requires new type of teachers, special facilitators, who – in excess of their disciplinary knowledge – possess high level knowledge on information-technological knowledge and competency. (Roberts, 2005) Teachers of 2010s must be able to actively involve and apply in teaching those modern technologies, what are used by their primary target group. If implementation of this fails the members of the young generation shall lose interest in education, and will use the internet

[12] In 2013 MENCO Platform carried out a research by involvement of 100 Western European and American pedagogues, and it resulted in that also the pedagogues are open to modernisation of teaching, a significant number of them is interested in application of online devices for teaching purposes. (Menco Platform, 2013)

for other activities, what they consider as interesting and what brings joy to them. (Duga, 2013)

Summary: Are these sociological problems or pedagogical possibilities?

In this article I attempted to give detailed presentation of those changes what has taken place in the socialisation, world view, skills and media usage of generation Z due to the development of info-communication technologies. I was reasoning on behalf of that this multi-dimensional transformation raises not only generation gaps, sociological and pedagogical problems, but at the same time it creates possibility for an educational reform leading to transfer of knowledge, what is up-to-date, customised to the demands of the youngest ones and promotes integration into labour market effectively.

Consequently, renewal of education is only an umpteenth step: technology and service provision planning should be preceded by an action- and intervention-focused society and child-image, what has definite and normative ideas originating from internal initiations about how and in what direction it wants to form the conditions defining science society. (Z. Karvalics, 2013) In order to achieve this it is inevitable to paradigmatically change the approach related to generational discrepancies. According to *Jukes* we are unable to understand and evaluate those stages of development, which the digital natives took during developing their skills. Instead of this we are lamenting over what skills they do not possess. Since digital language is not our native language, and since we appear in their world as digital immigrants, we unconsciously misesteem those children who practice different forms of action than we do; and this negligence prevents exploitation of the social potential hidden in them. (Jukes & Dosaj, 2006)

However this study did not declared to deal this issue, yet it is important to emphasize that information environment aware management must firstly appear on the level of disciplinary policy, what shall - as a complex “pre-reforming” strategic package - create future possibility for the members of the generation growing up through digital culture to become a full value member of the community also in their person. Consequently a science communication paradigm shift discussed in this article is a very complex process taking long in time and space: thus there will be schools shoving information society features in several elements, while in other countries and schools industrial era will still rule. (B. Tier, 2014) The education system is set up from several factors; accordingly considering reform we can only talk about slow distortion of ratios, what is preceded by experiments. However, if a kind of structural and methodological change can be successfully implemented in education, the members of generation Z will spent a part of their free time after school also for self-development, moreover they will do that in way unnoticeable for them, since they will engage themselves in exactly the same activities what they do in their everyday obligatory activities.[13]

[13] Formation of educational models is also inevitable because the first global digital generation will enter the labour market in a couple of years. Although in the article I did not discuss the members of generation Z as employees, decisions on modernisation of school lessons would be worth to think over by the methodology

One of the key factors of a possible structural and methodological change is to reconsider the current accountability policy. According to Anderson the actual one does not meet the aims and needs of a reform, so he strongly suggest that education leaders and policy makers "*need to evaluate whether or not accountability policies inspire teachers and students in science, foster innovation, and increase teachers' ability to use research-based practise*." (Anderson, 2011:125) He points out that "*accountability testing in science should place more emphasis on skills and scientific reasoning found in instructional methods such as inquiry and active learning.* Furthermore accountability systems should use "*multiple measures of students' ability, connecting to creativity , and students enjoyment of learning."* (Anderson, 2011:125)

Thus, concentrating on media consumption, characteristics and world view features of the generation, I am also urging the setting-up of a science communication methodology, which, based on the *Context model of Public Understanding of Science*, facilitates cooperation between digital immigrants and digital natives, what is collaborative, project-based, customised, adapting to changes of the world and rich in possibilities and interactions. This requires the establishment of progressive learning environment, and that pedagogues shall review their function and preparedness so that they can participate in information transfer rather as experts or mentors than along fixed pre-defined roles.

The most significant philosopher of China, *Confucius* (551-479B.C.) says *"if I hear it, I forget it; if I see it, I remember it; if I do it myself, I understand it."* Accordingly, the demands and interest of generation Z can be met only by an educational strategy built on flexibility in time and space (McWilliam, 2015), teamwork and the existing knowledge of the age-class, this way it would be worth if curriculum developers and science managers placed competency-based and pragmatic approaches in the forefront instead of traditional, content-based, theoretical approaches. A precondition to this is that the state shall assure access for each and every member of generation Z to the necessary information technology, what is a definitive step to bridge the social gap dividing the younger generation; to provide equal chances for the richer and less privileged layers.

Although the section did not analyse the limits of cognitive skills of generation Z, mapping them is also vital in respect of social problems and conflicts between age-classes. Recently several – and at first sight frightening – socio-psychological results were derived from research, which prove the harmful impact of technology in the human relationships and cognitive skills of the ones born at the end of 1990s. (Pintér, 2013b) Therefore there will be plenty of professional challenges in the future, but we cannot delay too much with modernisation of the science communication process, since within a couple of years the knowledge of our children – as they will become future employees, decision-makers, voters,

developers also in respect of that the presence of the ones born at the end of 1990s will obviously influence life at workplaces as well. Since this age-class becoming adult, will cause changes not only in the company systems, it will be not enough to be prepared to accept the future "dotcom" adults only on behalf of the organisations, but also the pedagogues should align the content of the curriculum, the requirements and forms of call for accounting to the expectations of the labour market.

and teachers of the forthcoming generation Alpha – will be the main drive of the development of the society.

Bibliography

Anderson, K. J. B. (2011). Science Education and Test-BasedAccountability: Reviewing TheirRelationship and ExploringImplications for Future Policy. Science Education, 96(1), 104-129

Asheim, G. B. & Tungodden B. (2004). Resolving distributional conflicts between generations, Economic Theory, 24(1), 221-230.

B. Tier, Noémi (2014). Tanulás az információs társadalomban [Learning in the Information Society] In. B.Tier N. & Szegedi E. (Eds.), Alma a fán – A tanulás jövője. [Apple on the Tree: the Future of Learning] (pp. 16-23) Tempus Közalapítvány, Budapest, Hungary. Available from: https://issuu.com/tka_konyvtar/docs/alma_a_fan_3_web_issuexs [Accessed: 17th May 2016] (in Hungarian)

Bauer, M. W. (2009). The evolution of public understanding of science - discourse and comparative evidence. Science, technology and society. 14(2), 221-240.

Bell, D. (1974). The Coming of Post-Industrial Society. New York: Harper Colophon Books.

Beniger, J. R. (1986). The Control Revolution: Technological and Economic Origins of the Information Society. Cambridge, Mass.: Harvard University Press.

Bessenyei, I. (2007): Tanulás és tanítás az információs társadalomban: az E-learning 2.0 és a konnektivizmus. [Learning and Teaching in the Information Society: E-Learning 2.0 and Connectivism] Budapest. [Online] Available from: http://www.ittk.hu/netis/doc/ISCB_hun/12_Bessenyei_eOktatas.pdf [Accessed: 17th May 2016] (in Hungarian)

Biggs, S. (2007). Thinking about generations: Conceptual positions and policy implications. Journal of Social Issues. 63(1), 695–711.

Billing, D. (2004). Teaching Learners From Varied Generations. The Journal of Continuing Education in Nursing, 35(4), 104-105.

Bourdieu, P. (1977). Outline of a Theory of Practice. Cambridge University Press.

Brown, Malcolm (2005). Learning Spaces. In D. G. : Oblinger @ J. L. Oblinger (Eds.), Educating the Net Generation. EDUCAUSE. 12.1.-12.22. [Online] Available from: http://www.educause.edu/research-and-publications/books/educating-net-generation/learning-spaces [Accessed: 17th May 2016]

Castells, M. (1996). The Rise of the Network Society. The Information Age: Economy, Society and Culture. 1. Cambridge, MA; Oxford, UK: Blackwell.

Castells, M. (1997). The Power of Identity. The Information Age: Economy, Society and Culture. 2. Cambridge, MA; Oxford, UK: Blackwell.

Castells, M. (1998). End of Millennium. The Information Age: Economy, Society and Culture. 3. Cambridge, MA; Oxford, UK: Blackwell.

Castells, M. (2006). The Network Society: from Knowledge to Policy. In: *M. Castells & G. Cardoso* (Eds.): The Network Society: From Knowledge to Policy (pp. 3-22) The Johns Hopkins University Press, Center for Transatlantic Research Relations, Washington, DC

Cisco – Intel – Microsoft (2009). Transforming Education: Assessment and Teaching 21st Century Skills. [Online] Available from: http://atc21s.org [Accessed: 17th May 2016]

Combi, C. (2015). Generation Z: Their Voices, Their Lives. London: Hutchinson.

Csepeli, Gy. (2007). A jövőbe veszett generációk. [Generations Lost in the Future] In M. Palcsó (Ed.) *Mesterkurzus.* [Master Course] Budapest: Saxum. (pp. 87–105). (in Hungarian)

Demers, D. (2005). Dictionary of Mass Communication and Media Research: a guide for students, scholars and professionals, Marquette Books, 143.

Duga, Zs. (2013): Tudomány és a fiatalok kapcsolata [The Connection between Youngsters and Science] Pécs (TÁMOP-4.2.3-12/1/KONV-2012-0016) Tudománykommunikáció a Z generációnak) [Science Communications to Generation Z] Available from: http://www.zgeneracio.hu/getDocument/331 [Accessed: 17th May 2016] (in Hungarian)

Dunkels, E. (2007). Bridging the Distance – Children's Strategies on the Internet. Doktorsavhandlingar i pedagogiskt arbete, Umeå Universitet. [Online] Available from: http://www.kulturer.net/documents/bridging_hela.pdf [Accessed: 17th May 2016]

Dupont, S. (2015). Move Over Millennials, Here Comes Generation Z: Understanding the 'New Realists' Who Are Building the Future. Public Relations Tactics. Public Relations Society of America. [Online] Available from: https://www.prsa.org/Intelligence/Tactics/Articles/view/11057/1110/Move_Over_Millennials_Here_Comes_Generation_Z_Unde#.VzrhSfmLTIU [Accessed: 17th May 2016]

Esping-Andersen, G. (2002). The generational conflict reconsidered. Journal of European Social Policy, 12(1). 5-21.

EU Kids Online II (2011): A magyarországi kutatás eredményei. [Results of the Hungarian Research] Nemzeti Média és Hírközlési Hatóság, Budapest (in Hungarian)

Fehér, P. & Hornyák J. (2010). Netgeneráció 2010: Egy felmérés tanulságai. [Netgeneration 2010: Consequences of a Survey] Budapest. [Online] Available from http://hu.scribd.com/doc/48558319/Feher-Peter-Hornyak-Zsolt-Net-Generation-2010 [Accessed: 17th May 2016]

Gass, S. & Selinker, L.(2008). Second Language Acquisition: An Introductory Course. New York, NY: Routledge.

Gergátz, I. (2009). ICT az 50+ generáció életében. [The Role of ICT in the Life of 50+ Generation], Ph.D. Thesis, Pécsi Tudományegyetem Közgazdaságtudományi Kar Gazdálkodástani Doktori Iskola, Pécs. Available fom: http://ktk.pte.hu/sites/default/files/mellekletek/2014/07/Gergatz_Ildiko_disszertacio.pdf [Accessed: 17th May 2016] (in Hungarian)

Glass, A.. (2007). Understanding generational differences for competitive success. Industrial and Commercial Training, 39(2), 98-103.

Gregory, J. & Steve M. (1998). Science in Public: Communication, Culture, and Credibility. New York: Plenum Trade. 11-17., 88-98.

Gregory, J. & Steve Miller (2006). Keresztűzben? A nyilvánosság szerepe a tudományháborúban. [Caught in the crossfire, the public's role in the science wars] Replika, 54-55(1), 195-205.

Guld, Á. & Maksa Gy. (2013): Fiatalok kommunikációjának és médiahasználatának vizsgálata, [Investigations about the Communication and Media Use of Youngsters] Pécs (TÁMOP-4.2.3-12/1/KONV-2012-0016) Tudománykommunikáció a Z generációnak [Science Communications to Generation Z] Available from: http://www.zgeneracio.hu/getDocument/501 [Accessed: 17th May 2016] (in Hungarian)

Hall, J. M. (2007). A History of the Archaic Greek World. Wiley-Blackwell.

Hamza, K. M. & Wickman, P. (2013). Supporting Students' Progression in Science: Continuity Between theParticular, the Contingent, and theGeneral, 97(1), 113-138

Harlick, A. M. & Halleran, M. (2015). There Is No App for That Adjusting University Education to Engage and Motivate Generation Z. Conference: New Perspectives in Science Education, Italy. [Online] Available from: http://www.researchgate.net/publication/273893292_There_Is_No_App_for_That__Adjusting_University_Education_to_Engage_and_Motivate_Generation_Z [Accessed: 17th May 2016]

Hartyányi, M. (2010). A Net Generáció kihívása. Tanárok a hálón. [Challenges of NetGeneration. Teachers on the Web] TeNeGEN. Budapest. [Online] Available from: http://www.tenegen.eu/sites/tenegen.eu/files/tenegen/books/R10_Tenegen_Book_HU_CD.pdf [Accessed: 17th May 2016]

Hinrichs, R. (2000). A Vision for Life Long Learning – Year 2020. Introduction by Bill Gates. Learning Science and Technology Microsoft Research. Microsoft. [Online] Available from: http://vision.cer.uz/Data/lib/readings/ff_social_development/SOC_Microsoft__A_Vision_for_Life_Long_Learning__2020_EN_2006.pdf [Accessed: 17th May 2016]

Horovitz, B. (2012). After Gen X, Millennials, what should next generation be? USA Today. [Online] Available from: http://usatoday30.usatoday.com/money/advertising/story/2012-05-03/naming-the-next-generation/54737518/1 [Accessed: 17th May 2016]

Howard, J. A. (2000). Social Psychology of Identities, Annual Review of Sociology, 26(1), 367-393.

Howe, N. - Strauss, W. (1991). Generations: The History of Americas Future, 1584 to 2069. New York: William Morrow. 299–316.

HVG (2014): Klasszikus módszerekkel nem lehet a Z-generációt tanítani. [GenZ Can't be Taught by Classical Methods] [Online] Available from http://hvg.hu/plazs/20140424_Klasszikus_modszerekkel_nem_lehet_a_Zgen [Accessed: 17th May 2016] (in Hungarian)

Ipsos Media CT (2013). GenZ: The Limitless Generation – A Survey of the 13-18 Year-Old Wikia Audience. [Online] Available from: http://www.prnewswire.com/news-releases/generation-z-a-look-at-the-technology-and-media-habits-of-todays-teens-198958011.html [Accessed: 17th May 2016]

Joshi, A. & Dencker, J. C. & Franz, G. & Martocchio, J. J. (2010). Unpacking Generational Identities in Organizations. Academy of Management Review,35(3), 392-414.

Jukes, I. & Dosaj, A (2003). The differences between digital native learners and digital immigrant teachers. The InfoSavvy Group. [Online] Available from: http://edorigami.wikispaces.com/Understanding+Digital+Children+-+Ian+Jukes [Accessed: 17th May 2016]

Jukes, I. & Dosaj, A. (2006). Understanding Digital Children (DKs) Teaching & Learning in the New Digital Landscape, The InfoSavvy Group. [Online] Available from: https://web.archive.org/web/20061018134943/http://ianjukes.com/infosavvy/education/handouts/ndl.pdf [Accessed: 17th May 2016]

Karp, H. B. & Sirias, D. (2001). Generational Conflict A New Paradigm for Teams of the 21st Century. Gestalt Review, 5(2), 71–87.

Kolin, P. (2002). Idősek az információs társadalomban [Elders in the Information Society], Evilág, Available from: http://www.pointernet.pds.hu/ujsagok/evilag/2002/07/evilag-06.html [Accessed: 17th May 2016] (in Hungarian)

Komenczi, B. (2009). Informatizált iskolai tanulási környezetek modelljei. [Models of Computerized School Learning Environments] Oktatáskutató és Fejlesztő Intézet, Budapest. [Online] Available from: http://regi.ofi.hu/tudastar/iskola-informatika/komenczi-bertalan [Accessed: 17th May 2016]

Kristiansen, R. (2011). Digital natives - Thinking map. [Online] Available from: http://roarkristiansensblogg.blogspot.hu/2011/03/digital-natives-mindmap.html [Accessed: 17th May 2016]

Landon, J. (1980). Great Expectations: America and the Baby Boom Generation, New York: Coward, McCann and Geoghegan

Lengyel, Gy. (2003). Az információs technológia terjedésének társadalmi hatásairól. [The Social Effects of Sprading Information Technology] In. Információs technológia és életminőség [Information Technology and the Quality of Life] BKÁE Szociológia és Szociálpolitika Tanszék, Budapest, pp. 5-10. Available from http://unipub.lib.uni-corvinus.hu/526/1/ite1_bev.pdf [Accessed: 17th May 2016] (in Hungarian)

Lewenstein, B. V. (2003). Models of public communication of science and technology. [Online] Available from: http://disciplinas.stoa.usp.br/pluginfile.php/43775/mod_resource/content/1/Texto/Lewenstein%202003.pdf [Accessed: 17th May 2016]

Mannheim, K. (1952). The Problem of Generations. In Kecskemeti, Paul. Essays on the Sociology of Knowledge: Collected Works, Vol. 5. New York: Routledge. 276-322.

Markert, J. (2004). Demographics of Age: Generational and Cohort Confusion. Journal of Current Issues and Research in Advertising. 26, 15.

Masnick, G. (2013). Defining the Generations. Harvard Joint Center for Housing Studies. Available from: http://housingperspectives.blogspot.hu/2012/11/defining-generations.html [Accessed: 17th May 2016]

McCrindle, M. (2010). The ABC of XYZ. Australia: University of New South Wales.

McWilliam, Er. (2015). Teaching Gen Z. EricaMcWilliam.com. [Online] Available from: http://www.ericamcwilliam.com.au/teaching-gen-z/ [Accessed: 17th May 2016]
Menco Platform (2013). Top 10 Educational Trends by Menco platform on Flickr. [Online] Available from: http://pinterest.com/pin/240520436321607462/ [Accessed: 17th May 2016]

Miller, J. D. (2012). The Generation X Report: Active, Balanced, and Happy: These young Americans are not bowling alone. University of Michigan, Longitudinal Study of American Youth, funded by the National Science Foundation.

Molnár Gy. (2007). New ICT Tools in Education - Classroom of the Future Project. In. D. Solesa (Ed.): The fourth international conference on informatics,Moleducational technology and new media in education. A. D. Novi Sad. pp.332-339. [Online] Available from:

http://www.staff.u-szeged.hu/~gymolnar/New_ICT_tools_in_Education_paper_pictures.pdf [Accessed: 17th May 2016]

Molnár, Gy. (2008). The use of innovative tools in teacher education: a case study. In: D. Solesa (Ed.): The fifth international conference on informatics, educational technology and new media in education. A. D. Novi Sad. pp. 44-49. Available from: http://www.staff.u-szeged.hu/~gymolnar/sombor_2.pdf [Accessed: 17th May 2016]

Nahalka, I. (2002). Hogyan alakul ki a tudás a gyerekekben? Konstruktivizmus és pedagógia. [The Development of Knowledge in Children: Constructivism and Pedagogy] Budapest, Nemzeti Tankönyvkiadó. (in Hungarian)

Ng, E.S.W. & Lyons, S.T. & Schweitzer, L. (2010). New generation, great expectations: A field study of the millennial generation. Journal of Business Psychology, 25(1), 281-292.

NOL (2014): A fiatalok gyors információkra vágynak, nem elmélyült fejtegetésekre. [Youngsters want fast informations not deep considerations] [Online] Available from: http://nol.hu/belfold/a-fiatalok-gyors-informaciokra-vagynak-nem-elmelyult-fejtegetesekre-1458275 [Accessed: 17th May 2016] (in Hungarian)

Nyíri, K. (1999). Identitáskérdések az elektronikus hálózottság korában. [Questions about Identities in the Era of Electric Networks] Magyar Pszichológiai Szemle, 56 (1), 19-21. (in Hungarian)

Nyíri, K. (2004). Információs társadalom és nemzeti kultúra. . [Information Society and National Culture], Információs Társadalom, 5(1), 7- 16. (in Hungarian)

Oblinger, D. G. & Oblinger, J. L. (2005). Is It Age or IT: First Steps Toward Understanding Ethe Net Generation. In: Oblinger, D. G. & Oblinger, J. L. (Eds.): Educating the Net Generation. EDUCAUSE. 2.1-2.20. [Online] Available from: http://www.educause.edu/research-and-publications/books/educating-net-generation/it-age-or-it-first-steps-toward-understanding-net-generation [Accessed: 17th May 2016]

Olympiou, G. & Zacharia, Z. C. (2011). Blending physical and virtual manipulatives: An effort to improve students' conceptual understanding through science laboratory experimentation. Science Education, 96(1), 21-47.

Owram, Doug (1997). Born at the Right Time, Toronto: Univ Of Toronto Press.

Palugyai, I. & Wormer, H. & Lehmkuhl, M. & Bán, L. & Neumann, V. (2012). Tudományos újságírás. [Science Journalism] Budapest: Tudományos Újságírók Klubja.

Papert, S. (1996). The Connected Family. Longstreet Publishing, Atlanta.

Parry, E. & Urwin, P. (2011). Generational Differences in Work Values: A Review of Theory and Evidence. International Journal of Management Reviews, (13)1, 79–96.

Pease, M. A. & Kuhn, D. (2010). Experimental analysis of the effective components of problem-based learning, 95(1), 57-86.

Pilcher, J. (1994). Mannheim's Sociology of Generations: An undervalued legacy. British Journal of Sociology, 45(3), 481–495.

Pintér, Dániel Gergő (2013a). A tudományos tartalmú közlésfolyamat a globális médiatérben. [Science Communication in Global Media] *Tudományos Próbapálya Conference Book.* PEME. pp. 23. ISBN 979-963-88433-8-8 Available from: http://www.peme.hu/userfiles/Interdiszciplin%C3%A1lis%20%C3%A9s%20tudom%C3%A1nyfiloz%C3%B3fia.pdf [Accessed: 17th May 2016] (in Hungarian)

Pintér, Dániel Gergő (2015). Bruno Latour Cselekvő Hálózat Elméletének alkalmazása a modern tudománykommunikációban [The Application of Bruno Latour's ANT int he field of Science Communication] In. *III. Interdiszciplináris Doktorandusz Konferencia 2014. Conference Book* ISBN 978-963-642-741-2. pp. 455-465o. [Online] Available from: http://phdpecs.hu/idk2014/index.html [Accessed: 17th May 2016]

Pintér,Dániel Gergő (2013b). *Semmivel sem törődik a Z-generáció*. [GenZ doesn't Care abut Anything] *Média 2.0 Blog*. [Online] Available from: http://media20.blog.hu/2013/04/18/a_boseg_zavara_121 [Accessed: 17th May 2016]

Prensky, M. (2001): Digital Natives, Digital Immigrants. On the Horizon, 9(5), 1–6.

Roberts, G. R. (2005). Technology and Learning Expectations of the Net Generation. In Oblinger, Diana. G. and Oblinger, James. L. (Eds.). Educating the Net Generation. EDUCAUSE. 3.13.7. [Online] Available from: http://www.educause.edu/research-and-publications/books/educating-net-generation/technology-and-learning-expectations-net-generation [Accessed: 17th May 2016]

Rückriem, G. (2009). Digital technology and mediation: A challenge to activity theory. In A. Sannino & H. Daniels & K. Gutierrez (Eds.), Learning and expanding with activity theory. pp. 30-38. Cambridge: Cambridge University Press.

Smetana, L. K. & Wenner, J. & Settlage, J. & McCoach, D. B. (2016). Clarifying and Capturing "Trust" in Relation to Science Education: Dimensions of Trustworthiness within Schools and Associations with Equitable Student Achievement. Science Education, 100(1), 78-95.

Sterbenz, C. (2015). Here's who comes after Generation Z - and they're going to change the world forever. Business Insider. . [Online] Available from: http://www.businessinsider.com/generation-alpha-2014-7-2 [Accessed: 17th May 2016]

Strauss, W. & Howe, N. (2000). Millennials Rising: The Next Great Generation. Cartoons by R.J. Matson. New York, NY: Vintage Original. 370.

Tari, A. (2011*). Z generáció* [Generation Z] Budapest: Tericum Kiadó Kft. (in Hungarian)

Trunk, P. (2009). What Generation Z will be Like at Work. [Online] Available from: http://blog.penelopetrunk.com/2009/07/27/what-work-will-be-like-for-generation-z/

Turner, A. (2015). Generation Z: Technology and Social Interest. Journal of Individual Psychology. 71(2), 103-113.

Ujhelyi, A. (2013). Digitális nemzedék – szociálpszichológiai szempontból [Digital Generation from the Perspective of Social Psychology] Digitális Nemzedék 2013 Conference Book, Budapest, 9-14. (in Hungarian)

Urick, M. J. (2012). Exploring Generational Identity: A Multiparadigm Approach. Journal of Business Diversity, 12(3), 103-115.

Vikat, A. & Spéder, Zs. & Beets, G. & Billari, F. & Bühler, C. & Desesquelles, A. & Fokkema, T. & Hoem, J. M. & MacDonald, A. & Neyer, G. & Pailhé, A. & Pinnelli, A. & Solaz, A. (2007): Generations and Gender Survey (GGS): Towards a Better Understanding of Relationships and Processes in the Life Course. Demographic Research, 17(14), 389-440. Webster, F. (1997). Theories of the Information Society. London: Routledge. Available from: http://cryptome.org/2013/01/aaron-swartz/Information-Society-Theories.pdf [Accessed: 17th May 2016]
West, A. & Pen, I. & Griffin, A. S. (2002). Cooperation and Competition Between Relatives. Science, 296(5565), 72-75.

Williams, A. (2015). Meet Alpha: The Next 'Next Generation. New York Times. [Online] Available from: http://www.nytimes.com/2015/09/19/fashion/meet-alpha-the-next-next-generation.html?_r=0 [Accessed: 17th May 2016]

Yelkikalan, N. & Ayhun, S. E. (2013). Examination of the Conflicts Between X and Y Generations: Research for Academicians. European Scientific Journal, 9(19), 19-33.

Z. Karvalics, L. (2013). From Scientific Literacy to Lifelong Research: A Social Innovation Approach. Worldwide Commonalities and Challenges in Information Literacy Research and Practice, 397(1), 126-133

Z. Karvalics, L. (2013). Mangalány mondja: közeledik a „digitális beavatottak" ideje. [Manga Girl says: the "Digital Initiates' Time Approaching] Conference Book: Digitális nemzedék 2013 Konferencia, Budapest, 19-23. (in Hungarian)

Z. Karvalics, L. (2014). Digitális kultúra és pedagógia: a történeti metszéspontoktól az információs írástudások új generációjáig [Digital Culture and Pedagogy] In. Polgári nevelés – Digitális oktatás. Nyelv és módszer, Magyar nyelvstratégiai Intézet, 68-84. (in Hungarian)

Zipernovzky, H. (2008). Felesleges időtöltés? [Useless Pasttime?] Tanszertár, Budapest. [Online] Available from: http://www.tanszertar.hu/eken/2008_02/zh_0802.htm [Accessed: 17th May 2016] (in Hungarian)

György MOLNÁR

Digital learning on the basis of 21st century higher education

Introduction

The rapid development of ICT is constantly calling for society and economics, as well as our way of life. This tendency is being intensified these days by the transformation of the basic lifestyles, tasks and roles besides the changes of the education system and its components. The major shifts in technical and technological advancements have resulted in the development of the learning environment and the spread of digital learning therefore required the adjustment of learning forms and fundamental principles (Benedek, 2013). Its signs are primarily visible in the changes of the classical teaching-learning methods, the redefining of the learning environment and the shifts of different roles (Szűts, 2009; Kálmán, 2016). The effects of these can be sensed in every educational area, from elementary schools through vocational training to higher education (Molnár, 2014).

LMS systems – Moodle

In Hungary the most popular LMS systems are: Drupal – http://drupal.hu, Joomla – http://joomla.org.hu, Moodle – http://moodle.org, Wordpress – http://word-press.hu, ILIAS, and Olat – www.olat.org.

They all share common characteristics:

- open source
- use various programing languages (php/.NET asp)
- simple or complex modular framework that can be completed with functional modules and plugins.

The most common system used worldwide is Moodle, so Budapest University of Technology and Education uses it also.

The Moodle system introduced in 2006 at the Department of Technical Education, Budapest University of Technology and Economics can be considered a formal social media network which, according to the statistical data, has achieved significant results in both learning management and content management. The system facilitates communication between teachers and students, the measurement of their activity, and the use of social forums, evaluation and provision of feedback in an electronic environment, in addition to allowing course materials to be downloaded (Benedek-Molnár, 2015). The behavior of the nearly 3,500 students using the system in an electronic learning supporting system can be monitored by means of different statistical measuring facilities such as the built-in statistical measurement system of the Moodle. This allows the diagnosis of the students' activity (both overall and broken down).

The report module of the system provides information about the users' activity. Figure 1 shows the activity pattern over three years, with the students' activity shown in red. It is evident that the maximum amplitudes which occurred were related to test dates or assignment deadlines.

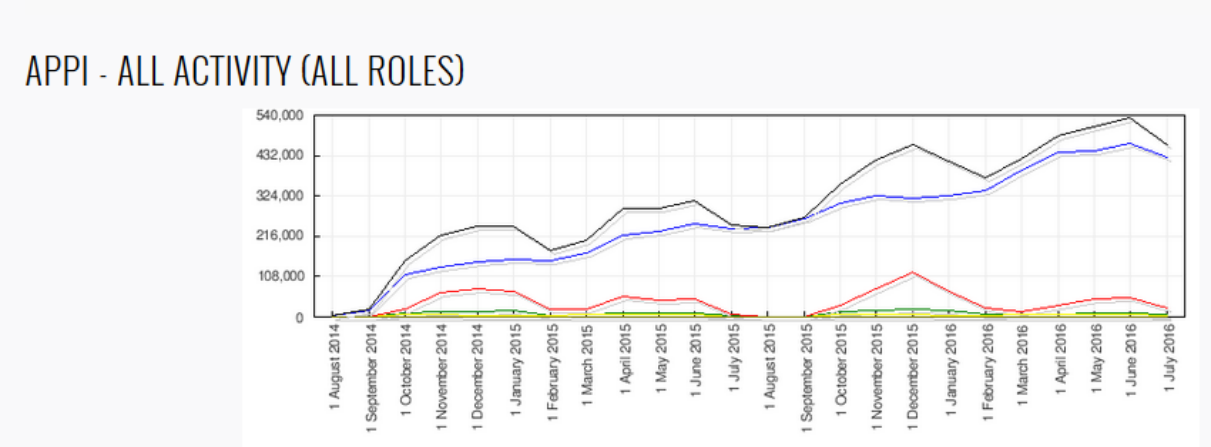


Figure 1. The activity in the Moodle system of the Department of Technical Education. Source: own figure

The other measurement tool employed is the Google analytics system, which when linked to the Moodle system also provided useful and informative statistical data as shown in Figures 2. and 3. concerning an elective courses.

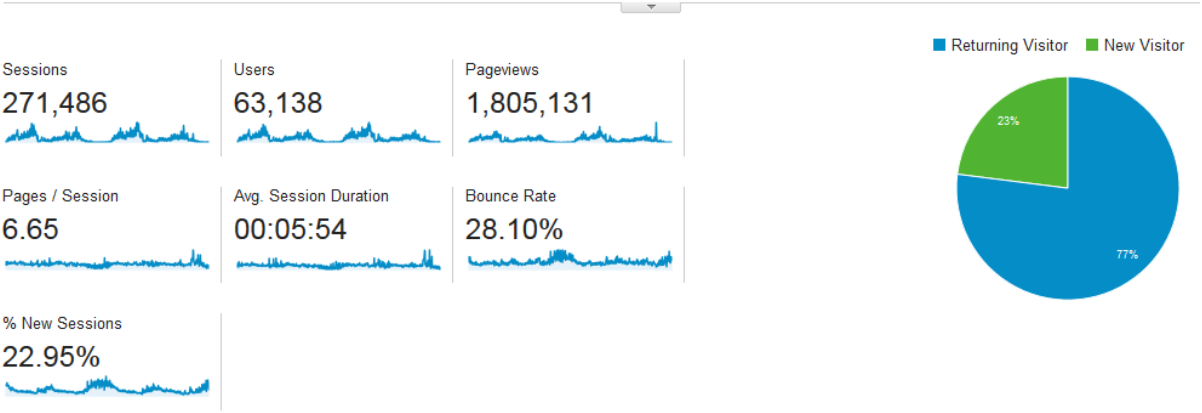


Figure 2. The activity of the participants of the Moodle courses. Source: own figure

Cloud-based solutions

Cloud-services appeared in the 2010s in the field of IT, and the number of cloud-service providers has increased dramatically ever since. Today, the mobile ICT devices enable the everyday use of them owning to their benefits which include reliable and budget-priced execution and operation, 80-90% of capacity utilization, small investment demand and limitless computer resources.

Generally speaking, these cloud-based systems intend to maintain cross-connections between different services, which is one of the essential notions of the system. It means that the created content is accessible from another service-provider thus the users are let off from reloading data and information to the new system.

The cloud-based information storing is provided by various hosting servers all of which are tightly connected to different operational system platforms. To name a few, the unarguably most frequently used hosting provider is tight-knitted with the Android system-based Drive-type systems, whereas the iOS systems use the Dropbox hosting services, and the skyrocketing Windows phone op-systems prefer OneDrive. Based on some preliminary forecasts, the growth rate of the cloud-based services will be several times (four or five times) more than as of the general ICT growth in the period between 2013 and 2017 thus the possible methodological use of these services is to be evaluated in the feasibility study of the research (Holik-Sanda, 2016).

What is more, the cloud-based services enable multiple users to co-work on a common project in the form of crowdsourcing. In order to study its practice, crowdsourcing projects could be initiated among state school teachers in which the participants were asked to channel their own know-how and knowledge into an interdisciplinary task. We could gather valuable information concerning the working process and were able to study efficiency and what cloud-based applications could help in task-accomplishment. Some distributed motors such as *Pentaho* or *Hadoop* will be used for analyzing shared content.

Trello is a cloud and group work based service which is capable of attaching files hosted in Google Drive to various tasks without having to re-upload them. The following screenshot demonstrates the opening page of *Trello* and its boards with some visible markers.

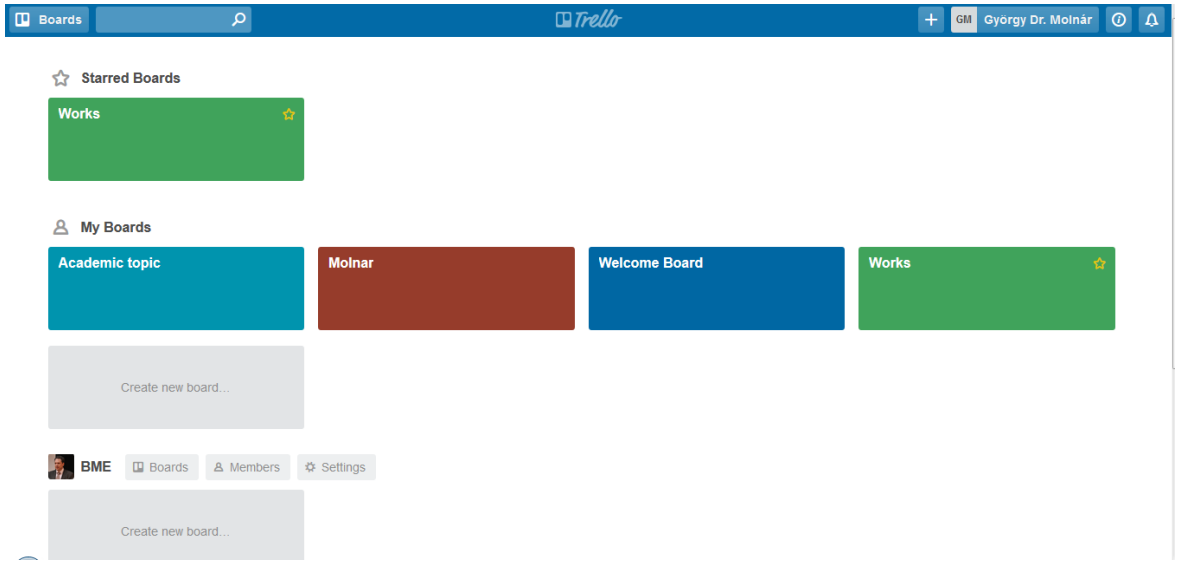


Figure 3.: The opening page of Trello and some personal boards. Source: own screenshot

Scratch (https://scratch.mit.edu) is a project-based application (Kővári, 2016) and *Learningapps* (learningapps.org) is a community-based service, both of which could be used for co-working purposes.

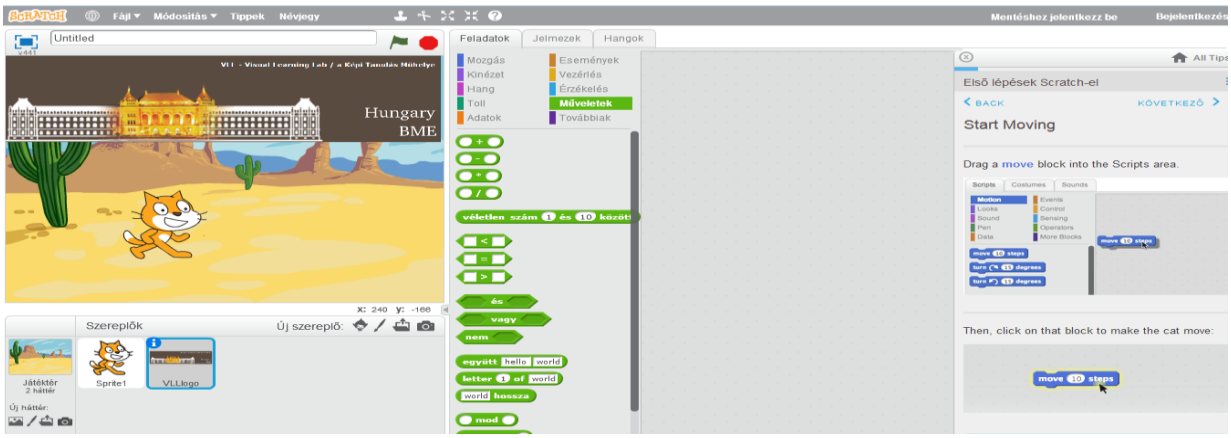


Figure 4: The editorial page of Scratch. Source: own screenshot.

MOOC systems

The theory of education has dealt with online teaching for some time while focusing on distance learning. It is noteworthy, however, that in 2012-2013 major universities in USA started a complex innovation project: MOOC. Massive Open Online Courses thence have become an important strategical development course at European University Association (EUA) as well. This innovation is a great example how the traditional boundaries are outspread by a new learning form which „environmental" understanding is more progressive than ever.

From a professional point of view it is particularly interesting that universities known for conservative teaching and learning methods have developed MOOC. These online courses have free (non-formal) access, no limits for participation, and non-formal ways of entry. They also share the disadvantage of not providing students with credits. On the basis of the properties listed above the experiment could be interpreted as a support for non-formal learning, an attempt within the framework of the traditional dissemination of information. Yet the importance and the professional value of the initiative is greatly increased by the fact that the best US universities offer the free open courses.

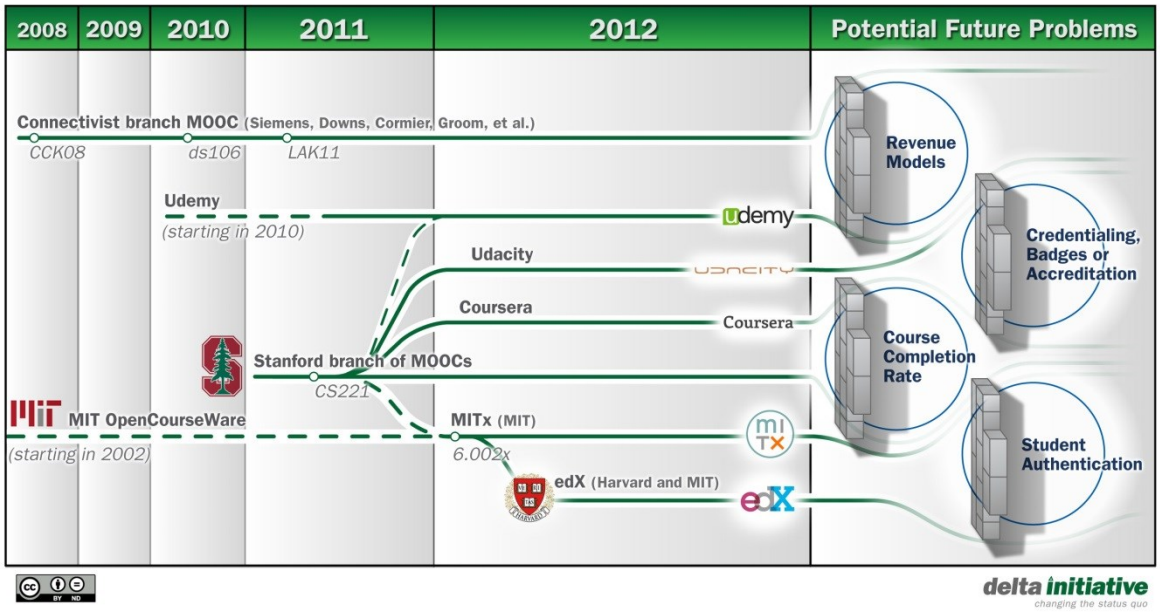


Figure 5.: Development of MOOC courses between 2008-2012, Source: Phil Hill, e-literate, 24/07/2012: Four Barriers That MOOCs Must Overcome To Build a Sustainable Model, http://mfeldstein.com/four-barriers-that-moocs-must-overcome-to-become-sustainable-model/ (downloaded: 2013. 03. 10.)

The most popular portals offering online courses (one of them being the EDX) have millions of registered students. The online courses are designed so that everyone has access to free and high quality education, which is mainly supported by implemented educational video materials. edX has several open sources based systems, own technology and source code. The percentage of students coming from different countries is: 27% USA, 11% India, 4% China, Brazil and United Kingdom, 3% Canada and Mexico, 49% other countries.

A Hungarian innovative project was started in 2016 called K-MOOC (Carpathian Basin Online Education Center), where several MOOC courses were offered in Hungarian. One of the courses can be seen on the screenshot.

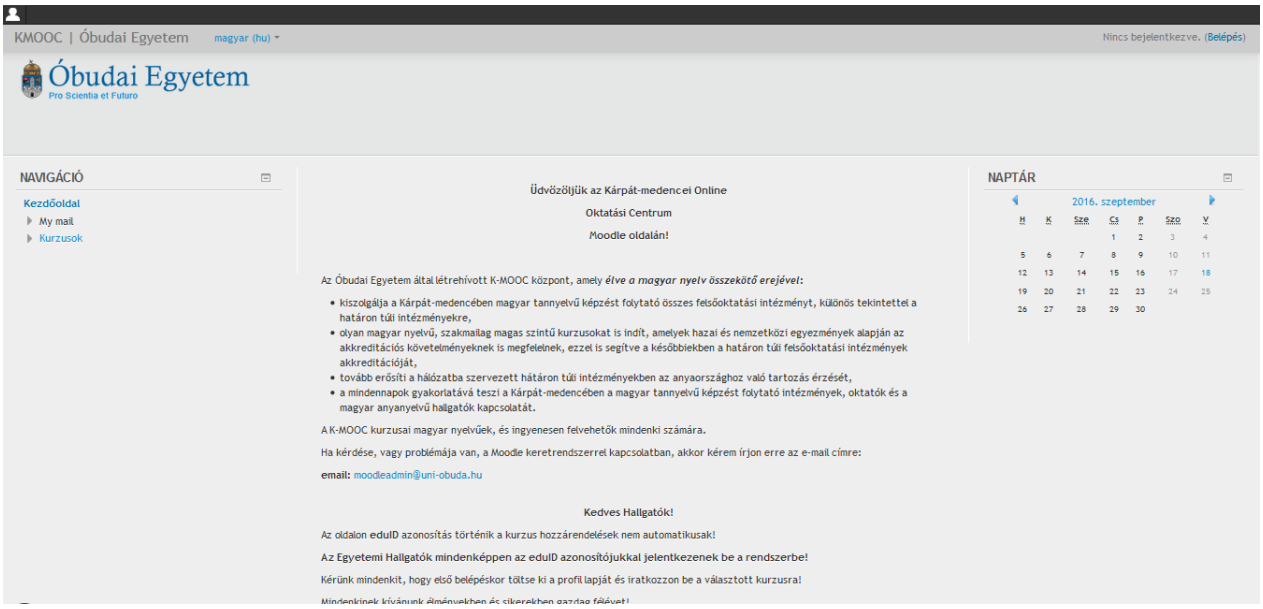


Figure 6.: K-MOOC MOOC courses

Virtual reality

Virtual worlds, surfaces, classrooms and courses can be found in a 3D game called Second Life. This program is popular worldwide. Originally, the developers wanted to build the game's virtual world, but different virtual campuses have been released since. In these, there are virtual classrooms, courses, faculties, students, all that is needed in reality in order for educational process to take place. The use of a virtual learning environment for teaching has got stronger and stronger domestic practice in Hungary too. Many examples of courses or conferences can be found, where the real person's avatar gets the main role, bridging the geographical limits of the real space. The following illustration shows the inner space of a campus, where students can chat or present on screen.

Figure 7.: Illustration: ELTE GRID virtual classroom, course: own screenshot

Latest developments center on virtualizing the social networking site Facebook. The name of the project is Oculus (Szűts, 2011). For this, only a console, haptic gloves that imitate touch

and a visor is needed. In the field of education the idea of virtual has also appeared, and registration is now available on Google Classroom and Craft Class interface also developed by Google. The following screenshot presents the virtual surface of Google classroom.

Figure 8.: Illustration: Google virtual classroom, source, own screenshot

Summary

Modern, ICT based solutions can help young generations both in teaching and learning. If appropriate solutions are developed, even those with special needs can benefit. Prosperous use of social media in education in obvious, and it helps the expansion of informal learning dimension. The greatest educational challenge is motivation, awareness-raising and sustaining. This can help the teachers of the modern e-learning support solutions (Benedek-Horváth, 2016). For this some practical examples were suggested by the author. The efficiency of the appropriate methodological design culture lies in the possibility of learning from each other. An aspect that must be accepted in today's educational system. This methodology enables us to thrive in today's changing digital world.

References

- András Benedek & János Horváth Cz. (2016): New methods in the digital learning environment: micro contents and visual case studies, In: António Moreira Teixeira, András Szűcs, Ildikó Mázár (ed.): Re-Imaging Learning Environments: Proceedings of the European Distance and E-Learning Network 2016 Annual Conference. Budapest: European Distance and E-Learning Network (EDEN), pp. 27-34.
- Anikó Kálmán (2016): Learning - in the New Lifelong and Lifewide Perspectives, Tampere: Tampere University of Applied Sciences, 139 p. ISBN:978-952-5903-80-5

- Benedek András (2013): Új pedagógiai paradigma: 2.0: tételek a digitális tanulásról, In: Benedek András (szerk.) Digitális Pedagógia 2.0. Budapest: BME GTK; Typotex Kiadó, pp. 15-51.
- Benedek, A.; Molnár, Gy. (2015) E-teaching and Digitalization at BME. In: Karmela Aleksić-Maslać (ed.) New Technologies and Innovation in Education for Global Business: 19th International Conference on Engineering Education, pp. 349-356.
- György Molnár (2014): Modern ICT based teaching and learning support systems and solutions in higher education practice, In: Milan Turčáni, Martin Drlík, Jozef Kapusta, Peter Švec (ed.) 10th International Scientific Conference on Distance Learning in Applied Informatics. 654 p. Praha: Wolters Kluwer Law and Business, pp. 421-430.
- Holik Ildikó & Sanda István Dániel (2016): Tanári kommunikáció. Budapest: Typotop Kft., 2016. 102 p.
- Kővári Attila (2016): Költséghatékony informatikai eszközökkel támogatott projektoktatás alkalmazásának lehetőségei, In: Kozma Tamás (szerk.) A tanulás útjai: HUCER 2016: Absztrakt kötet. Kaposvár: Magyar Nevelés- és Oktatáskutatók Egyesülete (HERA), 2016. pp. 92.
- Szűts Zoltán (2009): Az új internetes kommunikációs formák mint a szöveg teste (The new Online Communication Forms as the Bodies of the Text) SZÉPIRODALMI FIGYELŐ 3 pp. 38-51.
- Szűts Zoltán Torlódott galaxisok (2011): A nyomtatott szöveg és a világháló korának párhuzamai (Congested Galaxies: Parallels of Print Age and Web Age) EGYENLITŐ 9: (7-8) pp. 60-65.

Pirjo JAAKKOLA

Vocational teacher education in TAMK with emphasis on methodology and learning philosophy

Vocational and vocational higher education in Finland is undergoing significant changes which for higher education concern digitalization of learning environments, methods and ways of working in a more integrated way as well as promoting direct contacts with the working world. In vocational upper secondary level the reforms involve e.g. promoting on-the-job learning and personalized learning paths.

Figure 1. Word clouds describing changes and elements of the paradigm shift in education

Finland has a long tradition of seriously developing vocational education also historically. In addition to recent changes and concerns in education illustrated in figure 1 it is good to look back a little. The first vocational school was founded in Helsinki in 1899 and the pioneer and inspector of VET in crafts and industry, Jalmari Kekkonen, developed a curriculum of vocational education emphasizing student-centered learning and workshops. It was thought that planning and making practical products motivated students more than bare school training. Folk school reform and the reform of a system of school-based VET were integrated in the project of developing Finland towards a welfare state, Welfare Finland in the first half of the 20th Century. Industry saw the relevance of closeness to vocational education and several industries founded their own vocational schools. So, developing education to meet the needs of the surrounding society is nothing very new in Finland. Teacher´s profession is regarded highly valued and carries a long tradition of appreciation from the early years of the Finnish educational history. The high status of the profession makes teacher´s work very popular and a desired career. Teachers are trusted experts and work autonomously with a lot of freedom in how they carry out their work. Teachers decide to a large extent upon methods, materials, assessment of learning and teaching etc. In higher

education the curricula are locally planned by the university of applied sciences staff typically in co-operation with the working world and other relevant stake holders in an organized way. In vocational upper secondary level, the curricula are national but localized by the educational institutions.

Education policy in Finland

One of the basic principles of Finnish education is that all people must have equal access to high-quality education and training. The same opportunities to education should be available to all citizens irrespective of their ethnic origin, age, wealth or where they live. Education policy is built on the lifelong learning principle. The basic right to education and culture is recorded in the Constitution. Public authorities must secure equal opportunities for every resident in Finland to get education also after compulsory schooling and develop themselves, irrespective of their financial standing. In Finland education is free at all levels from pre-primary to higher education. Adult education is the only form of education that may require payment.

The key words in Finnish education policy are quality, efficiency, equity and internationalization. Geared to promote the competitiveness of Finnish welfare society, education is also seen as an end in itself. The broad lines of Finnish education and science policy are in line with the Europe 2020 Strategy.

Decisions on the contents of legislation on education and research are made by the Parliament based on government proposals. The Government and the Ministry of Education and Culture, as part of it, are responsible for preparing and implementing education and science policy.

The Education and Research Development Plan promotes equality

The Education and Research Development Plan is the key document of the Finnish education and research policy. The Development Plan is adopted by the government every four years, and it directs the implementation of the education and research policy goals stated in the Government Programme. The Development Plan covers all forms of education from early childhood to adult education as well as research conducted in universities and polytechnics. The focus in the period 2011–2016 is on alleviation of poverty, inequality and exclusion, stabilizing the public economy and fostering sustainable economic growth, employment and competitiveness

Source: The Ministry of Education and Culture http://www.minedu.fi/OPM/Koulutus/koulutuspolitiikka/?lang=en

Figure 2. Education policy in Finland

The national education policy crystallizes some of the key elements behind the success of the Finnish education system. Although there is a lot of freedom and localized decision making at institutional level the Ministry of Education sets the framework for the operations as well as points out the directions of development in the Education and Research Development Plan negotiated every four years with each institution in order to carry out the implementation of the education and research policy goals stated in the Government Programme. Within this framework the universities and other educational institutions can make their own individual decision on how they will contribute to the education and research goals of the government.

Development of vocational higher education and vocational upper secondary education naturally challenges teacher education in many respects. Tampere University of Applied Sciences as one of five UAS that give vocational teacher education responds to the challenges by updating the curriculum and working proactively as far as possible to ensure capabilities for vocational higher education and vocational education teachers in teaching and facilitating students and in developing their own work as well as contributing to the development of their organizations. TAMK gives the 60 cr pedagogical training that ensures the statutory pedagogical qualification for vocational teachers in higher education and in upper secondary vocational institutions. There is also an international teacher student group that are taught in the English language The group consists of students from Finland and several other nationalities. TAMK also gives further pedagogical training in special needs teacher education (60 cr) as well as guidance counsellor education (60 cr) and in education for specialists for competence based qualification. In addition to these School of vocational teacher education runs a number of further education courses and works in various different pedagogical projects and research initiatives.

Methodology and learning philosophy in teacher education in TAMK

Studying in TAMK vocational teacher education is a learning process where the students build their professional identities as teachers. Participatory pedagogy gives the teacher students the opportunity to monitor teacherhood as a multilevel phenomenon. The teacher students evaluate and reflect their own competence as teachers and facilitators together other teacher students, colleagues and various communities. The relationship of the teacher to the social and global phenomena is also an important part of the education and something that the students include in their practical authentic part of the studies in the networking practice.

Teaching and learning at TAMK vocational teacher education is based on the paradigm shift idea that emphasizes the changed role of the teacher from giving out information to facilitator, enabler of education and designer of learning environments. It is recognized that learning happens everywhere and at all times and is not restricted into classroom environments. Participatory pedagogy encourages large issues that enable the teacher students to combine relevant phenomena arising from the teachers´ work in their learning process instead of doing individual and disconnected tasks and learning contents by heart. The focus is on actions, building common knowledge and skills and finding alternative perspectives by working collaboratively in peer groups. Different activating, exploratory and problem and phenomena based pedagogical strategies are applied in participatory approach to education. The learning process is carried out through methods of blended learning utilizing digital platforms and tools as well as contact learning with f2f meetings or synchronous video conferencing. TAMK has an extensive digitalization strategy covering all functions and teacher education has an important role in implementing digitalization in teaching and learning (1). A means of improving the quality of teaching and learning and other functions in teacher education in TAMK is through design based action research. (2, 3).

The approach focuses on students´ participation in their learning process, participation of their background organizations in implementing the new understanding of teaching, learning and facilitation of learning processes in the various functions of the organizations. So, the learning process is as authentic as practically possible utilizing real educational situations in practicing and development functions. Evaluation and reflection of one´s own learning process is an important part of the model and gets excessive attention. Evaluation is seen as learning.

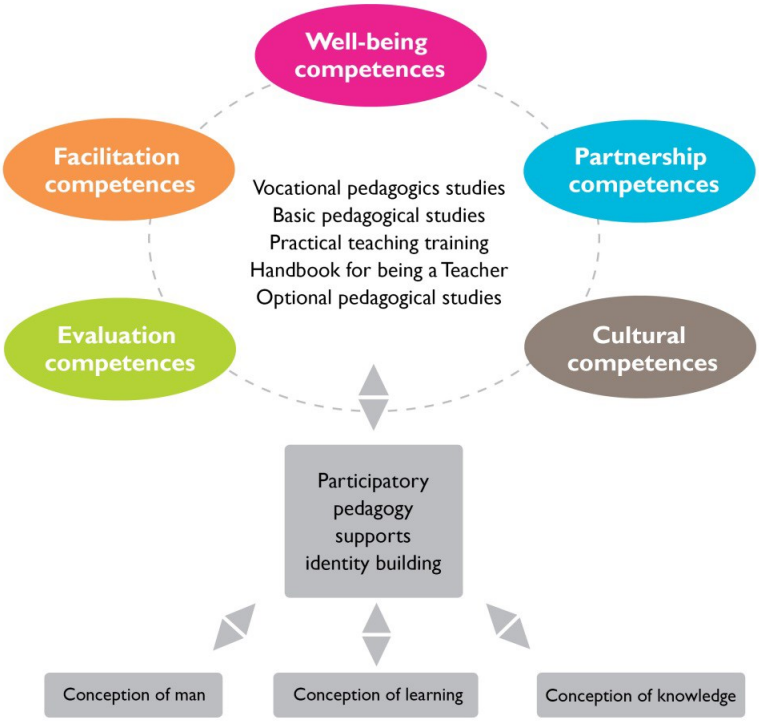


Figure 3. Description of teachers´ competences in vocational teacher education at TAMK

During teacher education the teacher students concentrate on competences in evaluation, facilitation, partnership, cultural aspects and well-being. They represent the multidimensional character of the work that teachers do. Ethical responsibility which is inevitably included in teachers´ work is built in the competences. The structure of teacher education in TAMK is modular with three modules described in figure 4.

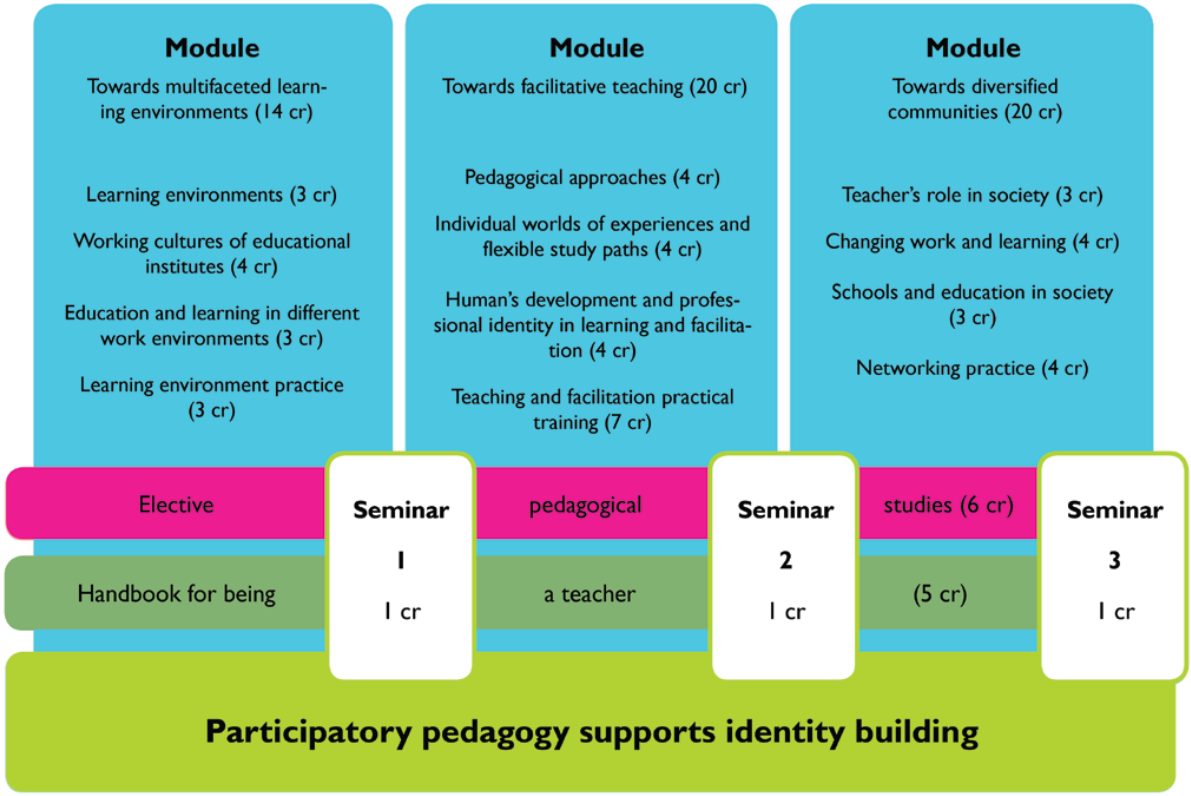


Figure 4. The modular structure of vocational teacher education at TAMK

The topics of the modules indicate a futuristic orientation of the contents: Towards multifaceted learning environments, towards facilitative teaching and towards diversified communities. The structure also includes elective pedagogical studies, teacher practice and creating a handbook of being a teacher (or portfolio). All students also prepare a development project.

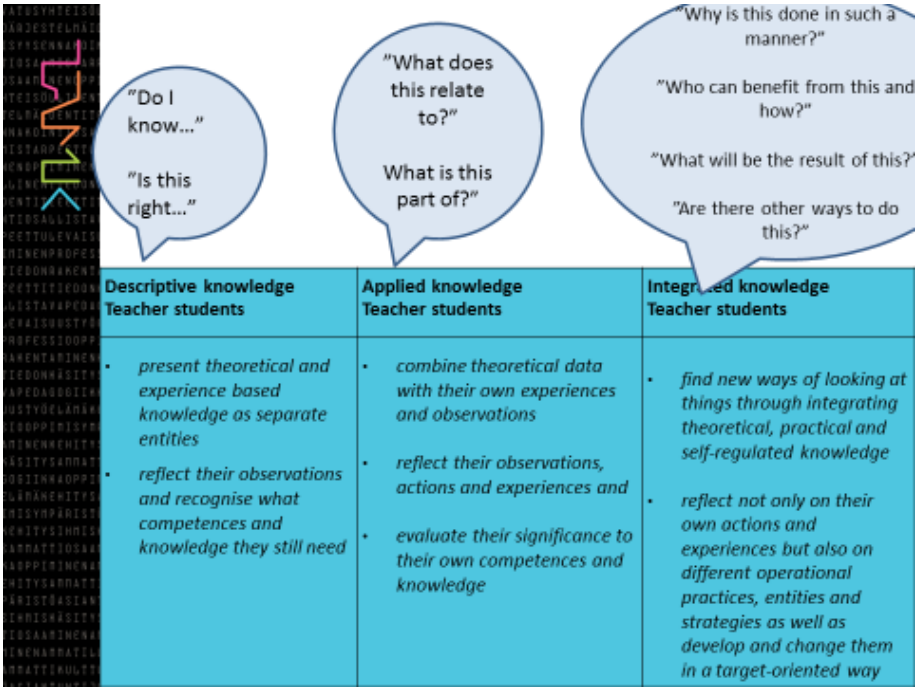


Figure 5. 3-step evaluation criteria for self-evaluation, peer evaluation and evaluation by teacher trainers.

Teacher education applies no exams in the programme. Evaluation is built in the system as part of the learning process. Figure 5 shows the 3-step criteria the students can use to position themselves as novice teachers or more advanced. The criteria are separately described for all the core competence areas but only the head lines are shown in figure 5. This evaluation method enables the evaluation of learners that are at different levels of skills. The evaluation system emphasizes evaluation of the learning process and recognition of progress in competences rather that evaluation of end products of separate tasks.

This presentation is a short overview of some main features of vocational teacher education at TAMK (4) as presented in the *Co-creative problem solving, Finn – Magyar Szimpózium – Workshop* in May 2016 in Budapest organized by Budapest University of Technology and Economics (BME). It is not a comprehensive description of the whole vocational teacher education programme. A very interesting aspect to teacher education as a career-long or life-long learning process was introduced be Anikó Kálmán while she was working at TAMK Vocational teacher education in 2015 (5).

List of references:

1. Ilkka Haukijärvi: *Strategic Digitalization in a Finnish Higher Education Institution, Towards a thorough strategic transformation*, Acta Universitatis Tamperensis 2181, Tampere University Press, 2016

2. Maija Kärnä, Pirjo Jaakkola, Päivi Lehtonen: *Social Media Challenges Vocational Teacher Education in Finland*, International Conference, The Future of Education 4th Edition, Florence, Italy, 2014

3. Maija Kärnä, Päivi Lehtonen: *Improving the Quality and Relevance of Vocational Teacher Education in Finland*, Tampere University of Applied Sciences, Finland, unpublished (to be published at EADTU Conference in Rome October 19-21 2016)

4. TAMK Vocational Teacher Education, Curriculum 2016, https://intra.tamk.fi/documents/629943/0/EnkkuOPS+2016.pdf/55fba33a-47bb-4eb2-b40b-949bd413b183

5. Anikó Kálmán: *Learning – in the New Lifelong and Lifewide Perspectives*, TAMK Tampere University of Applied Sciences 2016, ISBN 978-952-5903-80-5

Anikó KÁLMÁN

Co-creative problem solving

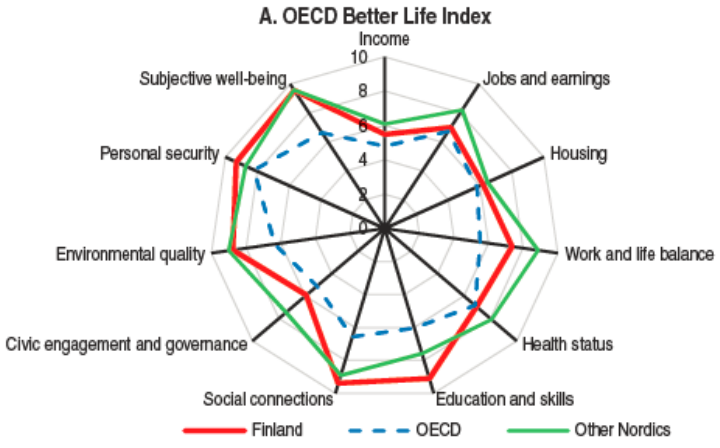
Introduction

There has been an increasing interest during the latest decades of Finland regarding the roots and reasons of the success of the country in the fields of Innovation, modernization, well being, social progress, high quality education. Along these key terms – together with other countries of the Scandinavian region but with a kind of special leading status, Finland has often been quoted in the international economy and policy studies.

„The country where people use the future" – more than a smart catchword, an exciting attitude which may well characterize why in many countries the Finnish way of development implicitly or explicitly serve as example.

A few illustrations about how in the global public opinion and media the country stands:

- First place on the list of best countries in the World (Newsweek, 2010),
- second place on list of Innovation groups of the World (Harvard Business Review, 2009),
- third place on the list of Global innovations (The Economist Intelligence Unit, 2009),
- first place on the list of best education in the World (World Economic Forum 2009, fourth place in 2014/15,
- first place on list of availability of Scientists/engineers (World Economic Forum, 2009),
- first place again on the list of wealth of the World (Legacy Prosperity Index, 2009),
- first place on the list of best countries in the World (Lifestyle, 2010),
- fifth place on the list of Global innovations in 2014 (3rd in 2009).



Quality of life in Finland

(OECD 2016)

Regarding the success of the education system, the most cited points are:

- *Education and learning has been a respected and admired part of the culture.* Finland built and secured its national identity in the 19th century through investing in education for all and when independence was achieved, the base was there to develop further.

- *"Leave no child behind"*
This has been a slogan adopted in Finnish schools (actually, long before it became popular in the US). Pupils with learning difficulties are patiently brought up to the average level by teachers and assistants giving them extra attention and support.

- *High quality teachers with compassion are needeed*.
Only 11% of applicants to the teaching profession are accepted, which means that the most motivated are selected. Respect for the vocation of teaching ensures that talented students choose the profession.

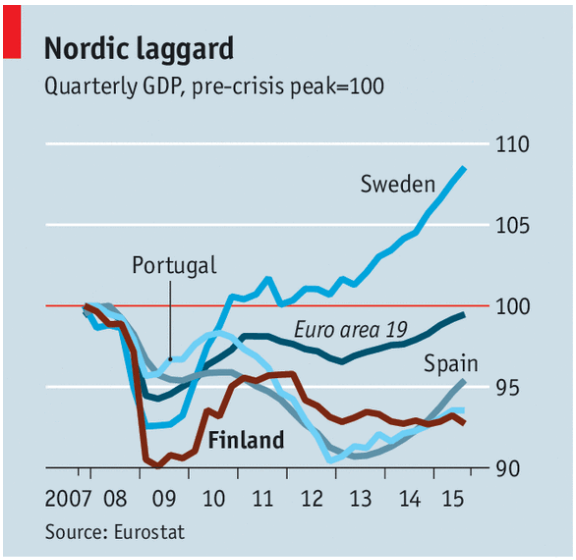
Recent period of economic downturn
However acknowledged for its high level of income and well-being, Finland has faced serious economic problems in the past years. The only Nordic member of the Euro-zone, ran into trouble after the financial crisis of 2007-08.

Output dropped by 8.3% in 2009 and although GDP grew in 2010 and 2011, then declined for the following three years. The country has suffered an *extraordinary combination of shocks*, like the decline of Nokia, once Finland's biggest company and the world's biggest maker of mobile phones. Exports to Russia have plunged by a third. Finland has also been affected by what the ETLA economic research agency in Helsinki called "the reduction of demand for print paper due to the substitution of print media by internet services".

The Finnish economic and social model is being challenged, says the OECD. Wages carried on rising despite sagging productivity: unit labour costs are 10-15% higher than those of Finland's trading partners. Potential growth has halved from around 3% a year before the financial crisis to less than 1.5% now. Unemployment is rising but social safety nets keep income inequality low.

The ongoing goverernemental austerity programme may realise savings of €4 billion—around 2% of GDP—in 2019, mainly through spending cuts. Even then, further parsimony will lie ahead for a country whose public expenditure is 58% of GDP, the highest in the European Union (the average is 47%). *The most important reform is an overhaul of the labour market*. Finland's system of national collective bargaining, wage agreements was

once a strength, but it is now keeping wages too high. The government advocates a more flexible system.



Productivity needs to be revived – it has fallen in manufacturing and hardly increased in business services. International competitiveness should be restored. The government programme to streamline regulations, promote competition and encourage entrepreneurship should support growth.

Finland is meanwhile well placed to find new sources of evolution. According to a World Economic Forum report, *it ranks second globally for innovation*. The government has an ambitious programme to restore competitiveness and fiscal sustainability through budgetary measures and structural reforms. *Startups are an ideology* among young Finns due also to a priority of the government: e.g. a €1.6 billion initiative to promote growth over the next three years to foster the use of new technology. High hurdles for the low-skilled in the labour market call for *further enhancing education and life-long learning*.

The international strategy environment

Though the original LLL idea of the UNESCO from the 1960's is still often meant to be mere paperwork concept in many developed countries, that is obviously not the case in Finland, where lifelong and lifewide learning practices and perspectives are feasible part of the everyday life, part of their national curriculum and corporate business strategies for more than a decade, especially following the paradigm shift in strategic thinking triggered by the economic downfalls and crises of the 21st century.

The main transforming factors regarding the context elements of education recently include the Ways of thinking - creativity and innovation, critical thinking, problem solving, learning to learn, meta-cognition – the Ways of working – communication, collaboration (teamwork),

Tools of working - information literacy, ICT literacy - and Living in the world - citizenship – local and global, life and career, personal, social responsibility.

According to the United Nation's proposition to measure development, emphasis should move to human-based rating instead of economic indexes. The Human Development Index accordingly includes the Life expectancy at birth, the Educational index and the GDP only follows then.

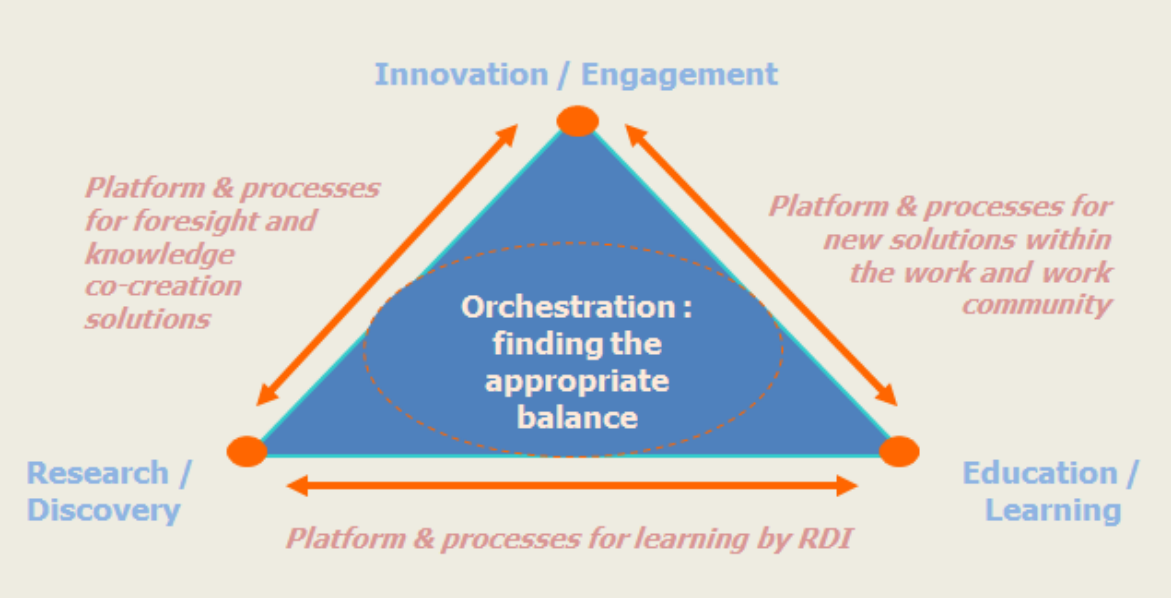
EU 2020 Strategy and Higher Education

The EU 2020 program mutually reinforcing priorities include: Smart growth - Sustainable growth and Inclusive growth. Among the seven flagships for implementation, we find the Digital Agenda, the Innovation Union and the Agenda for new skills and jobs.

The strategic role of universities in the processes can be identified as (i) focus on grand challenges, (ii) to strengthen the Knowledge Triangle- i.e. synergy between research & education & innovation and (iii) modernize the Triple Helix cooperation: University – Industry – Cities.

Meanwhile, in practical implementation, the focus is shifted on the Living labs and the user-driven innovations: the people and process development.

The Knowledge Triangle as blueprint of a new educational paradigm shift



The Knowledge Triangle should primarily be seen as a large-scale societal innovation through which Europe can strengthen its research potential, increase its capacity to educate talents and to promote and create demand-driven open innovation platforms for wide societal use.

New ways to learn call for new approaches to pedagogical development and assessment that truly encourage learning by doing and motivate the learners. Bringing together theory and practice is essential in implementing the Knowledge Triangle. (CESAER).

Implementing the Knowledge Triangle means among others targeting more development activities on curriculum and learning environment initiatives, which are essential to learning to learn. University teachers should be equipped with skills and competencies to facilitate learning and managing properly situations in which studies are focused on solving real life problems. The *growth of teacher students´ identities* should be supported through appropriate content, methods and importantly: operating culture.

In Finland, the emerging substantial economic as well as educational constellations have resulted in a focused pragmatic, research and innovation-centric paradigm shift in the educational, pedagogical thinking and strategy making, also known as Knowledge Triangle (Markkula 2013).

The idea of the organic interference among research-education-and innovation is being impressively put into practice by the newly established Aalto University of Helsinki project, manifested as a pioneering endeavour in Europe. The knowledge triangle concept – which has also led to the creation of the European Institute of Technology and Innovation (EIT) - makes part of the Europe 2020 strategy and the Horizon 2020 programme focusing on societal changes fostered by education, research and innovation. (EC 2009)

The educational changes and innovative stimuli fostered by the participants – teachers, students, researchers of businessmen – are expected to be *adopted, implemented* instantly and the result should be *reflected* as well as *detected* in the society. That is sustainable growth – and rather not the nonsense concept of sustainable development (Bartoli 2000 and Slemmer 1996) - and internalised knowledge sharing and accumulation, or in other words the intrinsic essence of LLL and lifelong education (LE) as envisioned by the UNESCO and the EU, respectively.

The role of universities and the Knowledge Triangle

The *EU "Common Strategic Framework"* for research, technological development and innovation stated that "where appropriate, European research and innovation policy should reach out to education and training, thus invigorating the knowledge triangle through concrete policy measures and synergies between education policy and the CSF for research and innovation.

The role of universities is crucial operating within their *regional innovation ecosystems* while being connected to global networks at the same time, and making the complex inter-linkages more understandable and visible. The quality and joy of research, learning and working will enhance remarkably, when the university activities are increasingly based on the real life & real case -approach building bridges to innovation and societal impact**.**

The effectiveness and efficiency of the university community will grow, when its operations are based on the implementation of the Knowledge Triangle principles and practices.

Realizing principles of Knowledge triangle also needs:

- motivating university students to effective and target oriented studies by developing teaching methods and support systems, such as student's personal study plan, multidisciplinary study teams and virtual learning environments;
- targeting more development activities on curriculum and learning environment initiatives, especially for the first-year studies which are essential to learning-to-learn;
- increasing ICT-assisted teaching and learning by developing new forms and methods of pedagogical education for all university teachers to equip them with skills and competencies as facilitators of learning;
- that many study teams include also professionals to apply lessons from the classroom to their work environment, projects that require students to work across traditional boundaries;

Present Educational Reforms in Finland: Raising workers' skills - Investing in the future

In the field of education, the performance of the country is acknowledged as excellent, but has weakened somewhat over recent years and the present budget cuts will need to be compensated by efficiency gains to maintain world-class results.
According to the OECD Economic Surveys on Finland (2016), adult skills are high in Finland, school results are good and educational attainment is also high. Tertiary education however starts late and is completed slowly. Vocational education provides a pathway to work for students with less interest in academic studies, but narrow qualifications and low foundation skills reduce adaptability to structural change.

The government foresees to launch programmes to continue professional education for teachers, update pedagogical approaches and use digital learning environments to allow a wider range of learning methods. The government also plans to make vocational education and training more flexible by making it easier to switch between educational paths and easing the financial and administrative burden for apprenticeships.

Finland has one of the highest levels of educational attainment in the OECD. It is renowned for its good results in compulsory schools, which are reflected in high PISA rankings, even though spending per pupil is slightly below the OECD average.(NB: PISA results are also falling in other Nordics). Finland ranks second in the OECD Survey of Adult Skills (PIAAC) for literacy, numeracy and problem solving in technology-rich environments . High-quality vocational education and training (VET) eases the transition from school to working life by focusing on trade-specific skills whilst lower foundation skills reduce VET graduates' adaptability to rapid technological change. Efforts to build these skills should be increased, along with life-long development and training.

Higher education institutions will be reformed by determined efforts to terminate overlapping programmes and through closer cooperation with government research institutes and economic life. A crucial question revolves around either developing the current higher education system (dual model) or discontinuing separate higher education sectors. The structural reform of universities should progress in short term perspective. Universities need to have globally visible profiles – with internationally attractive clusters of expertise to be created, joint public and private sector development measures implemented.

As it comes into everyday practice, the ideas and concepts may get palpable manifestations, like the *Phenomenon Based Learning project* launched in all the Finnish schools as of 2017 aiming at providing students more lifelike and involving practical experiences out of the classroom environment. The Finns commonly share the idea that whatever expertise or know-how we may possess it would be void and vain unless it is practically adoptable and useful in practice for the common good, also supplemented with the idea that we constantly need to acquire new skills and competences so as to be able to adopt to new situations, conditions in the swiftly evolving and changing digitalized world.

The Aalto University KT-based project and other attempts and pilot-projects in Finland do emphasize the importance of LLL as well as of shared and internalized and inclusive knowledge available for anyone interested.

Research and innovation policy reform program

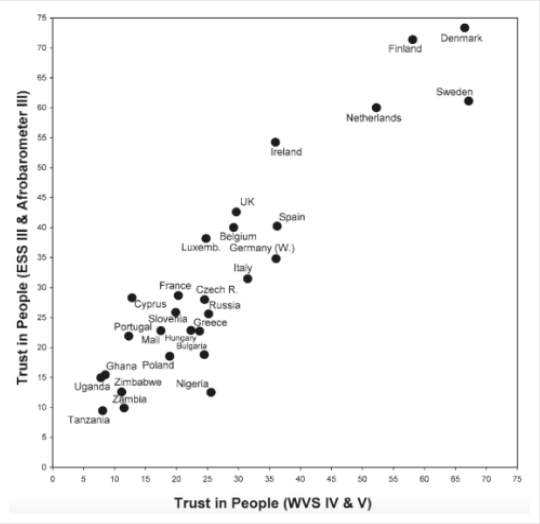
Digitalization and the increasing significance of intellectual capital and intangible value creation are transforming society, economy and R&D. New ways of acting and doing things have to be found as working life and competence requirements are changing. Raising the quality of education and research plays a key role in sustainable competitiveness.
The reform program of the Finnish Key development areas of R&D policy are shown in the following points:

- a radical reform of the higher education system
- promoting the exploitation and impact of R&I results
- strengthening new sources of growth, intellectual capital and entrepreneurship.
- improvement of the overall knowledge-base of the population and selective support for cutting-edge skills
- reform of the public sector and closer cross-administrative cooperation
- adequacy and targeting of R&D funding

Trust based approach

A noteworthy example of the socio-cultural context of education in Finland could be highlighted with the trust based approach.

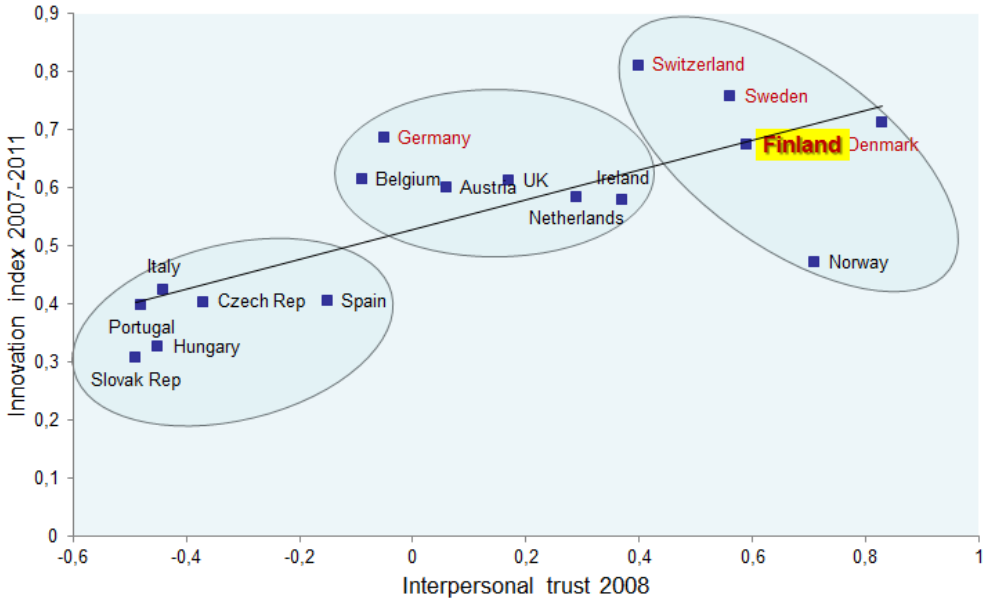
Interpersonal trust levels as measured by the World Values Survey and European Values Study, and the European Social Survey and Afrobarometer Survey – Inglehart & Welzel (2010)[26]



The Finnish society is characterized by high levels of trust. Teachers are also entrusted with considerable independence in the classroom. They have responsibility e.g. for the choice of textbooks and teaching methods. There is a climate of trust between educators and the community. There is no external evaluation and school inspection has no control over the work of teachers since they received a high level of authonomy.

The Year 2008 Social outcomes of education indicator included measures of self-reported health, volunteering, interpersonal trust and political efficacy, assessed in the Survey of the OECD Programme for the International Assessment of Adult Competencies. These four social outcome measures are considered among the key indicators of individual and national well-being. Both educational attainment and literacy proficiency are positively associated with these measures.

Whilst trying to find connection between trust and innovation, we can find a positive correlation.



The issue of trust in the educational process should be therefore considered as important.

Nowadays one may often feel lack of trust between education stakeholders and teachers which creates unreceptive environment for the professional development process.

In turn: "In a continuously unfavourable environment the majority of the energy is devoted to the continuous adaptation performance, little of it remains for "useful" work. In this environment, it remains just who is unable to concentrate resources needed for the outburst." (Kálmán, 2005)

Conclusive remarks – with some holistic aspects

The author of the present study has spent a year as guest professor in Finland - at the Tampere University – and had the chance to observe, experience, consider, even analyse several of the above described contextual elements in wider perspective, being also supported by the senior Finnish academic community fellows.

When we study the characteristics of paradigm shifts in Finland, the important aspects are: research based planning, trust based approach, career path, open learning environment, knowledge triangle - which can blaze a trail to the competences needed for LLL paradigm change.

The issue is really a kind of conceptual, if not philosophical one. We are dealing with deep, partly spontaneous, smartly governed conversion attempts in a thoroughly transforming system – being Finland, one of the globally most modern ones – whilst face the challenge of peculiar nature. *"Our democratic institutions were not designed for dealing with situations of interdependence" (Bauman).*

We are in fact observing a sort of futuristic-holistic scenario which may be with good deal of certainity, a model, a „Vorbild" for the European developments.

Or – alternatively - maybe we are dealing with a tough pragmatic one, directing us back to the down-to-earth aspects of simple interest-guided systems?

Lifelong learning has remained an applause line in public speeches but has yet to become a line item in educational policies. This requires a kind of social innovation as well – whatever abstract it may sound - , since globally, most communities do not have access to a lifelong learning networked system that could help it remain competitive in the global marketplace.

Given the decentralization of academic and governmental institutions, broad partnerships between industry and academia, policymakers, and engineering organizations could produce this infrastructure. Such partnerships could be effectively responsive to the rapidly and unpredictably changing environment, thus enabling the much needed social innovation (Quadrado 2013).

From education to independent learning is a pathway that by understanding and assessing current practices in lifelong learning may help to explore strategies for addressing unmet needs. A comprehensive, co-operative system of lifelong learning will require deep, long-term collaboration among key players in science and engineering.

Stimulating lifelong learning can improve the knowledge base of every country's human capacity for innovation and competition. Coordinated efforts between industry, academia, professional societies, and policymakers to develop a framework for lifelong learning should begin.

Resources

Reformative Finland: Research and innovation policy review 2015–2020
Research and Innovation Policy Council
http://www.minedu.fi/export/sites/default/OPM/Tiede/tutkimus-_ja_innovaationeuvosto/julkaisut/liitteet/Review2015_2020.pdf

Economist - Finland's economic winter
http://www.economist.com/news/business-and-finance/21689751-nordic-laggard-can-forge-ahead-reforms

Why Finland is first for education?
World Economic Forum Tokyo 2016
https://www.weforum.org/agenda/2015/05/3-reasons-why-finland-is-first-for-education/

OECD overview Finland 2016
https://www.oecd.org/eco/surveys/Overview-OECD-Finland-2016.pdf

Making the Knowledge Triangle a Reality.
Markku Markkula, Aalto University & EU Committee of the Regions Brussels,
DG EAC, 8 March 2012
http://www.cesaer.org/content/assets/docs/KT-Workshop_Markkula-Sjoer.pdf

Inglehart and Welzel, World Values Survey, 2010
https://ourworldindata.org/trust

OECD Economic Surveys – Finland - January 2016
http://www.oecd.org/finland/economic-survey-finland.htm

Finland and Its Northern Peers in the Great Recession
https://www.etla.fi/wp-content/uploads/ETLA-Raportit-Reports-49.pdf

Zygmunt Bauman: “Social media are a trap"
El Pais 25 January 2016
http://elpais.com/elpais/2016/01/19/inenglish/1453208692_424660.html

Kálmán, Anikó
Learning - in the New Lifelong and Lifewide Perspectives
Tampere: Tampere University of Applied Sciences, 2016.

Kálmán Anikó

Developments in Hungarian Lifelong Learning Policies as mean of Implementing the Knowledge Triangle

In: Pia Lappalainen, Markku Markkula (szerk.)

The Knowledge Triangle: Re-Inventing the Future. 190 p.
Helsinki: Multiprint Oy, 2013. pp. 85-100.
(The Knowledge Triangle)
Re-Inventing the Future
(ISBN:978-2-87352-006-9)

Päivi KARTTUNEN

Pedagogical development in TAMK – Finnish approach to paradigm shift in education

Background for development of universities of applied sciences in Finland

Higher education has changed a lot during the past 25 years in Finland. The universities of applied sciences (UAS) were established in the 1990s when the former college system became higher education. At the moment there are 22 universities of applied sciences and 14 universities. Universities and universities of applied sciences have their own profile and legislation as well. About 23 000 bachelor-level students and 2200 master-level students graduate from the UASs annually. It is quite normal that in universities all students will complete the master's degree with about 15 000 students getting their master's degree and 1821 getting their doctoral degree annually. In UASs it is not possible to complete doctoral studies.

The objectives for higher education are based on the educational policy and the government programme. The joint objectives of higher education for 2025 were established in 2016 by the new government. The four main objectives are:

- strong higher education units that renew competence
- faster transition to working life through high-quality education
- impact, competitiveness and wellbeing through research and innovation
- higher education community as a resource.

In Finland education is almost entirely publicly funded and at the moment about 11% of the total public expenditure goes to education (OECD average 12 %). The Finnish education level is relatively high. For example, Finland is one of the top-performing OECD countries in reading literacy, mathematics and sciences according to the OECD statistics. 85% of adults (ages 25 – 64) have completed upper secondary level education (OECD average 75%). 47% of women and 34% of men have completed tertiary education (OECD average is 35% of women and 31% of men,) (Education at a Glance 2015, OECD)

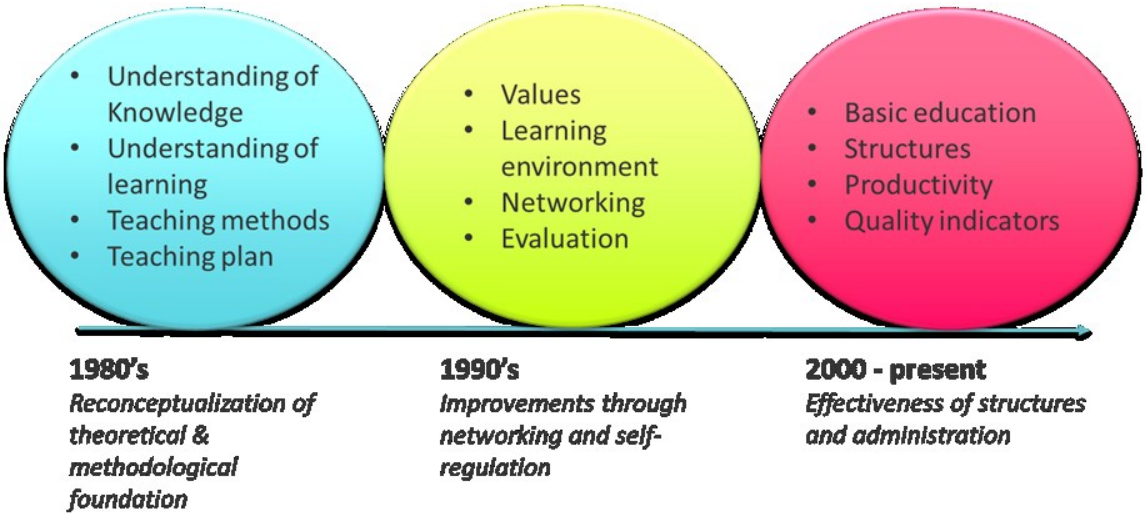


Fig 1: Changes in the Finnish school system since 1980s (According to Sahlberg 2015)

Sahlberg (2015), who has studied the Finnish school system, emphasizes three different phases in the development of education in Finland, which can also be recognized in the development of the university of applied sciences system. The UAS system was developed in the 1990s. Especially in the 1990s and 2000s the Ministry of Education supported the development by subsidizing joint development networks. During that time for example internationalization, research and development, as well as virtual courses and virtual pedagogy were developed together with the UAS sector. The Bologna process has been implemented in Finland since 2002. It means for example concentration on quality assurance, ECTS principles, and student-centred learning.

The UAS sector implemented a joint project in 2004. At first the focus was on supporting the transition to the ECTS credit system. The second part of the ECTS project concentrated on supporting the universities of applied sciences in student-centred and competence-based curriculum design (Arene 2007). The first quality audits were also launched in 2005 and the third round of quality audits are being planned together with the higher education institutions at the moment. According to Talvinen (2012) evaluation concerning the first quality audits in 2005-2012 emphasizes that quality assurance has more and more become a part of everyday practice.

Pedagogical development at Tampere University of Applied Sciences is based on the strategy, strategic management and leadership and quality management

Finnish higher education institutions are relatively autonomous concerning their operations. The education policy lines out the objectives for the government programme. The objectives are agreed in the four-year performance agreements made by the UAS and Ministry of Education and Culture. During the performance agreement process the main objectives are

based on the government's education policy and the strategy of the UAS, and the objectives are integrated together.

During the past twenty years the UAS sector has adopted a more strategic orientation to management and leadership, which also means that development of universities of applied sciences is more systematic. According to Talvinen (2012) quality management is also more and more inseparable from strategic management and general development work (Talvinen 2012).

The internal performance planning process as a tool for pedagogical development at TAMK

In Tampere University of Applied Sciences (TAMK), the objectives for the development work and activities concerning pedagogical development are established as part of the internal performance planning process in a dialogue between the executive board and the schools of TAMK. The strategy and action plan, where the focus of annual development is set, are checked by the executive board of TAMK annually. Both the plan and the emergent strategy are important. They are integrated together during the annual evaluation.

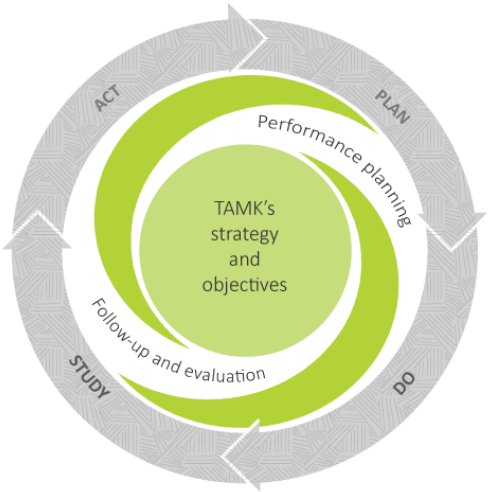


Fig 2: TAMK's strategy, performance planning process and quality management

The internal performance agreement process is a dialogue between the executive board and the schools and units of TAMK. The process starts with the evaluation done by the schools and units in TAMK. During the spring term all results and evaluation data are assessed and based on it the objects which need development are known. The self-evaluations and reviews create the basis for the following year's performance agreement objectives and the planning phase starts in June.

During the planning phase the schools and units will at first make their proposition for the following years' development objectives and then discuss these objectives with the executive

board. At the end of the discussions and the process the president of TAMK and the director of the school or unit will sign the agreement.

TAMK's strategy was formulated in 2010 and revised in 2015. TAMK has a lot of competences in the field of pedagogy because it has the School of Vocational Teacher Education, which is one of the five schools of vocational teacher education in Finland. A notable feature and profile in the strategy of TAMK is learning and creativity, as well as wellbeing and health, and business and production. According to the strategy there are five focus areas. One of these focus areas is developing professional pedagogy and education. This focus area encompasses both the teacher education and research, development and innovations in the field of vocational education. During the past five years there have been for example projects where TAMK's School of Vocational Teacher Education has educated new teachers focusing especially on digital and mobile education.

One important part of the strategy of TAMK has been digitalization. According to Haukijärvi (2016) digitalization challenges institutions to develop on every domain and aspect. It is not enough to change teaching and learning models but changes are needed in the whole organisation. Haukijärvi (2016) also did a longitudinal research concerning the process on how to apply and develop digital strategy in TAMK. He stated *" there is no strategy for digitalization, but a strategy for ensuring sustained competitive advantage in the digitally connected world".* (Haukijärvi 2016) Such a comprehensive approach supports the higher education institution in developing education and supporting teachers, students and researchers in their work.

Teacher's continuing training at TAMK

Higher education undergoes a transition which is the reason for why teachers also need continuing training and lifelong learning. Such intellectual capital is the most important for higher education. Teachers need both substance and pedagogical training. A powerful tool to develop knowledge and skills and learn a new teaching style is practical action research concerning teachers' own work (Zeihner, 2009.) The concept of knowledge triangle which Kalman (2016) has analysed is another tool we can apply in developing education and teachers' competences as well (Kalman 2016). Internal networks are very important in pedagogical development at TAMK. By sharing both good practices and not so good practices teachers and schools can develop their teaching and learning. The most important tools alongside externally funded projects are TAMK's internal networks, such as the curriculum development team and the quality development team. The curriculum development team has members from the schools of TAMK and the idea is to share good practices and to work as a steering group for curriculum development. Karttunen (2016) stated that the effectiveness and impact of the work of internal networks depends on leadership of networks, which has been taken into consideration. All the leaders and managers have to know the objectives of the network.

TAMK teachers' annual development discussions with their superiors establish their personal development objectives. The aim of the development discussion is that the personal objectives are in keeping with the objectives of TAMK. The discussions are also a good opportunity to get information on the education as well as feedback on teachers' work. Based on the development discussions the Development Unit together with the School of Vocational Teacher Education arrange training and projects to teachers at TAMK. There is for example a programme for teachers to develop their pedagogical competences in the digital environment. In 2015 the digimentors started their work in every school of TAMK. They are peers who support teachers in their work.

Curriculum development forms the basis for quality of learning and teaching

The curriculum is an important tool for development. The autonomy of the Finnish higher education means that higher education institutions are responsible for curriculum development. In TAMK the curriculum development team with representatives from the schools works as the steering group for curriculum development and quality of teaching and learning. The schools of TAMK organise their own development group which leads the process in each degree programme. The development process is based on dialogue between the schools, degree programmes, and the Development Unit of TAMK, which is led by the vice president responsible both for internal development and the School of Vocational Teacher Education. The curriculum development team in TAMK is responsible for:

- process of curriculum development
- application of the objectives for curriculum development
- development of curriculum evaluation criteria
- evaluation of the curriculum development process.

Curricula are approved by the higher education council of TAMK. Before the approval the curricula are evaluated by the curriculum development team using the curriculum criteria of TAMK. These criteria encompass for example the objectives of curriculum development. During the academic year 2015-2016 the curriculum development objectives included for example:

- Clearly competence-based curricula which are based on the needs of working life
- The student's learning is the focus
- The student's possibility to proceed flexibly and effectively according to her/his curriculum
- Knowledge utilisation across the "borders" of different fields of education
- Curricula include descriptions and procedures that allow identification and recognition of prior knowledge and skills
- Diverse learning environments which integrate RDI activities into learning and teaching.

- Digitalization and its influence on learning, learning outcomes and competences
- The international dimension is an integral part of learning and its implementation
- TAMK's strategy and its implementation to practice.

An important part of the curriculum development process and a part of the annual performance planning process is analysis of competences needed in working life.
Because the working life is changing rapidly the analysis of the competences needed in degree programmes is important. That's why every degree programme has an advisory board which meets twice a year and concentrates especially on the needs of working life. In the Tampere region there is also an education foresight network which collects both qualitative and quantitative data on the educational needs of working life. At the national level, education foresights form a part of education policy and decision-making.

Conclusions

The higher education undergoes a transition which means that we should update our conceptions concerning our operations in both teaching and learning environments of higher education. In such situations higher education leadership and management are also important tools in supporting the changes and development. When we live in the changing world and speak about higher education, we should take into consideration the features of a learning organisation. This means that we do not only react to the new information but self-assess and reflect on operations and activities constantly and use our human capacity to create new knowledge and new models for operations (Kalman 2016.)

References

Arene. 2007. The Bologna Process and Finnish Universities of Applied Sciences. Participation of Finnish universities of applied sciences in the European Higher Education Area. The final report of the project. Edita Prima Oy. Helsinki

Education at a Glance 2015: OECD Indicators – Finland: http://www.keepeek.com/Digital-Asset-Management/oecd/education/education-at-a-glance-2015/finland_eag-2015-55-en#page3

Haukijärvi, I. 2016 Strategizing Digitalization in a Finnish Higher Education Institution. Towards a thorough strategic information. Academic dissertation. Acta Unversitatis Tamperensis 2181. Tampere: Tampere University Press.

Kalman, A. 2016. Learning – in the New Lifelong and Lifewide Perspectives. Tampere University of Applied Sciences. Tampere: Eräsalon kirjapaino.

Karttunen, P. 2014. Verkostojen johtaminen sisäisen kehittämisen näkökulmasta. Marttila, L. (ed.) Johtajuuden jäljillä. Näkökulmia ammattikorkeakoulun johtamiseen. Tampereen ammattikorkeakoulun julkaisusarja. Sarja B. Raportteja 71.

Salhberg, P. 2015. Suomalaisen koulun menestystarina ja mitä muut voivat siitä oppia. Latvia: Jelgava Printing House.

Talvinen, K. 2012. Enhancing Quality Audits in Finnish Higher Education Institutions 2005–2012. Publication of the Finnish Higher Education Evaluation Council 11/2012. Tampere. Tammerprint Oy.

Zeichner, K. 2009. Educational Action Research. pp. 24-42. In: Schmuck. R. A. Practical Action Research. Second edition. Corwin Press. A Sage Company. USA.

Judit VIDÉKINÉ REMÉNYI

STEPS IN NEED OF TEACHERS' TRANSFORMATIVE PROFESSIONAL LEARNING

Outdated teaching methods blunt the potential of teachers' professional development

Introduction

Teachers are increasingly faced with ever changing conditions and expectations of education in terms of – among others – learning environments, target group, content, methods and tools. Development and changes are so radical and fast that "no matter how good pre-service training for teachers is, it cannot be expected to prepare teachers for all the challenges they will face throughout their careers."[1] Obviously, this leads to the growing importance of teachers' quality in-service training and their continuous professional learning. However, a "significant proportion of teachers think that professional development does not meet their needs: over half reported wanting more than they received during the previous 18 months."[2]

This problem concerns Hungarian teacher further training programmes, teachers' professional development as well. Surveys and common experience suggest that teachers cannot unlearn and relearn measurably, so the upgrading of their skills is questionable. It is clearly reflected by the surveys showing that they tend to use the instructional methods their teachers used to. This fact implies the slow change of teachers' beliefs, attitudes and practices. The dominance of teacher-centered presentation techniques in Hungarian schools is a growing concern for educationalists. So it is the teacher trainers' challenge to design so effective in-service training programmes that make the teachers change their practice, enable them to grow professionally. However, transmission-oriented teachers' professional development programmes cannot do the job. Teachers' professional development programmes should adopt a teaching approach that diverges significantly from the dominant transmissive teaching practice and will lead to teachers' changing practice in order to maximize student learning.

The maximization of student learning is of key importance if we wish to catch up with the developed countries and achieve a competitive education system. Our education should be able to provide young citizens with 21st century competences instead of 20th century content to meet labour market needs and boost economic growth of the country. The economic and social progress of a country requires skills and capacities as only a highly educated, skilled workforce can adapt to the advancing technologies. It points to a quality education system instead of growing the exposure to learning. More recently, a study of the common characteristics of the most successful school systems highlights the central role of teachers,

[1] The Professional Development of Teachers. https://www.oecd.org/berlin/43541636.pd
[2] See above.

asserting that "the quality of an education system cannot exceed the quality of its teachers" and that "the only way to improve outcomes is to improve instruction".[3] "The significant, positive correlations between teacher quality and student achievement, as most important within-school factors explaining performance, and between in-service training and student outcomes, are consistently borne out by research."[4]

"There are many different ways to improve a school system, and the complexity of this task and the uncertainty about outcomes is rightly reflected in the international debate about how this should best be done."[5] The method of choosing the right people and training them to become effective teachers works irrespectively of the culture as the experience of the top school systems suggest.

Teachers' professional development matters

Teachers' professional development covers different forms of formal, non-formal education and training, informal learning, and various activities (such as learning by doing, learning from colleagues, participating in projects etc.). It is obvious that not all professional development programmes, activities are equally effective. "Most professional development today is ineffective. It neither changes teacher practice nor improves student learning."[6] Teachers' effective professional development is "on-going, includes training, practice and feedback, and provides adequate time and follow-up support. Successful programmes involve teachers in learning activities that are similar to ones they will use with their students, and encourage the development of teachers' learning communities. There is growing interest in developing schools as learning organisations, and in ways for teachers to share their expertise and experience more systematically."7

However, the "design of high-quality professional development is as complex a discipline as the design of high-quality teaching. It requires the planning of programmes of connected activities with clarity about intended outcomes, and evaluation. "[8] Short and/or irrelevant professional development programmes, in-service workshops are less effective than sustained, coherent programmes which include structured, collaborative in-school activities.

[3] How the world's best-performing school systems come out on top 2007 http://www.smhc-cpre.org/wp-content/uploads/2008/07/how-the-worlds-best-performing-school-systems-come-out-on-top-sept-072.pdf
[4] Caena, F. (2011): Literature review - Quality in teachers continuing professional development
[5] How the world's best-performing school systems come out on top 2007 http://www.smhc-cpre.org/wp-content/uploads/2008/07/how-the-worlds-best-performing-school-systems-come-out-on-top-sept-072.pdf

6 Gulamhussein, A. (2013): Teaching the Teachers
http://www.centerforpubliceducation.org/Main-Menu/Staffingstudents/Teaching-the-Teachers-Effective-Professional-Development-in-an-Era-of-High-Stakes-Accountability/Teaching-the-Teachers-Full-Report.pdf
[7] The Professional Development of Teachers *In*: Creating Effective Teaching and Learning Environments (2009) https://www.oecd.org/berlin/43541636.pdf
[8] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/537030/160712_-_PD_standard.pdf

These should involve different activities designed to sustain and embed practice, including individual and collaborative teacher activity; well-designed formative assessment and evaluation. The activities should have explicit relevance to participants.[9]

Not much is known about how teachers learn, how teacher learning compares with student learning. However, it is obvious that not all teacher development programmes are conducive to the narrowing of teachers' performance gaps, to promoting their professional development and student performance. "Most teachers only experience traditional, workshop-based professional development, even though research shows it is ineffective. Over 90 percent of teachers participate in workshop-style training sessions during a school year.[10] Teachers should be exposed to other forms of professional development in order to boost the efficiency of these programmes. "Despite its prevalence, the workshop model's track record for changing teachers' practice and student achievement is abysmal. Short, one-shot workshops often don't change teacher practice and have no effect on student achievement."[11]

"The reason traditional professional development is ineffective is that it doesn't support teachers during the stage of learning with the steepest learning curve: implementation**."**[12] This implies that the largest challenge for teacher trainers is to design professional development programmes that not only make the implementation of new approaches, practices possible, best in the context of the teacher's subject area, but trigger transformation.

Why Transformative Learning[13]?

The answer to the question why it is essential to upgrade our in-service teacher training programmes is trivial: It is impossible to solve our problems with the same thinking we used when we created them. Traditional presentation techniques, structuring practice – most teacher further training programmes have been using – will not result in fundamental changes, as research shows that teachers change only after they see success with students. It is fundamental change in perspective or frame of reference that is essential for transformative learning.

[9] Standard for teachers' professional development. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/537031/160712_-_PD_Expert_Group_Guidance.pdf
[10] Darling-Hammond, L. et al. (2009) Professional Learning in the Learning Profession
[11] Strauss, V. (2014) Why most professional development for teachers is useless https://www.washingtonpost.com/news/answer-sheet/wp/2014/03/01/why-most-professional-development-for-teachers-is-useless/?utm_term=.6115e73b6752
[12] See above
[13] Transformative or Transformational Learning, based on Mezirow, J.'s Transformative Dimensions of Adult Learning (19901) and Learning is Transformation (2000)

Transformative learning is a theory relating to adult learning and its practice is based on learning experiences that cause a shift in an individual's perspective. In general, experience, critical reflection, and rational discourse can contribute to transformational learning.

The process of transformative learning begins with a sense that something needs doing about poor student learning outcomes and lack of student motivation. Once a new technique has been introduced or a new strategy has been deployed and its efficiency in terms of academic performance and/or motivation is recognized, the experience needs to be reflected upon.

In order transformative learning to occur it is fundamental to create such conditions that "have the potential to transform the learner on many different levels (cognitive, emotional, social, intuitive, creative, spiritual, and other)"[14]. This kind of teaching should lead to a greater understanding of self as a teacher and learner by discovering and developing their unique talents and capabilities to the fullest extent possible. This way the programme can lead to self-actualization and is individualized.[15]

A model of teachers' transformative learning

The transformational approaches should not and cannot dominate the professional development programme offered by universities as most university classrooms are lecture halls which do not tend to support interactive pedagogy and active learning. Auditoriums are much more in favour of lecture-based courses with content-focused knowledge gap correction. However, transformative learning can be applied in formalized classroom environments of in-service teacher training programmes as well to maximize learning through a variety of techniques if these techniques can make teachers examine and reconsider their beliefs and attitudes.

Mezirow describes the ten phases of Transformative Learning, out of which some might be more emphasized, others marginalized. Teacher trainers need to design learning activities that encourage engagement in a transformative learning process composed of the following five essential steps:

1. An acknowledgement of the dilemma
2. Critiquing their own assumptions
3. Critically reviewing new ideas or perspectives
4. Making a decision
5. Taking action

14 Johnson, A. P. (2015): Three Views of Teaching: Transmission, Transaction, and Transformation. https://www.linkedin.com/pulse/three-views-teaching-transmission-transaction-andrew-johnson

15 See above

"As long as incoming information easily fits within a person's meaning perspective, transformative learning does not occur."[16] In order transformative learning to occur a strong challenge is needed. Transforming existing ways of teaching requires teachers to be convinced that there is a need for transformation. They first need to examine their old beliefs in the light of new knowledge and new experience, which involves unlearning as well.[17]

The necessary introductory phase to transformation – *the acknowledgement of a dilemma* facing most teachers – does not need much mining activity as Hungarian teachers do not need to read the latest PISA reports to be deeply dissatisfied with their students' academic performance and motivation. Case studies posing a disorienting dilemma can be also used in this phase.

Hungarian teachers again and again blame external factors for their "unsuccessfulness" such as lack of resources, lack of time, lack of students' enthusiasm, underskilled students, bad school books, students' study overload, teachers' workload etc. As long as they fail to recognize their own responsibility, it is extremely difficult to make them change. This tendency can be due to poor self-assessment and self-reflection skills. These skills are essential to professional development and an important part of learning.

Critiquing their own assumptions is the second essential phase and based on "self-reflection upon the previously unexamined assumptions that generated the problem in the first place".[18] This can be implemented in university classrooms as well by means of well-prepared activities that lead to teachers' examining beliefs, feelings, behaviours, analyzing their former experiences, exploring relationships or new roles. These activities include critical questioning, discussion of examples and counterexamples, alternative scenarios, or differing perspectives, reading conflicting case studies and should be followed by critical reflection, as it is central to learning from experience and getting rid of teacher-centered perspectives. The discussions – also a fundamental component of transformation - should lead to the teachers' recognition of the limitations of their current beliefs and practice. Action research can also lead to change in understandings and practice.[19]

[16] Filer, J. - Barnes, C. D. – Cooper, M.: The Role of Faculty in Dispositional Development of Teacher Candidates.
https://books.google.hu/books?id=ossyfypEuPAC&pg=PA161&lpg=PA161&dq=http://www.lifecircles-inc.com/Learningtheories/humanist/mezirow.html

[17] Gravett, S. (2004): Action research and transformative learning in teaching development, Educational Action Research, 12:2, 259-272, DOI:10.1080/09650790400200248. http://dx.doi.org/10.1080/09650790400200248

18 Gogia, L. (2012): Transformative learning theory: How Mezirow created a living seminal work through dialogue
https://www.academia.edu/8018605/Transformative_learning_theory_How_Mezirow_created_a_living_seminal_work_through_dialogue?auto=download

[19] Peters, J.: Teachers Engaging in Action Research: challenging some assumptions
http://www.tandfonline.com/doi/pdf/10.1080/09650790400200267

New strategies, concepts, or paradigms can be introduced; research papers, readings or best practices can be presented to encourage c*ritical reviewing of new ideas or perspectives.* Role-playing, simulation or debates can also be useful for focusing on a problem and approach it with multiple perspectives or problem-solving approaches. When encouraging a "move from thought to action, students need opportunities to apply new knowledge"[20] and try on new perspectives. It is important that students' activities will most probably result in success.

In this phase it is of vital importance that students can contradict and discuss their assumptions and then reflect on their "for and against" experiences, as this phase is followed by decision making. Teachers need to actively engage in making sense of a new practice in order to innovate new teaching strategies. Consequently, this is the phase when teachers need to "experiment with" new strategies and methods to be able to make meaningful decisions which will impact their future practice. Innovative teaching methods imply new technology (and new learning environments) to transform the students' engagement level and create an enhanced learning experience.

Active engagement in innovative practice can only be implemented by the teachers themselves in their own contexts and followed by critical reflection. It can be a collaborative activity as well. However, this might be the most "critical" component of transformative learning as without the teachers' complete commitment and genuine engagement, transformation will not occur. Teacher trainers must design the activities to be implemented by the teachers and the evaluation criteria of fieldwork carefully to avoid the danger of teachers' choosing experiences that comfortably fit their frame of reference. This kind of sham activities can deceive both the teacher and the teacher trainer as well, when teachers insist on their prejudices, stereotypes and are unwilling to unlearn their unquestioned and unexamined assumptions. In other words, it cannot be taken for granted that transformation is welcome by all teachers. Empirical studies suggest that not all students feel comfortable with a goal of transformative learning and "not all students are predisposed to engage in transformative learning".[21]

The most serious barriers of teachers' transformative learning are to be found in this phase. Teacher trainers do not have control over the teachers' external learning environment, that is, their school environment, cannot impact the teachers' consideration of alternatives and cannot ensure teachers' genuine self-reflection. Without the teachers' genuine willingness

[20] Peters, J.: Teachers Engaging in Action Research: challenging some assumptions http://www.tandfonline.com/doi/pdf/10.1080/09650790400200267

[21] Santalucia, S. and Johnson, C. R. : Transformative Learning. Facilitating Growth and Change Through Fieldwork. http://www.duq.edu/assets/Documents/occupational-therapy/Fieldwork-Education/Suggested%20Readings/Transformative_Learning.pdf

and active engagement, teachers' transformative professional development programme is only a 'pit stop' in their continuous professional development, and they cannot meet the specific challenges of changing their classroom practice.

There is no 'one size fits all' recipe for establishing learning environments conducive to transformative learning. Research suggests that the potential of modelling should be exploited, that is, teacher trainers should not forget that the "revolutionary move away from replicating traditional classroom-based teaching practices"[22] should start in university auditoriums.

Supposing that the previous phase - c*ritical reviewing of new ideas or perspectives through innovative activities* - has been successful, teachers need to *make a decision* and *take action*. Although many a teacher considers innovative teaching important, it must be rewarded in measures related to salaries, promotion, and workload. Research has shown that in addition to teaching quality school leadership is the most important factor in raising student achievement.[23]

While making an action can only be encouraged and hoped by teacher trainers, action taking cannot be monitored at all, as it relates to the teachers' future practice. Hedberg[24] lists 11 obstacles to integrating ICT into teaching and learning activities referring to Vrasidas, C. and Glass [25]. These include the following ones:

"Teachers' resistance to changing their traditional teaching approaches"
"Lack of ongoing support"
"Lack of released time and incentives for teacher innovators"
"Incompatibility of traditional teaching with the constructivist framework fostered by ICT"
"Need for teachers to unlearn traditional teaching beliefs and practices"
"Lack of training in how to integrate ICT into learning within teacher preparation programs".

It can be supposed that teachers who have made a decision and intend to take action will face the very same barriers. From this phase on it is the school leaders' responsibility whether fundamental changes will occur in our schools or not as without individual transformation there is no school transformation.

[22] http://theconversation.com/outdated-teaching-methods-will-blunt-technologys-power-40503

[23] http://learningforward.org/docs/pdf/why_pd_matters_web.pdf?sfvrsn=0

[24] Hedberg, J. G. (2006) : Searching for Disruptive Pedagogies: Matching Pedagogies to the Technologies. http://www.curriculum.edu.au/verve/_resources/hedberg_paper.pdf

25 Vrasidas, C. and Glass, G. V. (eds) (2005): Preparing teachers to teach with technology, Information Age publishing, Greenwich, CT.

Conclusion

Teachers should be presented with new (innovative and proactive) teaching methodology via interactive pedagogy encouraging active-learning in order that they unlearn their direct information transmission beliefs about teaching and learning. Once teachers do not hold this view anymore, transformation of their practice can start. Teacher trainers should encourage discourse, to change thinking and take transformative action. When professional development programmes impact teachers' practice in a powerful and transformative way, significant personal and professional growth will be catalysed. Minor changes in teachers' beliefs and practices will not lead to major changes in students learning outcomes and will not change Hungarian schools. It is of utmost importance that more emphasis is put on teachers' professional development and schools act as learning organizations.

Bibliography:

Hedberg, J. G. (2006) : Searching for Disruptive Pedagogies: Matching Pedagogies to the Technologies. http://www.curriculum.edu.au/verve/_resources/hedberg_paper.pdf

Johnson, A.P. (2015): Three Views of Teaching: Transmission, Transaction and Transformation.
https://www.linkedin.com/pulse/three-views-teaching-transmission-transaction-andrew-johnson

Major Éva: A tanárok folyamatos szakmai fejlődése, Európában az EU és az OECD anyagainak tükrében (Teachers' professional development in Europe, from the viewpoint of the EU and the OECD reports)
http://www.oktatas.hu/pub_bin/dload/unios_projektek/tamop315/Major_Eva_tanulmany.pdf

Peters, J.: Teachers Engaging in Action Research: challenging some assumptions
http://www.tandfonline.com/doi/pdf/10.1080/09650790400200267

Simmons, E. H. (2012): Rewarding Teaching Innovation
https://www.insidehighered.com/advice/2012/04/18/essay-how-colleges-can-encourage-professors-innovate-teaching

The Human Capital Report 2015
http://www3.weforum.org/docs/WEF_Human_Capital_Report_2015.pdf

Webster-Smith, A. – Albritton, S. – Kohler-Evans, P.: MEANINGFUL CONVERSATIONS Coaching to Transform the Heart, Head and Hands of Teaching and Learning http://www.lifecircles-inc.com/Learningtheories/humanist/mezirow.html

http://harvardmagazine.com/2012/03/twilight-of-the-lecture

Sami SUHONEN

Flipped, Online and Blended Learning:
Digitalization in TAMK

1. Different levels of digitalization in education

Digitalization is present in many levels in education. Starting from the top level, all administrative systems in universities are of course digital. What comes to different courses, many of them use some kind of learning management system (LMS) like Moodle. LMS offers many ways for teachers and administration to investigate students' online behaviour and success with learning analytics (LA) [1, 2].

Digitalization in education is present in many ongoing research projects as well. The projects can for example aim to find meaningful ways to exploit digitalisation to enhance learning [3] or increase teaching accessibility [4]. This can mean the usage of smart phones and tablets to take the learning outside classroom – to the nature, historical sites, museums etc. With smart phones' powerful processors and set of different sensors it is possible to let the students make measurements by themselves in very many different locations for physics courses' needs, for example [5].

The smallest level of digitalization in education is different (one-task) tools teacher can use to enhance learning. These tools can be mobile apps or web sites.

2. Digimentors

In many cases digital tools and methods in education are tested and taken into usage by enthusiastic individual teachers, whereas most of the other teachers haven't even heard about those and lack the courage, time or interest to test them. In many cases they don't have a clear idea how digital tools would be beneficial in teaching. To overcome this bottleneck, Tampere University of Applied Sciences (TAMK) has established a "digimentor"-network in 2015. Teachers sometimes need a little push towards the new and the main idea in the digimentor network is that a colleague in the same field is the best to inform a teacher about the benefits and usage of a certain digital tool. In TAMK each university's field of education (called schools) has one or two digimentors. This mean that one digimentor has typically 30-50 colleagues to guide and altogether there are 11 digimentoris in TAMK. Also the normal helpdesk and ICT services are available to faculty members. Digimentors share information regularly among each other and therefore they can together cover wider range

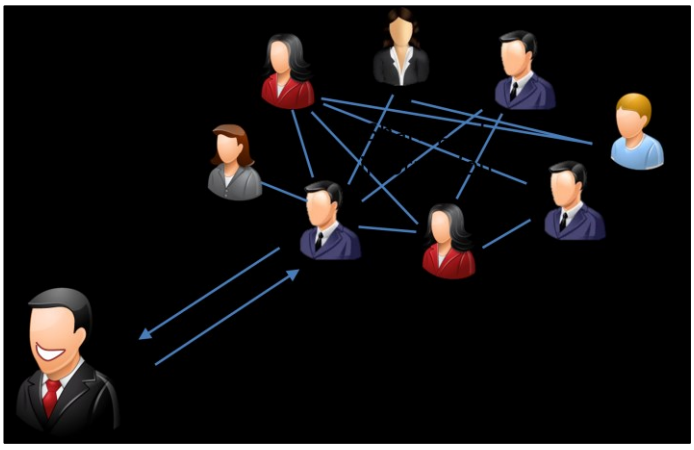


Figure 1: Digimentor network.

of tools and methods than single enthusiastic teachers alone. The digimentors help colleagues typically in two ways: either arranging workshops for a group of teachers in certain topics depending on their needs, or giving on-site help on a short notice for individual teachers on specific topics like “How to create a channel in YouTube”. At TAMK, a part of working time is allocated for this helping function for digimentors, but majority of their workload comes still from their normal duties, in most cases classroom and online teaching.

3. Tools and Tips

Jane Hart's website “Centre for Learning and Performance Technologies” [6] has presented the ranking list for different digital tools in education since 2007. The ranking is based on user survey among teachers and educators. This year’s survey got 1238 answers from 64 countries and the list is shown as a screen shot in Figure 2. In actual website, it is possible to get some hints and tips for usage by clicking the names of the tools. Many of the tools are widespread


1. YouTube (1)
2. Google Docs/Drive (5)
3. PowerPoint (4)
4. Google Search (2)
5. Twitter (3)
6. Dropbox (10)
7. Prezi (14)
8. Kahoot (15)
9. Powtoon (22)
10. Word (16)
11. Moodle (27)
12. Screencast-O-Matic (31)
13. WordPress (9)
14. Google Chrome (33)
15. Facebook (6)
16. Google Forms (34)
17. Skype (7)
18. Padlet 35
19. Google Apps for Education (GAFE) (40)
20. Camtasia (24)
21. Slideshare 18
22. OneNote (19)
23. Pinterest 29
24. Gmail (32)
25. TED Talks/Ed (21)
26. Audacity (28)
27. Evernote (17)
28. Office Mix (42)
29. Trello (43)
30. iSpring (44)
31. Google Maps (49)
32. Khan Academy (52)
33. Quizlet (53)
34. Wikipedia (11)
35. Snagit (26)
36. Socrative 55
37. iPad & Apps 58
38. Sway (59)
39. Google Hangouts (41)
40. Google Plus (45)
41. Blogger (56)
42. Adobe Connect (62)
43. Whats App 13
44. Articulate 25
45. Excel 46
46. Diigo 54
47. Google Scholar 60
48. Canvas 67
49. Poll Everywhere 68
50. SurveyMonkey 70
51. Movie Maker (77)
52. Google Classroom (80)
53. Adobe Captivate (39)
54. edPuzzle (81)
55. Easygenerator (51)
56. Udutu (61)
57. Scoopit (72)
58. Edmodo (86)
59. Weebly (88)
60. ThingLink (90)
61. Clarify (92)
62. Explain Everything (95)
63. Google Sites (96)
64. Blackboard (99)
65. Mahara 100
66. Webex 36
67. Desire2Learn (D2) (108)
68. Jing (109)
69. SharePoint (38)
70. Nearpod (110)
71. Outlook (50)
72. Wix (112)
73. Canva (57)
74. Keynote (64)
75. Firefox (65)
76. iMovie (69)
77. Piktochart (85)
78. GoAnimate (89)
79. TodaysMeet (94)
80. OneDrive (103)
81. eXe (114)
82. Animoto (115)
83. Blackboard Collaborate (123)
84. Zoom (65)
85. Turnitin (126)
86. Grammarly (128)
87. Pixton (130)
88. Sakai (131)
89. BigBlueButton (146)
90. Schoology (150)
91. Notability (152)
92. Kaltura (155)
93. Moovly (156)
94. Explaindio (157)
95. Zeetings (158)
96. ILIAS (159)
97. Remind (160)
98. WeVideo (161)
99. Showbie (162)
100. PlayPosit (165)

Figure 2: Top 100 Tools for Education (2016) [6].

and need no introduction, whereas some are rather unknown. In the next chapters, a few of the not so well-known tools are viewed a bit deeper.

3.1 PlayPosit

PlayPosit is an online learning environment to create interaction to videos. These interactive videos are called “bulbs” and they can be shared among teachers and can be assigned to student groups. Teachers begin with any online video (Khan Academy, YouTube, etc.) and

build multiple-choice or open questions on top of it. The video stops automatically for presenting the questions at the chosen time instants. Teachers access the answers via web interface. The idea is presented in Figure 3.

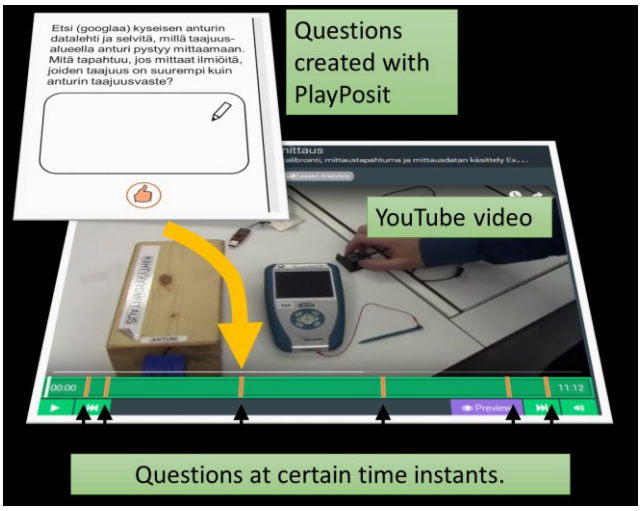


Figure 3: The principle of PlayPosit.

3.2 PollEverywhere

As the name suggests PollEverywhere (www.polleverywhere.com) is used to pose polls and surveys to students. There is an option to make answer anonymous. Sometimes students are shy to present their ideas. Part of the student group may also want to withdraw and stay passive. With anonymous polls and surveys it is possible to give voice to the silent and shy ones. Moreover, it activates the passive students to participate and to contribute. The questions are either multiple choice, open ended or in picture format. The latter allows user to define clickable areas on the picture and the students then answer by choosing and clicking different areas. Other way is to let students freely click different locations on the picture. What comes to pedagogy, PollEverywhere can for example be used to quickly gather students' prior knowledge in the beginning of lectures. With suitable questions the possible misconceptions of the presented topic can be surveyed and then corrected right away. PollEverywhere with

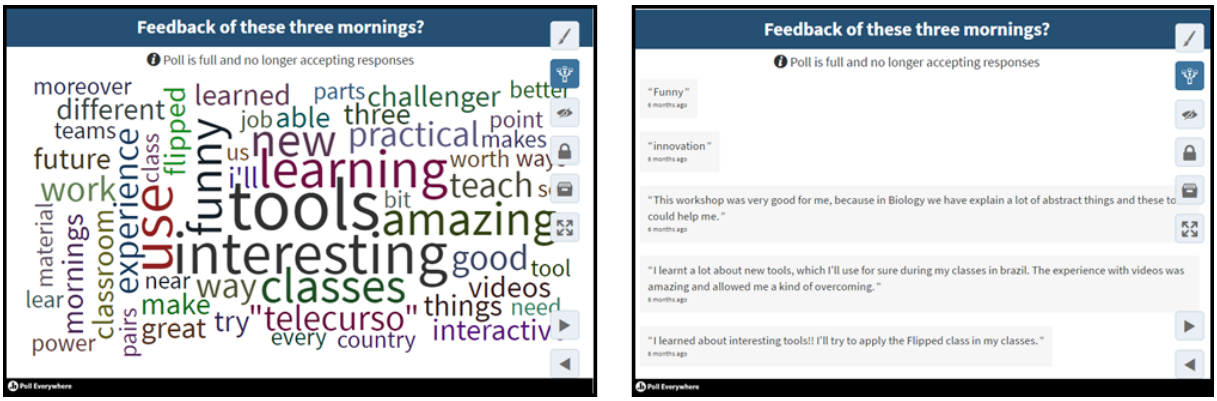


Figure 4: PollEverywhere answers seen as word cloud (left) and text wall (right).

open ended text questions can be used as a text wall. To hide individual answers but still present the "average answer" of the group, the display can be changed from a line view to word cloud view in which the word font size depends on the number of times it had been mentioned.

3.3 Kahoot

Kahoot (https://getkahoot.com/) is another polling website/software, but it differs from PollEverywhere by having a competitive nature. In Kahtoot it is possible to present four different answer choices. In the competitive mode the speed of giving right answer is converted to points a student gets. After the polling the ranking can be shown (using nicknames) and the student with the highest point count can be prized.

3.4 YouTube and videos

Almost everyone is familiar with YouTube from the watcher's side. But fewer teachers and instructors have own account and channels in YouTube despite its benefits as a tool to present lecture recordings and short educational video clips. Educational videos have enabled new teaching methods like flipped classroom, just in time teaching and peer Instruction [7 - 9] and videos can be used as tutorials or instructions for laboratory work [10 - 12]. The main idea is to use videos for one directional sharing of information and free valuable face-to-face time for active learning, which is demonstrated to increase learning outcomes [13]. Short video clips and activating learning methods can be combined to enhance learning, both in face-to-face and online implementations [5, 14].

At TAMK Physics, all educational videos are produced by the physics teachers. Why not just link existing online videos to the course material? One reason is the lack of Finnish university level educational physics videos. There was no other option. In three years, the video count has increase to 1000 and they have been watched over 110 000 times for 350 000 minutes. The number of freshmen in engineering studies at TAMK is approximately 400-500 annually

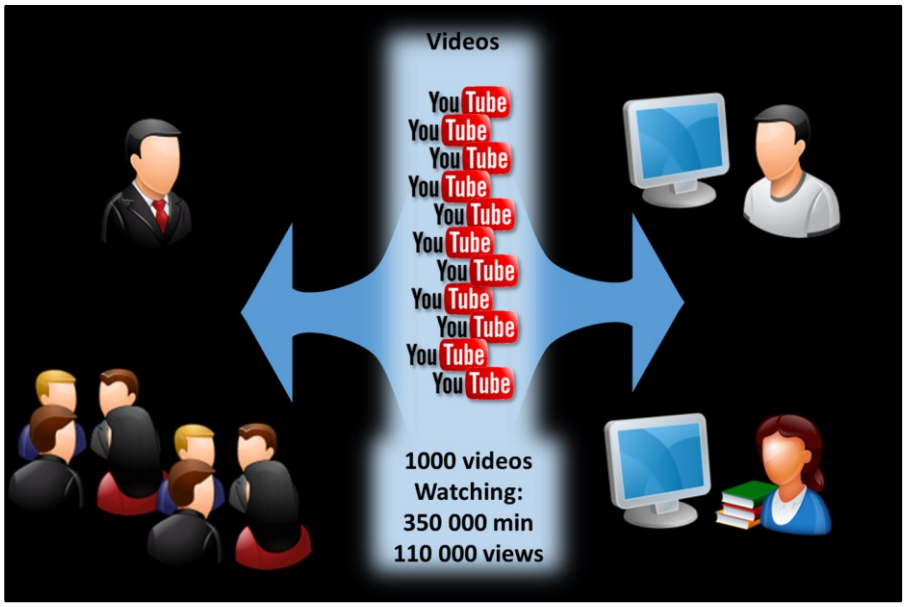


Figure 5: Short video clips are produced at TAMK and used for blended and online learning.

and physics is taught during the first two years. In relation to this number of students, the videos seem to be well in use.

Teachers are usually rather busy and there is no extra time to spend on video production. Therefore, very simple methods were chosen at TAMK Physics and any teacher can start using

similar methods rather easily. Depending on the purpose and content of the video, as well as teachers' preferences, the following methods are used:

- iPad + pen + paper (Figure 6 A)
    - This is a very simple and straight-forward way to produce for example calculus-based solutions to homework exercises. IPad is placed to a holder above empty paper. IPad's camera and microphone are then used to record the video as the teacher carries out calculations etc. on the paper explaining it simultaneously aloud. These are fast to do, and pen and paper are an easy interface for anyone to learn. The drawbacks are that the graphics quality depends on the artistic skills of the teacher and once a mistake is made, everything has to be started over.

- iPad + ExplainEverything (Figure 6 B)
    - ExplainEverything is an app for iPad which can be used to simultaneously record the teacher's voice and his/her drawings and writings on iPad's screen with a stylus pen. As such, this is a digital counterpart for the pen&paper method. When needed due to mistakes, the recording can be paused anytime, rewound to a certain time-instant and re-recorded

- PowerPoint videos (Figure 6 C & D)
    - Presumably all teachers have PowerPoints. It is possible and easy to record timing to a PowerPoint presentation and then convert to video format. The video can include teacher's narration and highlights with "laser pointer" as any live presentation does. Moreover, in PowerPoint it is easy to build simple animations or include a video clip or audio file in the slide.

- Video camera and cameraman (Figure 6 E)
    - For example, to explain the proper handling of laboratory equipment or to present a demonstration of a law of physics, video camera can be used similarly as in recording holiday videos. In many cases two teachers need to cooperate: one is performing the actual measurement or set-up of laboratory equipment and simultaneously explaining what is being done. The other one is a cameraman who is responsible for aiming and zooming the camera.

- Screen capture (Figure 6 F)
    - Screen capturing is best suitable to present how to use a certain computer program like CAD or Excel. The recording can be taken from the screen alone or alternatively a talking head can be included by recording it simultaneously using a web cam. Naturally, both computer audio and narration are recorded.

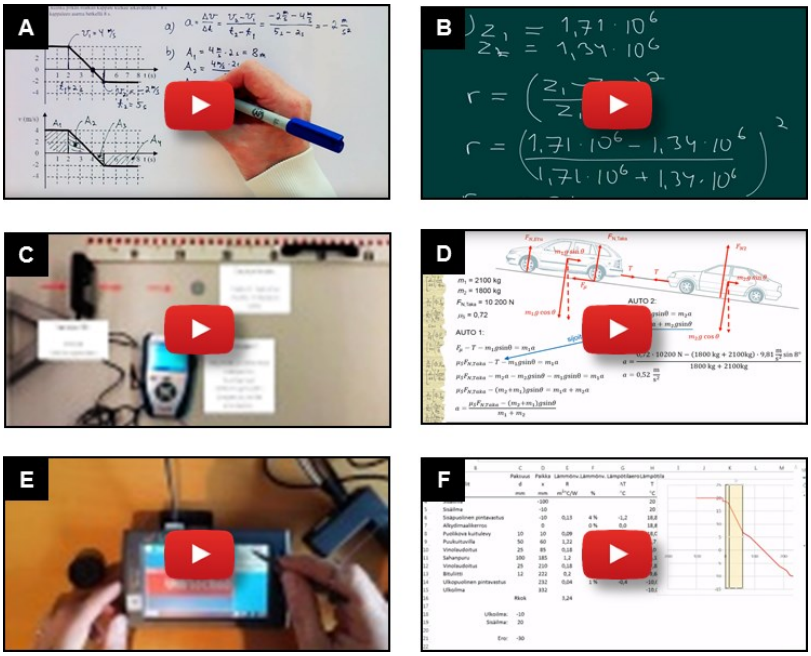


Figure 6: Different ways to produce short educational video clips.

4. Learning analytics

Learning analytics means the measurement, collection, analysis, reporting and visualizing of data about learners. Many learning managements systems (LMS) offer built-in tools to record, view and analyse student's online activity. Typically, opening of different learning activities, posting messages to forums etc. are recorded to log files. The times, durations and sequences of these activities can be recorded and analysed. Based on the log data it is possible to tailor students study paths, suggest certain supportive study materials or use it as an alarming system for interventions to reduce drop-out rate from courses.

At TAMK, the LMS in use is Moodle. It offers some build-in learning analytics tools, but for deeper analysis the event log data can be transferred to Excel, in which it can be categorized according to various parameters. In Moodle, the log shows all actions taken in the highest level of hierarchy in Moodle's structure, whereas deeper structures are not recorded. For example, opening a folder containing many links to videos is logged only as one event. Opening the individual videos is not logged. Therefore, all activities which need to be analysed, have to be on the highest level of hierarchy. All actions and their timestamps are recorded individually for each student. This way it was possible to analyse at what time a student has taken a certain action: opened a homework assignment, watched a solution video or handed out his/her own solutions to problems, and what is the time difference between actions. It should be noted, however, that learning analytics can't reach the effectiveness and intensity of studying, nor can it record such learning activities as reading a book.

A few examples of different ways to use learning analytic data is shown below. Figure 7 shows the correlation between student's video watching activity versus course's final grade [1]. Clearly, the percentage of videos watched tells about studying, since it has a correlation with final grade up to mark 4. Interestingly, the students who got the highest mark (5) didn't watch videos as much as other passed students (grades 1-4). One possible explanation is that the

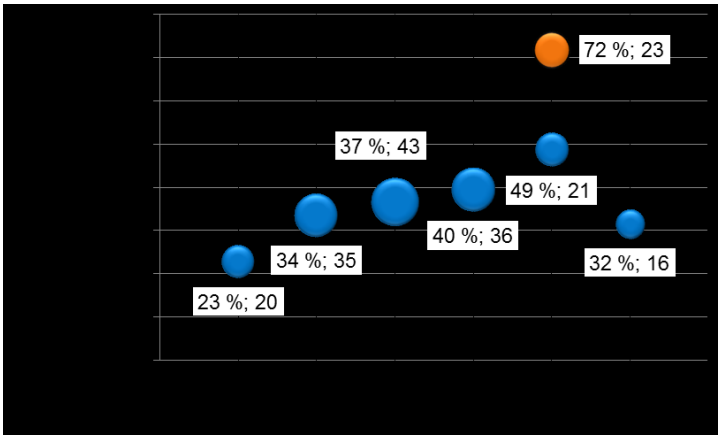


Figure 7: The correlation between video watchinh and final grade [1].

good ones know that they know – therefore they don't need to watch the videos so much to get the confirmation for their knowledge.

In Figure 8 students' daily online learning activity is presented as a function of time of day for two identical online course implementations. Based on the graph, it can be noted that most of the studying takes place after normal working hours. If a teacher genuinely wants to help his/her students this result recommends that the teacher should be online in the evenings. At TAMK, some of the teachers have organized online "office hours" at 20-21 o'clock once a week to be able to serve the students and answer their questions at suitable times. Nevertheless, willingness to do so depends very much on the teacher.

In addition to LMS log data, also Google Analytics can be used to survey students' online activity. The amount of views and watching times are easily accessible, together with a large variety of other options (time, traffic sources, percentages watched, location, device, etc.).

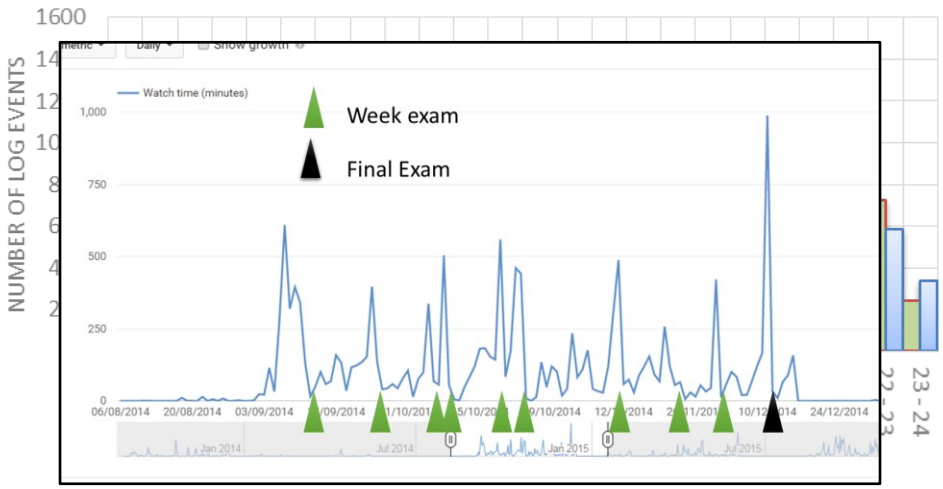


Figure 9: The temporal distribution of number of video openings from Google Analytics.

Figure 9 presents Google analytics data of a physics course. It clearly shows the highest activities just before week exams and final exam. Traditionally, learning outcomes are tested at the end of the course using final examination. When using this type of summative assessment, the studying activity tends to be highest just before the final examination. By changing to continuous assessment or to assignments with deadlines every week, it is possible to encourage the students to spread their studying more evenly throughout the course.

5. References

[1] Tiili, J., Suhonen, S. (2014). Analysis of Analytics - Videoclip Watching Activity in Introductory Physics. Proceedings of SEFI 42nd Annual Conference, Birmingham, UK

[2] Suhonen, S. (2016) Learning Analytics View to Students' Homework Activity in Engineering Physics. INTED2016 Proceedings, pp. 3998-4005.

[3] S. Suhonen, J. Tiili (2014) Simple Measurement Assignments as Activators in Elementary Engineering Physics, INTED2014 Proceedings, pp. 4057-4066.

[4] Suhonen, S. (2016) Students' experiences of different types of (distance) learning, Proceedings of The Online, Open and Flexible Higher Education Conference, Rome, Italy

[5] Suhonen, S., Tiili, J. (2014) Combining good practices in fully online learning environment – introductory physics course, Proceedings of SEFI 42nd Annual Conference, Birmingham, UK

[6] Jane Hart (October 2016), Top 100 Tools for Education, Retrieved from http://c4lpt.co.uk/top100tools/top100-edu/

[7] Lasry, N., Dugdale, M. Charles, E. (2014) Just in time to flip your classroom. The Physics Teacher, Vol. 52, pp. 34-37.

[8] Crouch, C. H., Mazur, E. (2001) Peer Instruction: Ten years of experience and results, American Journal of Physics, Vol. 69, No 9, pp. 970-977.

[9] Schmidt, B (2011) Teaching engineering dynamics by use of peer instruction supported by an audience response system, European Journal of Engineering Education,Vol. 36, No 5, pp. 413 - 423.

[10] Callens, R. Vandepitte, D. Sloten, J. (2011). Tutorial video clips in a basic engineering mechanics course, Proc. of the Conference PTEE 2011, Mannheim, Germany.

[11] Suhonen, S., Tiili, J. (2016) Enhancing physics laboratory work with online video instruction, Proceedings of SEFI 44th Annual Conference, Tampere, Finland.

[12] Lewis, R.A. (1995) Video introductions to laboratory: Students positive, grades unchanged, American Journal of Physics, Vol. 8, No 5, pp. 468-470.

[13] Deslauriers, L., Schelew, E., Wieman, C. (2011), Improved Learning in a Large-Enrollment Physics Class, Science, Vol 332, pp. 862-864.

[14] Tiili, J., Suhonen S. (2013) Combining Good Practices : Method to study Introductory Physics in Engineering Education, Proceedings of the SEFI annual conference 2013, Leuven, Belgium.

Zsolt CSUTAK

The Finnish way

'Where everyone thinks the same,
no one is really thinking'
old wisdom

When talking about Finland in general most people tend to recall particularly three things: the (ex)mobile-phone giant **Nokia, Santa Claus** (but only for Europeans), and ever since the new millennia, when the most surprising PISA-results emerged, **the miraculous educational performance of the Finnish students and teachers**'. 'There is nothing new under the Sun!' we haven't invented anything new in education, we just implement what other great nations had hammered out and then neglected to put into practice'[1] the mostly humble and reserved Finns would say whenever the educational pundits and policy-makers from all corners of the world rush there and pry into the schools of this famous Nordic country, the host of a world famous educational miracle of the 21st century.

What makes the Finnish educational system so unique, outstanding and particularly efficient? Or is it really so? Could we just copy- and paste, and adopt it in Hungary or in the USA, for that matter? Is it really true that Finns read the most, learn the least but can still use the largest set of skills and competences from among other nations in our post-modern digital world? Well, these are the kinds of recurring challenges obviously eagerly waiting for quick, positive and prompt responses to which the Finns tend to say something blury and murky or just uneasily shrug not possessing the expected witty answers. If we wish to get satisfactory replies, unfortunately we have to take a much deeper look into the Finnish way of life and habits of the mind and even their modern historical and social-cultural background deeply rooted in the harsh Nordic environment.

To answer the inspiring great questions above, we can rely on several great studies on Finland both by Finnish and foreign analysts, scholars like Pasi Sahlberg, Maria Kouta or the witty presenter and connoisseur of the Nordic people's psyche Michael Booth, and not so much on the personal findings, experiences and research of the author of the present short study. So, let me guide you through this interesting inquiry on the much-cited Finnish educational system attempting to find a bit broader and more satisfactory answers to our questions tending to deal with the **historical-political, psychological and educational policy** aspects, background factors of the *suomalainen tapa* or the *miraculous Finnish way,* within the constraints of this paper in three main chapters.

[1] see Sahlberg (2015) Kindle version loc.450-500 and Kouta (2012)

1.The shadow and glory of the past

'He who controls the past controls the future.
He who controls the present controls the past.'
George Orwell

No doubt history has pretty much to do with our present status and conditions in any matter in any country, definitely not just in the rather gloomy dystopian context of Orwell presented in the motto. Finland is a relatively young, small and humbly insignificant country in terms of her historical importance and independent sovereign statehood – next year the Finns will be celebrating the centennial anniversary of their fragile independence guaranteed by the two eternal rival giant neighbours, Sweden and Russia. Being a Finn in the remote Nordic wilderness meant almost daily struggle for survival both against nature and his landlord masters sent by either the kings of mighty Sweden for more than 600 years or lately the tsars of imperial Russia for about a century. This double frontline of the daily grind resulted in developing and cherishing great and useful skills and competences, which are so to say genetically coded in the less than six million inhabitants living on a vast and harsh granite terrain of land, the size of France. Finns managed to adopt and learn new things quickly and silently and also to preserve their identity, language and society based on hard work, individual duties and tough decisions as well as on the constant cooperation of the mostly rural population. Nevertheless, the Finns quickly realised that they are basically a small nation standing alone in the storm, basically ever since 1809 when at the diet of Porvoo, Sweden agreed to hand over her grand principality of Finland to tsar Alexander I. of Russia. Then in the ensuing nationalistic new Finnish ***Fennoman*** movement the Finns realised that they have to find their own way and life and they must stand up defiantly for their rights and existence against their mighty neighbours thus proclaiming that 'Swedes we are no more, Russians we cannot become, therefore Finns we must be[2]!' As history has manifested, this national idea of the 'small but beautiful' and tough Finland has proved to be quite prevailing ever since the 19th century.

The leaders of the Finnish community were keen to maintain a reserved, modest yet alert policy and covert diplomacy, carefully watching the sensitive reactions of their rulers from Stockholm or Moscow, yet ready to take action when it was due as the marshal of Finland, C.G.E. Mannerheim (a Swedish-German baron) did in 1917 after the Russian Soviets' revolution and during the inevitable devastating and fractious civil war of 1918 between the Reds (communists supported by Soviet Russia) and the White Finns (republicans supported

[2] motto attributed to the famous Fennoman lecturer at Turku **Adolf Ivar Arwidsson** but coined by **Johan Vihelm Snellman** see reliable Wikipedia link on Fennoman movement: https://en.wikipedia.org/wiki/Fennoman_movement
Interestingly enough, many members of the Fennoman Finnish nationalistic revival movement proved to be of Swedish origin just like the famous Finnish composer J. Sibelius, the architect Alver Aalto or colonel Mannerheim himself, considered to be the greatest Finn.

by the Imperial German Army). The civil war ended with the victory of the Whites, demanded terrible losses – more than 30 thousand victims – in lives and property as well as in the people's mind since the political fractures disrupted and badly affected the growing and emerging urban Finnish society in the aftermath as well as the Finnish psyche for decades. Moreover, a pretty gloomy lesson indeed that boosted the Finnish fighting spirit for the motherland a lot during the terrible Winter War (or *Tarviosta*) of 1939-40 against Soviet Russia, when the young Finnish nation manifested outstanding bravery and fierce, exemplary manly resistance in the pitched battle against the Soviet invaders, who lost more than 127 thousand soldiers, though ultimately the Finns were forced to surrender and cede the Eastern part of their motherland, the Karelian peninsula to the Stalinist Soviet Union after the Moscow Peace Treaty[3]. During the Cold War decades, the mindful diplomatic courtesy of neutral Finland contributed a great deal to the development of the nation when the Finns were considered good negotiators and couriers of ideas, intelligence, people and spies between NATO and the Soviet Union, Helsinki became a common meeting place for grand diplomacy and espionage.

As we can witness from the quite devastating and bloody flow of events throughout modern Finnish history, the swiftly growing, urbanising and more educated Finnish population was forced to acquire, adopt new skills, experiences and competences during the social, political and cultural turmoil, which unfolded within a few generations[4]. These experiences galvanised the Finns who realized their strengths and willingness to work together more efficiently and build a modern independent, self-ruling, self-sufficient, tolerant and neutral country[5] appropriate and cherishing for all members of its population by implementing the freshly acquired democratic rights and legislation in all aspects of life.

2.The *Finnishness* or *suomalaisuus*

What is to be a Finn? In the 21st century multi-ethnic and globalised society what makes a person a Finn or Swede; are there any stereotypical features, traits of national or ethnic identity? It is a quite diverse scholarly and at the same time controversial issue. However, the social-psychological, and particularly the cultural anthropological analyses and studies have come up with great findings along the last decades which may prevail yet they are not universal, naturally. The common national characteristics are partly genetic but mostly learnt, adapted traits and skills from the ancestors and may be constantly altered by the new

[3] See https://en.wikipedia.org/wiki/Winter_War

[4] the Finnish population grew tenfold within a century until the WWI with rapid urbanisation, and thanks to to the very strong social-democratic party of Edvard Valpas, *universal suffrage* (women included) was launched in the Russian Grand Duchy of Finland in 1907 among the very first in the world: https://en.wikipedia.org/wiki/Finnish_parliamentary_election,_1907

[5] the famous foreign policy of *'active neutrality or Finnish solution and national realism'* proclaimed by president **Juho Paasikivi** and developed further by his successor the quasi mythical prime minister and president of Finland **Urho Kekkonen,** for almost three decades,

external impacts, e.g. immigration. Finland is not the homogeneous society it used to be before the end of the 20th century, yet they are not facing such serious challenges in this term as their great western neighbour Sweden, where more than 10% of the population is of non-Swedish ancestry.

However, concerning the basic features of the Nordic population of Finns, Swedes and Sami people there are some prevailing and mostly appropriate stereotypes of Finnish people in general, such as: they are notoriously laconic, reserved and obstinate, desperately addicted to coffee, spirits and heavy metal, feeling ultimately relieved and great at home in their remote cottages (*mökki)* surrounded by mother nature or in their genuine *saunas*[6] far from their fellows, they tend to be very pragmatic, non-pious and thoughtful, self-reliable and individualistic however working well in small groups if necessary[7]. All these interesting traits can be observed and experienced in their everyday routines as well as in their school classrooms. The well-known taciturn pragmatism and shrewdness of the Finns helped them a great deal throughout their harsh history fighting to survive and find their own ways around and this humble but stubborn attitude, persistent self-sufficiency and stoic determination (the famous *sisu*) provided them with self-esteem and a set of values they could always rely on in challenging times. Finns are considered to be people of action and of mindful thoughts and not the ones talking too much in vain.[8] Their love of nature and personal freedom and the high esteem of self-reliance also manifest in their common fishing-hunting-hiking pastimes, Finland having the second largest gun-owner population after the USA, though in shocking contrast to America, Finland displays one of the lowest violent crime and incarceration rate/capita in the developed world[9].

The Finns' willingness to adopt and integrate new things and ideas in their lives and business practices enabled them overcome economic, political as well as educational challenges, crises as it happened after the two bloody wars, during the decades of Cold war or in the forthcoming years of economic plummet and crisis after the disintegration of the Soviet Union in the early 1990's. Interestingly enough, Finland being considered as an extremely individualistic and secular society, the importance of social cohesion and the all-embedded presence of trust affect the course of action in all aspects of life. Trust, respect and professionalism are highly regarded social values along with hard-work and open-mindedness. These are the skills and competences which can make a modern society hit the

[6] more than half million mökkis and 1 million saunas in a country of 5 million inhabitants
[7] See Booth (2014) great observations on Finland
[8] Just remember the countless great jokes about Finns talking, drinking, fishing a.s.o.
[9] Mostly alcohol-related crime is general in Finland see: http://sciencenordic.com/alcohol-behind-finlands-high-homicide-rate

roof in any world ranking in terms of work and study efficiency, happiness and life-complacency as Finland has spectacularly manifested for the last few decades[10].

And all these great features, basically stem from their core Finnish attitude based on their educational system which is freely available for everyone from any social and cultural or political background.

3. Unveiling the secrets in the land of the famous *peruskoulu*

Ever since the time of the Finnish revival movement Fennoman of the early 19th century, teaching has always been regarded as a prestigious, trusted profession for the Finns. Teachers are thought of as intellectual leaders, the shining 'candles for the people' as the Dean of the Faculty of Behavioural Sciences of the University of Helsinki, prof. Patrik Scheinin put it wittily[11].

The world famous educational celebrity from Finland, Harvard lecturer Pasi Sahlberg[12] has repeatedly asserted that the best decision made in modern Finnish society proved to be the establishment and launching of the Finnish educational reform based on the nine-year free comprehensive school or *peruskoulu* replacing the former primary *(kansakoulu*) and early secondary-school *(keskikoulu)*. It wasn't a smooth transition from the conventional biased and unequal school-system to the much more egalitarian, non-competitive high performing one, though it had been initiated by the pedagogues of the distant and least developed Northern region of Lapland and pretty soon the rest of the country realised that it wasn't such a bad idea after all during the trial period lasting from 1971 to 1978[13]. The forthcoming great results, though did not prove to be convincing at all for the sceptical Finnish analysts and policy-makers, particularly taken into consideration the more business-oriented lobby groups and decision-makers who were openly pushing for switching back to a more American-style educational agenda during the crisis-stricken decade of the 1990's, aiming to abolish the comprehensive basic school system of *peruskoulu*. Then the first great comprehensive OECD PISA results of 32 participating countries were announced in Dec. 2001, as a lightning out of the blue for the astonished world as well as for Finland. In the hindsight, it seems like an anecdote that even the Finns – evidently, missing the slightest touch of pompousness – could not believe their eyes witnessing the outstanding performance of their 15-year old students[14]. For them it would have been more than enough success to surpass the school performance of their eternal rival neighbour, Sweden[15].

[10] No need to see the various global surveys or rankings compiled by the UN, OECD, World Economic Forum or Happines Index Rate of countries, Finland generally on every list has a top positions: https://en.wikipedia.org/wiki/International_rankings_of_Finland

[11] See Booth (2014), loc.4075 Kindle version

[12] A practising high-school teacher of maths and physics himself, author of the bestselling book on the Finnish educational miracle *Finnish lesson 2.0.*

[13] See the short historical outline on this website, as well: https://www15.uta.fi/FAST/US5/REF/wesfin90.html

[14] Kouta (2012).

[15] Sahlberg (2015) loc.1138 Kindle ed.

According to the new decrees on Finnish education issued back in the late 1970's, all the educational staff from pre-school to high-school teachers were obliged to obtain master's degree in education, as well, which resulted in the emergence of a highly trained and devoted educational staff all over the country from downtown Helsinki to the remotest villages of Lapland. As we know, hard-work, professionalism with humble modesty are highly appreciated and respected personal characteristics and values in the Nordic society, the highly educated and trained teachers have steadily turned into one of the most trusted and high ranked professionals in the Finnish society – along with physicians, engineers and judges - which obviously may result in great professional performance.

The masters of education, namely teachers on all levels, could easily get acquainted with the various international trends in pedagogical methodology and philosophy and choose, implement whatever they have found feasible and efficient, useful for their daily work in and out of classrooms for the benefit of their students. Thus, basically, the unique Finnish education system is a nice blend of ideas and practices elaborated in the USA, Canada, Germany or Sweden though it has been masterfully mixed, customised and put into practice in Finland meeting the local expectations and the project-practice based pragmatism of the Nordic population. It is worth emphasizing that the sheer fabric of the Nordic society is based on trust, professionalism, and open-mindedness to adopt new techniques, therefore the national and local school curricula are regularly reviewed and updated to harmonize with the new trends and expectations in the rapidly changing postmodern world. This process is carried out by a nationwide professional board of educators compiled of around 300 chosen outstanding educational experts from all over the country, unlike in many other places where the mostly jurist or economist policy-makers have the final say in national educational issues.

Surprisingly enough for external analysts, there is no formal control, supervision, assessment of any kind on educators which can be directly derived from the common trust and high esteem given for the teaching profession. Nor are the schools ranked as in the rest of Europe, since there are no high-flier elite or underachieving schools according to the Scandinavian-Nordic idea of moderate high-performing middle-class society also reflected in the school system. The head teachers help and monitor the daily work of their school staff and report their findings back to their … fellow teachers. The 100% publicly funded education system[16] relies on the commonly shared concept of teachers' professionalism and trust in their devotion for the benefit of the entire society, as such. Thus, there is no need to bother them with external supervision and control – as it happens in many under-performing over-controlled education systems where, in most cases the slightest touch of common trust is missing from the part of society and educational policy-makers, as well. The

[16] even in times of economic downturn the education expenditure of Finland remains around 6% of the country's GDP, and about 12% of the annual state budget, which is of outstanding rate in the EU: http://www.stat.fi/til/kotal/2014/kotal_2014_2016-05-11_tie_001_en.html

highly professional and practice-oriented vocational education and training is greatly appreciated in the Finnish society also meeting the demands of the new technologies and businesses in the market-economy, therefore it proves to be a quite popular career choice among secondary school students[17].

The national curriculum is a framework guideline for the schools that they can totally supplement or even partly neglect it. One recurring and perhaps valid criticism is upon the neglected talent management of the high-achievers in schools, who have to take care of themselves since the primary attention and care of the Finnish educators is supposed to focus on the lower performing students so as to avoid the increasing number of drop-outs - and as a result a prevailing consequence: juvenile delinquency and youth unemployment - which on the other hand, naturally is the lowest among the OECD countries, with an average rate around 4% (in Hungary, for instance is more than 10% and the trend is dramatically soaring)[18].

Based upon the guidelines of the current national curriculum, the local school syllabi tend to focus on creating, developing and cherishing all the vital skills and competences necessary for the next generation living in a digital age modern society, such as: problem solving practices, advanced ICT-applications from an early age, individual and team work, creative, critical, and analytic thinking. The ancient Chinese wisdom of 'learning by doing is the best' has been taken remarkably seriously for a long time in Finland, and as of the new academic year of 2017 the new National Curriculum Framework calls upon the regular, monthly application of the *Phenomenon/practice based learning (PBL)* method in all schools aiming at teaching cross-curricular topics or projects implemented in practice by the students themselves.[19]

[17] see http://www.minedu.fi/OPM/Koulutus/ammatillinen_koulutus/?lang=en
[18] see the latest comprehensive OECD countries' report in 'Education at a Glance 2015' : http://www.keepeek.com/Digital-Asset-Management/oecd/education/education-at-a-glance-2015/finland_eag-2015-55-en#.V441IvmLRD8
[19] See the NCF of Finland on PBL: https://www.noodle.com/articles/phenomenon-based-learning-what-is-pbl

And here we get to the heart of the matter, the essence of the Finnish education system and most likely the secret of their great performance: namely, student-centric customised education and curricula with a lot of personal freedom for both the teachers and the students, far less centrally standardized testing and much more practice and time to digest the subjects in and out of the classroom.

Home economics class:cooking in practice for high school sts

Among many educational pundits, Sahlberg also asserts that the quite balanced socio-financial background of the students takes a lot into account when we assess the generally outstanding performance of the Finnish school children. There is a direct correlation between the school performance and the financially deprived and socially more disadvantaged students and their families. The same way, the educational record of the parents highly affect the performance of their offsprings.

According to a common wisdom shared by PISA-educationalists[20], "the quality of an education system cannot exceed the quality of its teachers" which seems absolutely adequate in many comparative studies on education emphasizing the importance of professional background as well as the social and human factors behind school-children.

When the *peruskoulu* and high quality early-age education was launched in Finland, most likely, the decision-makers were just instinctively aware of the result of years-long American survey of this kind on the significant impact of high-quality early-age education and successful career path of the adult individuals later on.[21] So, these factors from above combined culminate in the outstanding performance of the Nordic education system and not as a consequence of the financial aspects as many experts tend to misconceive.[22]

The OECD standardized tests tend to assess the personal problem solving, creative thinking and reading comprehension skills of 15-year old students from more than 70 different countries. Acquiring those skills assessed by PISA[23] or even by the more curriculum-based

[20] Most likely originating from South Korea see. OECD PISA-report (2007) p.17,croossref.19
[21] See the great survey of Project STAR in Tennessee, USA (Friedman et al.) 2011, pp. 1655-56.
[22] Sahlberg (2015) loc.1565, taken that e.g. the US spends much more on education than Finland in ratio though with much worse efficiency and outcomes see the famous McKinsey and Co. report (2007) pp.6-7
[23] see the OECD PISA (2012) p.5

latest TIMSS-test on sciences and PIRLS-test[24] for literacy and comprehension show that Finnish students perform on outstanding level though with a slightly declining tendency for the last decade[25]. Many experts claim whether this performance slope would be the sign of vanity and complacency after the initial peak, or could it as well be the result of the latest economic downfall of the country.

The answers are controversially unclear for the time being, nevertheless many educators and policy-makers are seriously concerned about the slight but gradual downfall, which obviously should also result in finding and keeping the golden mean between theory and practice in education or between lexical knowledge and practice-based skills development.

3.Conclusion

All parties agree that education is a very complex and controversial matter, a very important issue for the future success of any country and society, and thus, even in time of economic crises the public educational budget must not be cut but rather ought to be increased for providing new opportunities for the people to retrain and to get access to lifelong learning[26]. The state of education implicitly reflects the state and conditions prevailing in the given society, which also let us assume that Finnish society and education – in contrast to the Hungarian or the American for the matter – are in pretty good shape and they tend to keep heading in a good direction to build a modern, tolerant and inclusive knowledge-society[27].

In modern days Finland, in the land of Linux, Skype and Angry birds-maker Rovio Inc.'s success stories, the quick and dramatic downfall of Nokia mobile phone giant pops up vividly from living memory, and nowadays the moral of its story can be related to any aspects of economy and education, as well. Namely, we – educators, policymakers, businessmen - must follow the quick changes and new trends in the world and the new expectations of the society unless we can easily plummet into a state of secondary assembly line state perishing from the club of pioneer knowledge-societies as the EU 2020 strategy might as well outline[28].

[24] see http://timss.bc.edu/latest-news/portugal-nrc-coverage.html
[25] http://www.businessinsider.com/why-finland-fell-in-the-pisa-rankings-2013-12
[26] the European LLL strategy has also been integral part of the Finnish higher education strategy since 2006
[27] see the findings of the 2015 OECD report on Education
[28] see EC (2014) pp.18-21

There are countless outstanding studies and analyses which highlight the importance of investments into the human capital, and especially in education for the success of developed

An average IT-room in a normal high-school

nations.[29] In this respect, Finland serves as a sort of role-model country for the rest of the crisis-stricken European countries, since in the Nordic countries – not exclusively in Finland – the flagship priorities of the ambitious EU strategies do coincide with the national strategic priorities of the country, namely: promoting digital society, increasing the R&D investments, fostering the opportunities for lifelong learning and supporting all kinds of educational development and youth employment projects. Obviously, all these lofty principles are not considered to be mere catching phrases at all - as it would be the case in several other EU-member states - but they are meant to be running feasible projects implemented at cross-country level on a daily basis.

At this point, we are supposed to come to some sort of conclusions concerning the essence of our findings from above on the hidden success factors of the Finnish miracle, particularly in the field of education. However, were we laconic Finns we could whisper that there is not much to investigate or make a big fuss about anything since they have just been doing their best in their taciturn, thoughtful and pragmatic *sisu-like* manner with strategic steadfastness of purpose for the last few decades relying on the prevailing trust, sense of responsibility and professionalism which penetrate to the core of their Nordic society.

As for the educators they 'have always been the candles for the people' in Finland, so nowadays, they also share increased responsibility and duty in shaping the future of the country by coaching and guiding the next generations towards the highways of success endowing them with the vital skills, competences and lexis to meet the demands of the 21st century.

The author in front of a high-school in Tampere

[29] see the great revelations of Daren Acemoglu and James Robinson (2012)

List of references

Acemoglu, Daren and Robinson, James (2012): *Why nations fail? The origins of power, prosperity, and poverty* Crown Business NY

Booth, Michael (2014): *The Almost nearly perfect people: behind the myth of Scandinavian utopia*. Vintage Digital

European Commission (2014): 'COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS' *Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth.* Brussels, 19 March, 2014.

Friedman, John.N., et alia (2011): 'How does your kindergarden classroom affect your earnings? Evidence from project STAR'. *Quarterly Journal of Economics* vol. CXXVI. Nov.2011, Is. 4.

Kouta, Maria (2012): *On the top of the world: how the Finns educate their children*. Amazon Digital Services

McKinsey and Co. (2007): *How the world's best performing school systems come out on top?* London, (Sept. 2007)

Sahlberg, Pasi (2015): *Finnish lesson 2.0. What can the world learn from the Finnish?* Teachers College Press 2nd ed.

OECD, (ed.) (2012): *PISA 2012 Results in Focus: What the 15-year olds know and what they can do with what they know*?

Wagner, Tony (2014): *The Global Achievement Gap: why even our best schools don't teach the new survival skills our children need – and what can we do about it*. Basic Books.

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Lászlóné NAGY-CZIROK

International experience of Hungarian school headmasters in Finnish continuing professional teacher training environment

I. Comparative evaluation of Finnish and Hungarian approaches and practices

The European Commission works with EU countries to raise standards of teaching and teacher education by facilitating the exchange of information and experience between policy-makers.1 We mean this exchange is just as important between teachers. Therefore, we, BME APPI teachers, build relationships with other educational institutions.

In April **11-17.** 2016, a study visit was organised in frames of **visiting the Finnish education system,** in the School of Vocational Teacher[2] Education at Tampere University of Applied Sciences (TAOKK).

Finnish education is facing challenges like most such systems worldwide. Vocational institutes and universities have to prepare their students for the emerging new situations, developing new ways of working, meeting challenging practices as well as working on the limits of their own abilities. Changes taking place in society and working life have been driving the educational system into a new situation.

Routine application of existing methods and experience is not sufficient in the teachers' work anymore. The required new skills are collaboration in various working environments, developing solutions and creating new ideas by which they can respond to challenges.

In discussions with vocational teachers at TAOKK, their relevant experience has been weighted against the Hungarian one, to examine how they can be used in our public educational practice. Having studied the description of the Finnish education system with the peer colleagues, some of the featured items have been compared with the Hungarian practice taking into account the core elements of the Hungarian **teacher** career model to find out the significant similiarities and differences.

The use of information and communication technologies as well as the social media are important elements in Finland in collaboration and knowledge building.

> *ICT use has been part in the Hungarian everyday practice as well. Collaborative methods are also increasingly used in blended learning form in teacher training courses, introduced and promoted by innovative teaching staff.*

[1] http://ec.europa.eu/education/policy/school/teaching-professions_en

[2] Vocational teachers, also called career and technical education teachers, teach workplace skills to children and adults. They work for public middle and high schools

Participatory pedagogy and authentic learning are substantial elements for evaluation of teacher students. The ideology behind participatory pedagogy requires different approach to learning than before. Instead of relying on individual, disconnected tasks and learning contents, the comprehensive issues, phenomena and problems which arise from the teacher's work are emphasised. This approach enables the use of different ways of activating learners, application of exploratory, problem and phenomena based pedagogical models and methods.

Participatory pedagogy focuses on supportig the students' participation, understanding the importance and use of peer groups, taking into account the students' own starting points and goals, accepting that learning happens everywhere, with continuous use of reflection and evaluation. Participatory pedagogy uses the principles of authentic learning. Authenticity is realised in the learning environments. The functional approach is research-based work, which supports the development of thinking competences.

> *Most paradigms sounded familiar for the Hungarian peer group. We focus principally on the same aspects but using different emphasis. The term 'participary pedagogy' is rarely used in our professional communities but often highlighted during the teacher evaluations. The 'continuous use of reflection and evaluation' is more important, due to the Hungarian teacher career model.*
>
> *Research based teaching is less frequently used in our pedagogical practice – neither among students nor among teachers.*
>
> *The Finnish focus on better learning environment. Their classrooms are typically described as learner-centred. We should welcome this idea, to the extent we can afford it. In Hungary fewer teachers take students preferences into account and not too many of them believe that'learning can happen everywhere'.*

The aim of TAOKK is to involve the students in finding and getting inspiring learning experiences.

> *We also believe that it is more effective to apply experiential methods this way and less thorough frontal knowledge transfer. Phenomenon based learning is in our country less used than it would be expected.*

The evaluation which emphasises the students' own activeness and reciprocity consists of self, peer and working life evaluation.

> *There are good practices in Hungary as well which are based on the same elements. Workshops in schools, self evaluation groups, and the role of consultants also follow this methodology.*

The Finnish teacher education modules and courses use the same evaluation table which is based on an integrated epistemology. It is divided into descriptive knowledge, applied knowledge and integrated knowledge. Teacher students present theoretical and experience

based knowledge as separate entities. They reflect on their observations, actions and experiences.

Applied knowledge is most item prominent in the Hungarian apprenticeship exam. Our apprenticeship exam and proceedings are similar, but integrated knowledge is required during our master teacher certification process. Observation however should be a more pronounced element in our country.

To choose methods which work properly in different situations is showing up in the Finnish system as advanced skill. New working methods and strategies are being permanently developed. The important questions are "Why is this done in such a manner?" "Who can benefit from this and how?" and "Are there other ways to do this?"

These aspects appear in our qualification practice as well. At our qualification process teachers have to be be reflective, in their documentation as well. Our related questions are the same.

Documentation of one's own learning is an important part of participatory pedagogy.
It shows how the teacher students' own professional thinking and work have developed.
The aim is to enhance reflective thinking and deepen the learning process

For the same reason should Hungarian teachers and candidates write their portfolio.

The competences in the Finnish curriculum are: evaluation competences, facilitation competences, cultural knowledge, partnership knowledge and well-being knowledge.
In national educational policies, there is a wide variety of approaches to define the competences that teachers are required to be able to deploy, ranging from a 'light touch' to complex description. In Finland, the government declarations on university qualifications give general guidelines. The novel pedagogical approach of „well-being"is especially interesting.

These competences are partly different from the Hungarian requirements and more similar to „Basic competences in life and in work" (Kálmán, 2006).

In Hungary the teacher standards are defined by ministry regulations. We don't use the „well-being"term.

Finnish teacher students can have an active part in designing and evaluating their own learning. Each teacher student can create his/her own individual study plan. The plan lists the students' learning goals compared to the goals of teacher education, sets personal goals and finds new opportunities for learning. In Applied Methodology, it is called:„Teaching Learners to be Self-Directed."

These self regulated methods support building key competences for Lifelong learning. We consider them as credible! The teacher will be able to understand and support the students' learning process more effectivly this way. The Hungarian practice is similar.

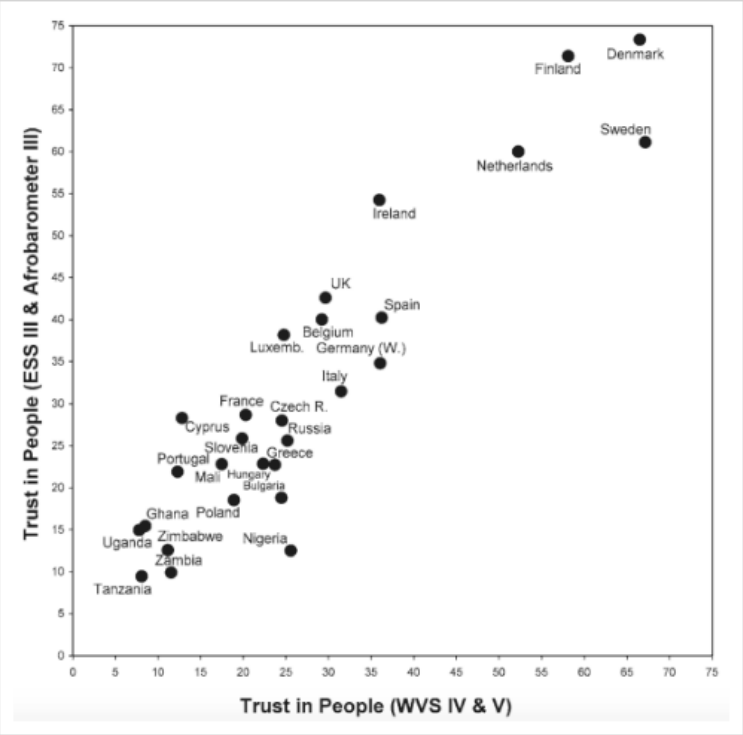
As summary of the comparative consultations, we have collected keywords of the Finnish highlighted terms: **High quality, Autonomy, Student centered, Support, Constructive learning, No national tests of learning outcomes, No school ranking lists, Innovation, Trust.** The issue of **trust** should be highlighted in the national comparative context. In the Hungarian practice this term is not too frequently used.

II. Trust based approach

In the consultations with the Finnish peers this theme has been often discussed.

Levels of interpersonal trust

Interpersonal trust levels as measured by the World Values Survey and European Values Study, and the European Social Survey and Afrobarometer Survey – Inglehart & Welzel (2010)[26]

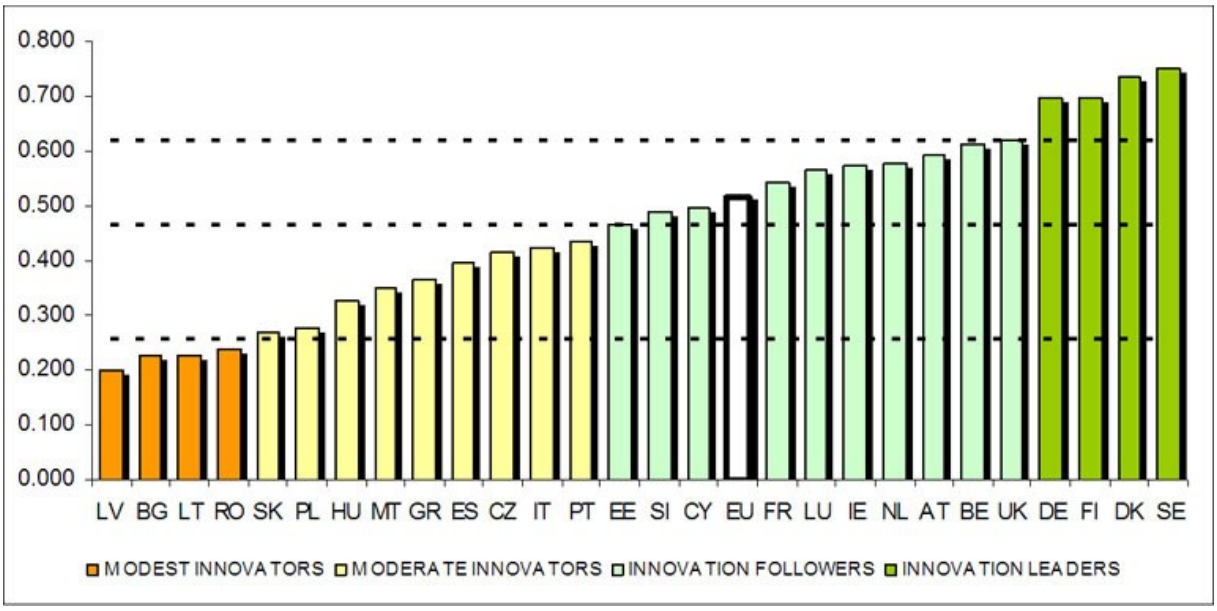


1. figure [3]

The Finnish society is characterized by high levels of trust. Teachers are also entrusted with considerable independence in the classroom. They have responsibility for the choice of textbooks and teaching methods. There is a climate of trust between educators and the community. The curriculum at TAOKK was revised by 300 teachers in collaboration. There is no external evaluation and school inspection has no control over the work of teachers since they received a high level of authonomy. „Trust and support"- was said by the Finnish partners.

[3] https://ourworldindata.org/trust

European innovation scoreboard shows:

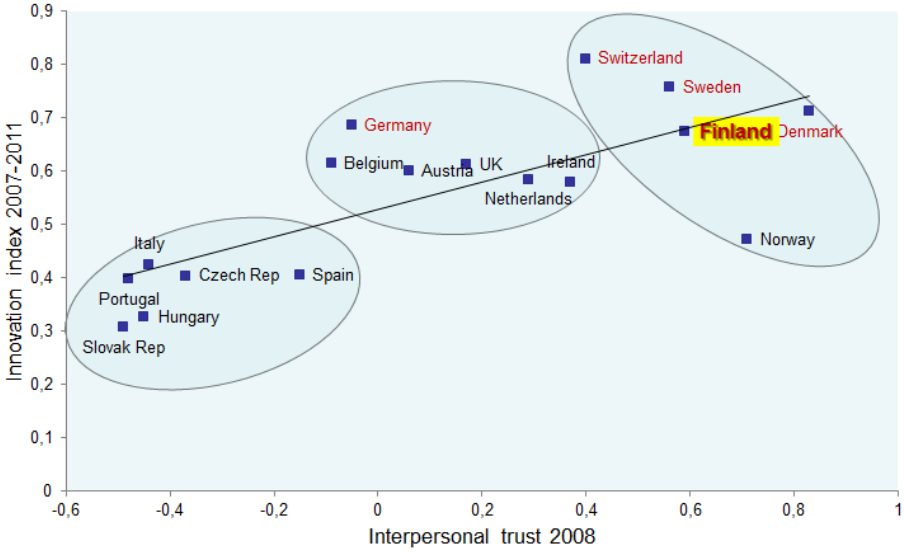


2. figure [4]

Hungary is a Moderate Innovator (2016)[5] Finland belongs to Innovation leaders.

Interpersonal trust and innovation

Whilst trying to find connection between trust and innovation, we have found that there was a clear positive correlation.



3. figure

The Year 2008 Social outcomes of education indicator included measures of self-reported health, volunteering, interpersonal trust and political efficacy, assessed in the Survey of the OECD Programme for the International Assessment of Adult Competencies. These four social outcome measures are considered among the key indicators of individual and national well-

[4] https://ec.europa.eu/jrc/en/news/new-innovation-union-scoreboard-main-competitors-outpace-eu-despite-progress-many-member-states

[5] http://ec.europa.eu/DocsRoom/documents/17840

being (OECD, 2013). Both educational attainment and literacy proficiency are positively associated with these measures[6]

The issue of trust in the educational process should be therefore considered as important. Nowadays one may feel lack of trust between education stakeholders and teachers in Hungary which creates unreceptive environment for the professional development process. In turn: “In a continuously unfavorable environment the majority of the energy is devoted to the continuous adaptation performance, little of it remains for "useful" work. In this environment, it remains just who is unable to concentrate resources needed for the outburst.” (Kálmán, 2005)

III. Relationships between Teachers’ competences and paradigms in education

In consultations with the Finnish partners about the 21st Century Skills, the following items have been emphasized: [7]

Ways of thinking: Creativity and innovation; Critical thinking, Problem solving; Learning to learn, Meta-cognition

Ways of working: Communication; Collaboration (teamwork)

Tools of working: Information literacy; ICT literacy

Living in the world: Citizenship – local and global; Life and career; Personal, social responsibility

This listing was completed with these paradigms: system thinking, from disciplinarity to multi disciplinarity, from local to global, from simplicity to complexity. (Kálmán, 2016)

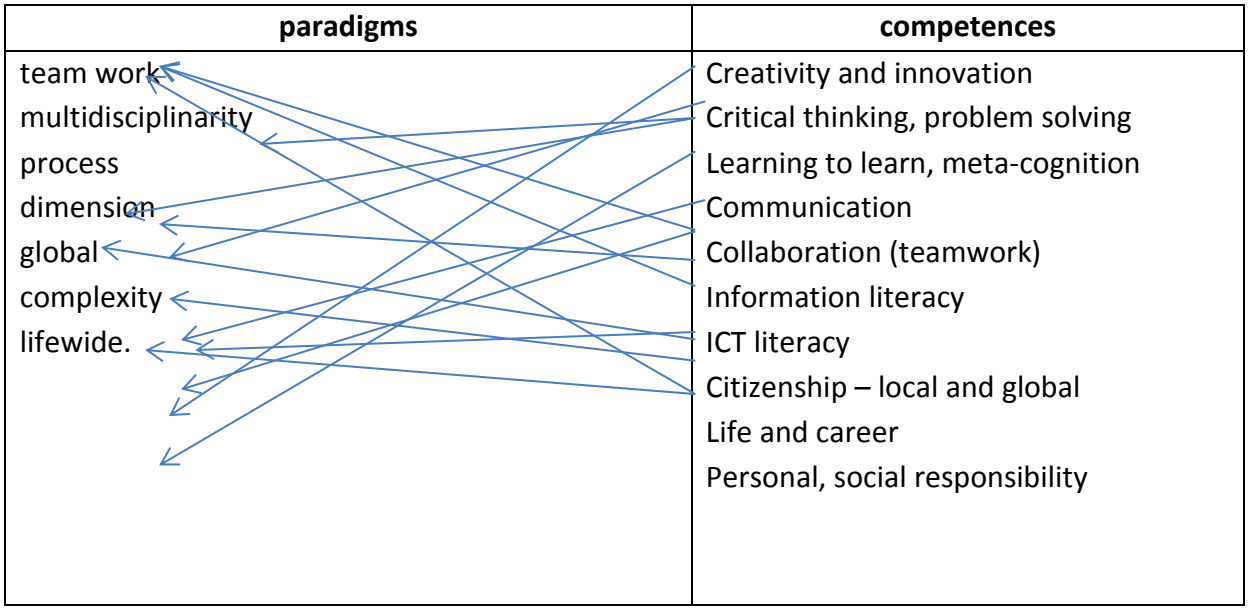
It’s easy to identify these terms among the expectations toward teachers both in Finland and in Hungary. ‘Life and career’ is more typical in Finland where government supports changing career paths. We noticed the similarity and correlation between this and the ‘well-being’ competences.

[6] https://www.oecd.org/edu/Education-at-a-Glance-2014.pdf

[7] Source: Microsoft-Intel-Cisco *ATC21S* project

We compared Paradigm Shift in Education with the expectations mentioned above.

- from individual to team work
- from disciplinarity to multidisciplinarity
- from standard to process
- from stability to dimension
- from local to global
- from simplicity to complexity
- from lifelong to lifewide

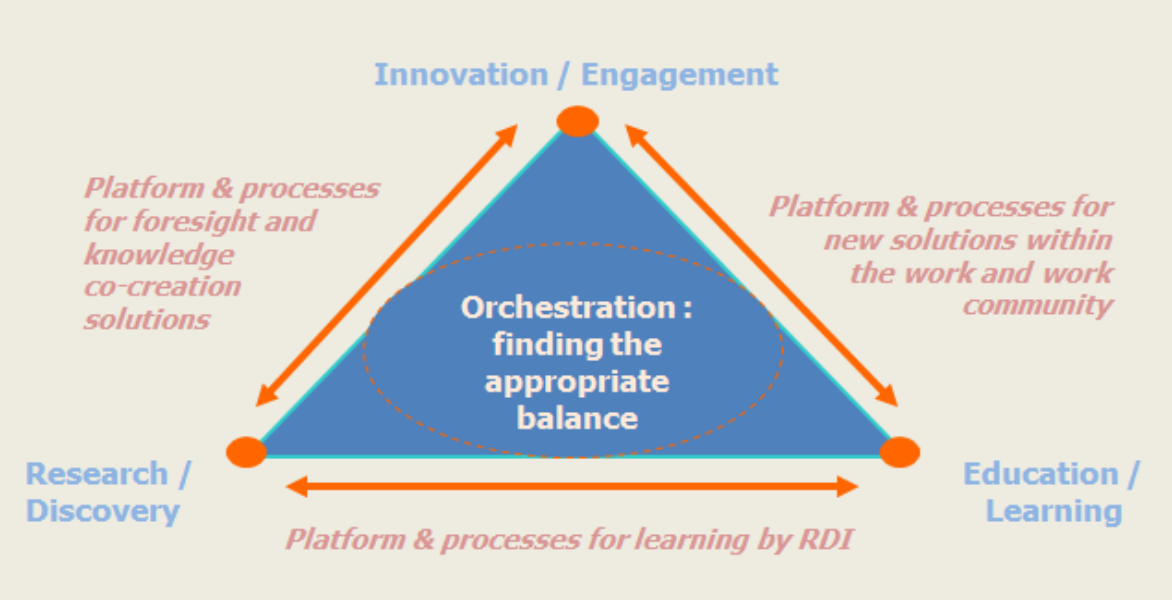


4. figure

It was agreed that at the same time these changes support and develop the teachers' competences needed for Lifelong learning. Each of these items can be found in the Hungarian practice as well, whilst not in all aspects with the same emphasis as in the Finnish context.

This paradigm shift can support teachers in becoming more innovative. The innovative approach should be part of contemporary education. Relying on education research achievements, it can help to find balance between learning, the foresight and the work community. This thesis is illustrated with the Knowledge Triangle.

What is the Knowledge Triangle?



5. figure

„The Knowledge Triangle should primarily be seen as a large-scale societal innovation through which Europe can strengthen its research potential, increase its capacity to educate talents and to promote and create demand-driven open innovation platforms for wide societal use" [8]

„New ways to learn call for new approaches to pedagogical development and assesment that truly encourage learning by doing and motivate the learners. Bringing together theory and practice is essential in implementing the Knowledge Triangle."

Implementing the Knowledge Triangle means among others the following concepts:

- targeting more development activities on curriculum and learning environment initiatives, which are essential to learning to learn;
- equipping university teachers with skills and competencies to facilitate learning;
- taking advantage of situations in which studies are focused on solving real life problems;
- supporting the growth of the teacher students´ identities as teachers through content, methods and the whole operating culture.

Summary

In frames of the above series of consultations with our peers, we have studied the Finnish educational system and their teacher training methods from several aspects. It was found that the expectations in the Hungarian career model show certain similarities. The characteristics of the related paradigm shift in Finland has also been studied and considerations made for their application and adoptation in Hungary. The important aspects

[8] The Knowledge Triangle. European Society for Engineering Education SEFI, CESAER (Conference of European Schools for Advanced Engineering Education and Research)

found as worth considering were: research based planning, trust based approach, career path, open learning environment - which can blaze a trail to the competences needed for LLL paradigm change.

“The philosophy or theory of practice is not a plan to be implemented, not content ideas or worldview, it is not even a paradigm (according to the most abstract model), but something that speaks to the practical alternatives and criteria for decision-makers. If you like nothing more than a combination of human decision-making rules, methodology. Therefore, who is calvig from the West what to do, instead, learn from it, as it’s used to do, preserves backlog.”

(Kálmán, 2006)

Thanks for dr. Kálmán Anikó, who helped me with her experiences to place my thoughts into a wider context.

Bibliography

Dr. Anikó Kálmán (2016): Innovative Finnish Education. Finn-Magyar Szimpózium és Workshop: Co-creative problem solving. Plenary Session 1. 2016-05-24 APPI BME

Dr. Anikó Kálmán (2005): A felnőttoktatásban és -képzésben alkalmazható kompetenciaelvű módszerek és azok alkalmazhatósága. Kutatási zárótanulmány. Budapest

Dr. Kálmán Anikó (2006): Tanári szerepek – tanulási stílusok: a felnőtt-tanulás folyamata.(Lifelong learning füzetek) OKKER Kiadó, Budapest

European Commission (2013): Supporting teacher competence development for better learning outcomes. „Teacher Professional Development” Thematic Working Group’s document, Brussels http://ec.europa.eu/dgs/education_culture/repository/education/policy/school/doc/teachercomp_en.pdf (06-10-2016)

OECD (2014): Education at a Glance 2014. OECD Indicators. OECD Publishing. http://dx.doi.org/10.1787/eag-2014-en

Binkley, M., Erstad, O., Hermna, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2012): Defining Twenty-First Century Skills. In Griffin, P., Care, E., & McGaw, B. Assessment and Teaching of 21st Century Skills, Dordrecht, Springer. (in: Microsoft-Intel-Cisco *ATC21S* project http://www.atc21s.org/) (06-10-2016)

European Commission (2011): New Innovation Union Scoreboard: main competitors outpace the EU despite progress in many Member States https://ec.europa.eu/jrc/en/news/new-innovation-union-scoreboard-main-competitors-outpace-eu-despite-progress-many-member-states (06-10-2016)

European Commission: The teaching professions. http://ec.europa.eu/education/policy/school/teaching-professions_en (06-10-2016)

Dalma PAP

Entering through the doors of innovation: School visits in Tampere

Owning to the experience provided by the Budapest University of Technology and Economics (BME for short), a group of Hungarian teachers were given the opportunity to attend TAMK (Tampere University of Applied Sciences) in Finland between 11-15thApril 2016. As a member of this group, I could visit not only TAMK but also two Finnish schools, which experience drew my attention toward the discrepancy of the Scandinavian and Hungarian systems and school results. In this report I intend to introduce my readers to my observations and opinion which are solely based on some interviews I made there and my personal views.

1. The university logos of TAMK and BME [1]

First of all, it is generally true that when people travel abroad, they tend to compare their own cultures to the host country's, as well as they try to point out the most obvious differences. From this perspective, Hungary and Finland belong to two well-distinguished worlds.

To start with, as far as I am concern, teacher tourism is not that prominent in Hungary. Unfortunately, our country has lost its dominance on the stage of education therefore we have become followers who try to adapt new methodology and guidelines. It is really saddening but we must realise that right now we are not the ones who are pioneers in this field. The reason why I am pointing that out is because I firmly believe that Hungarian educators must sit back and accept this fact, and should re-evaluate their methodology and teaching style. I am not suggesting in any way that the Finnish system is perfect, nor am I stating that we should copy it. On the contrary, we have to open our eyes and make a shift in order to be better and more respected. For these reasons, this pilot programme organised by BME seemed like a good starting point.

It is not that the Finnish educators are fully aware of the importance of their great results. When asked, they could really not answer what made them one of the best. However, they were very helpful and open-minded during our stay. Our hosts, including Sisko Mällinen and Jiri Taok Vilppola from TAMK, really made us welcome and tried their best to let us have a glimpse of what the world calls the 'Finnish miracle.' However, when I write 'glimpse' it is really what I mean since it would have been impossible to become an expert of the Finnish

[1] TAMK logo [Online]. http://www.tamk.fi/web/tamk/etusivu | Last dowloaded: 11/18/2016.
BME logo [Online]. https://www.bme.hu/ |Last dowloaded: 11/18/2016.

system within a week. Nonetheless, we could truly understand the framework and guidelines that shape the Scandinavian education system.


2. Sisko Mällinen, TAMK and Jiri Taok Vilppola, TAMK [2]

One such framework worth mentioning is the system itself. Imagine a system where you can have choices: you can decide what you want to learn and what you want to become. We have seen this before, you may say, for example one must think about the English-American systems where students have obligatory and elective subjects to choose from. In Finland, however, what really fascinated me was the fact that there were always second opportunities for those who have made a bad decision or who wished to broaden their horizons. This kind of attitude truly amazed me because it means that students are not frustrated and do not live under pressure of their choices, as they sadly do elsewhere in the world.

Let me tell you an example for that in order to prove my point. During our stay we had the chance to visit two Finnish schools: a primary and a secondary vocational school. When entering this latter one, we could see that the age of students range from 14 to 40+. The headmaster of Prisma vocational school told us that this was because education is free and members of the older generations can even earn a monthly state scholarship worth € 1 000. As a result, generally speaking the Finns are well-educated and qualified. They are owners of profession certificates or diplomas provided by state vocational schools or colleges/universities. This also means that they seek positions that require high-level of qualification and if they lack those skills, they can still be accepted with the provision of mastering the required skills later. Therefore in the school one of the classes we visited consisted of 12 students, of which 7 belonged to the high school student age and the rest of them were considered adults. This spectrum of age groups seemed beneficial in the classroom since the older students could teach the younger ones and tell them about their experiences in the field, on top of that, youngers could gain hands-on experience on what that profession in real life was like. All in all, this policy ensures that fewer students will make bad career decisions and those who do can start a new profession immediately after realising this fact. Not to mention that the number of school-leavers will probably shrink.

[2] Pictures were downloaded from: https://fi.linkedin.com/in/sisko-m%C3%A4llinen-16395966 and https://plus.google.com/106893713836757145819 |Last dowloaded: 11/18/2016.

3. A typical Finnish schoolbuilding with bicycles in front of it and a part of the Hungarian delegation[3]

Connection to the modern world is crucial for them. Not only they were trying to teach real-life skills, but also let the students and teachers discover the field of their profession for real. For time to time, students and teachers alike are required to take part in community work programmes. Students can choose what profession they want to try for some weeks, while vocational school teachers must practise in the field they teach at. As a result, everyone is up-to-dated and students can decide on their future career more easily. I find it noteworthy that pupils must do mainly physical labour, and to back this idea up, we were told that the most popular job among the high schoolers were plumbing because in Finland that is one of the best-paid manual jobs. Also, when interviewing the students, they praised this part of the system. One of them told me that he had spent a summer at a chemical laboratory and this experience helped him in choosing a career: the 24-year-old boy wanted to become a brewer.

Experience is important and the Finns know that. That is the reason why they support experience in a field. For example, if a person wants to become an electrician but he has already worked as an assistant to an electrician therefore he has some knowledge of the field, he can choose to be evaluated by a professional committee that can give him credit points for the tasks he can already do. On the one hand, this is beneficial for the person because he has to learn less and needs to prove only his new skills by the end of the course. On the other hand, the government does not have to finance the full sum of the course since the adult student will spend less time in the system. Hence older and more experienced students can get back to work earlier.

No matter their age and skills, everyone was equal in the classroom. Furthermore, equality was not only a trendy cliché: teachers treated everyone with the same respect and manner, and students were given the same opportunities. In general, equality for them means different paths one must go through. In practice we saw that the students could choose the topics they wanted to learn, the skills they wanted to master and when they were ready they

[3] Photo made by Ágnes Judit Presér, published at http://hvg.hu/itthon/20160415_finnorszag_kozoktatas_tampere_okostabla | Last dowloaded: 11/18/2016.

showed their products to their teachers. Even at university the students signed up for courses, picked topics and areas for themselves and decided on a deadline for them. If they were successful, they could opt for a new project. However, if their product was not satisfactory, they could spend more time with it and prove that they mastered the skill later. This has lead to a democratic, student-centred system where teachers are only facilitators of the learning process and students are motivated enough to participate in it.

Even in Finland sometimes it is very hard to motivate students. However, the main difference between Hungary and the Scandinavian country is that they are not pushing the kids. For instance, we visited a primary school lesson where the 10-year-old kids had to learn in groups of four. There were some boys who did not want to participate in the task and the teachers let them be. Not because they did not wish to deal with the boys, but because they realised that forcing them would lead to nowhere. After around ten minutes, the boys joined the task willingly and finished the materials on time. Later, we asked the teachers what would have happened if the boys had not participated and they told us that the group would not have been punished. If a child is not ready to take the next step, he will not unless he masters the skills on his own before the new stage starts. This lenient attitude was first strange for us but having seen the students working for their own sake made us realise that indeed in Hungary we do not really mean student-centeredness for real because we do not really see the students behind the tasks, nor do we understand their needs.

Every person is different therefore they have different needs. In Finland, they know this and work according to it. However, there are some students who need more attention due to their special needs. These kids are often taught together with the others but get special care from time to time. Kindergarten teachers have to spot these kids and a board later decides what steps are to be taken. Early recognition results in better chances of rehabilitation. When entering the primary school, the students' records and reports are sent to the schools which can take care of the students with special needs.

Every learning group has a teaching assistant who follows the group from lesson to lesson. The subject teachers have their own rooms with the books the students use, their own kitchen and teacher's corner for personal space. In front of each and every room there is a table for the extra skills development sessions. When a group and its assistant enter the classroom, the teacher can decide if some children need special care. For example, if a child has reading difficulties, she or he may decide that the student will spend some of their time in the corridor by the special desk with the assistant. It is important that not the entire lesson is to be spent there therefore the child will not feel isolated from the group. It seemed that kids take turns and the ones who are better at Mathematics were given extra lessons of the English language and vice versa. Due to this measurement, no child is left behind. After all, every child has special needs according to the Finns.

4. A typical corridor, in the foreground the desk for special education sessions, own photo

The obligatory education in Finland ends with primary school. However, elementary school education – unlike in Hungary – is nine years long. After it, students must decide whether to start working without qualification (because they want to achieve it later), or to go to secondary vocational or grammar school. We were told that based on the statistics, half of the students choose secondary vocational education, and 50% opts for grammar schools. Those who cannot make up their minds can stay for a 10th year during which general skills development lessons and career guidance take place. There are no entry exams: students only have to apply for a school major and they will be granted it provided they have recorded the proper skills development. Students and teachers do not need to travel long distances given the fact that each and every school has the same quality of education, and each city education board offers almost the same profession palettes.

Another idea worth mentioning is the environment. In Hungary, we can state that most of the school buildings are in average condition, however, most schools are not properly equipped. In Tampere, the schools we visited were very well-equipped. Besides, all equipment was available by the students as well. Free Wi-Fi connection was provided everywhere and the kids were online all the time. Since our Finnish colleagues know this, they have decided to turn this phenomenon to their own advantage: it was not special to ask the kids during the lesson to use their mobile phones or tablets and search for online information. Using the telephone was allowed during the lessons no matter what the students did on their phones. Obviously, we could sense that not every teacher was happy with this policy, however, even them were willing to give online tasks for the pupils. For example, during a lower primary English lesson the teacher used the technology for teaching the group the proper pronunciation of the English alphabet. What is more, the use of digital materials was evident from the beginning and one of the teachers told us that students own only a handful of books because the school provides them with everything, even with tablets full of digital materials.

Technology, however, is not most important thing that got my attention. What I enjoyed the most was the fact that seemingly there was no schedule the teachers or students were holding to. Everything seemed changeable and not fixed. Even the furniture was not only portable but also convertible. The chairs, the desks and even the boards were mobile and

sometimes we could see how easily a teacher changed the environment to fit the needs of the students or the lesson.

5. A portable classroom[4]

This mobility also supports the notion that not the material but the people who take part in the learning process should be in the focal point. The classical 'aeroplane' style of seating arrangement does not fit every lesson and it can happen that a project needs more space.

What is more, who says that learning should take place solely at lessons? While wandering through the corridors, from the windows we could see some students in the schoolyard who were measuring trees. When we asked them what they were doing, they told us that their Mathematics teacher asked them to measure the diameter of the trees because of a project. Later we were informed that every child must finish a school project each and every term. The projects are multidisciplinary and usually take at least a week to complete. For example, when the group enters the Forestry project, they learn about trees in Biology, go to the nearest forest to draw some pictures of trees in Arts, learn and write poems in Literature and create wooden chairs in Crafts. During that period of time, everything is in connection to the theme after which the students must perform or show their skills.

6. A project on global warming, own photo

This kind of teaching is similar as of the alternative teaching programmes in Hungary. The difference is that they do not teach in this style all year around therefore when project weeks come, the students are really looking forward to them. They even organise

[4] Photo made by Ágnes Judit Presér, published at http://hvg.hu/itthon/20160415_finnorszag_kozoktatas_tampere_okostabla | Last dowloaded: 11/18/2016.

performances or exhibitions based on their projects to which they invite their parents, the city governor and the members of the local education board. They even appear in the local news.

Students participate because they feel motivated and involved. The teachers know that the students will do their best given the fact that they want to perform well. This system, as we can see, is based on trust which was evident wherever we went. During our talks with the educators, it turned out that in Finland no testing takes place. The first test students encounter is the Matura examination. Of course, students are evaluated – but by themselves. After lessons students have to fill in a short questionnaire and answer some basic question about their performance. Teachers record those notes and add their own suggestions. Students and their parents alike can read the reports so together they can decide on the best way to develop the pupil.

Not only the students are not tested, but the teachers are not evaluated, either. In Finland, the teachers are among the best-educated and most respected people, and the government accepts this fact. There is no supervision and the teachers are given freedom. The national curriculum was written by 300 teachers and contains only 10% of the school curriculum, so the schools and teachers can decide what they want to do. In this respect, the teachers do not feel oppressed or forced to focus on topics just because those are obligatory. Moreover, if a teacher is trusted to choose their own materials, they will teach that with pleasure which is beneficial in long term, given the fact that burning-out might be avoided that way.

The word trust is essential here. In Hungary, we do not trust our students. We test them, we give them daily homework because we do not believe that they were capable of learning on their own, we choose the materials ourselves because we do not feel they could do that. We hardly ever give them freedom because on the one hand, we were socialised that way, and on the other hand, because we are never given freedom, either. Unfortunately, in Central Europe teachers are the slaves of the system in a way that they are oppressed.

However, some questions arise. Is it only freedom that matters? Would the system be better if we were provided with more choices? Could we motivate the students more? These are very hard questions to answer. However, the truth is that based on what I have seen, the answer is maybe. With time, we could get to the point where the participants of education are trusted. Until then we can buy the fanciest equipment, print the most flamboyant books and develop the best digital materials, there will be no changes because in Hungary school is a must and not a great place to be.

Teaching takes at least two: an educator who wants to teach a new skill and a student who wants to master that skill. The whole teaching process should be based on mutual trust and cooperation. In an ideal world, the student would tell us what skill they needed to develop and we would decide together how to do that. We should not teach them as the original sense of the word suggests, but must facilitate and monitor the progress and report back on

the development. However, it is the student only who could decide if she or he has reached the aimed target in skills development. Not the teacher, nor a standardised test. After all, she or he should be the beneficial of our work.

At least this is what this project has taught me, and for this experience and realisation I will forever be thankful for both TAMK and BME.

András BENEDEK

Open Content Development Model (OCD)

1. Introduction

The research group that, besides experienced and academic researchers, includes practitioners as well as students who are engaged in scientific student work and are attending their engineer and economist teacher evening courses while being present in school practice, was established in 2015 within the framework of the Department of Technical Education and the Teacher Training Centre of the Budapest University of Technology and Economics (BME) with the aim to implement a project focused on researching methods supporting learning, and initiated and financed by the Hungarian Academy of Sciences (HAS). Relying on this specific base of researchers and practitioners, our project undertook to develop and introduce new procedures based on the experiences and analysis of the educational methods used by vocational teachers during their work. By presenting the research topic, this paper intends to introduce the process, in this case the open content development and the work done in order to create a new model of this, which allows the active participation of students in research and development as well as the connection of smaller researches into bigger research projects.

2. Setting out – international and domestic tendencies

Within the frames of the call for methodological programs announced by the president of the HAS in 2016, we undertake, in accordance with the specialities in Hungarian vocational education, to develop a methodological training related to complex subjects. Building on our domestic and international research and development activities carried out in this field during the latest years, the developed methods and procedures will be applied in practice, the electronic learning resources elaborated and tested, and efficiency checked in a school VET environment. We implement our research, test the results and apply and analyse the effects and results of the vocational methodology in a development environment, by *implementing school practice and the network dissemination of the vocational methodological model at vocational training institutions* as well as preparing workshops and conferences and summarizing their outcomes and implementing researches in certain issues.

Concerning international trends, we must refer to the fact that during the economic crisis of the latest decade, it was typical in the world economy that successful economies, primarily the countries leading in technological development (the USA, Japan or England) came over the crisis as a result of an extremely intensive and focused process which included the renewal of their education and training as well. This process exerted an impact on the public opinion about technical-technological culture as well as the systems of vocational training, its internal structure and the applied methods. According to the comparative study by the CEDEFOP, in Hungary 73.8 percent of the pupils in secondary public education attend general, non-vocational education (level ISCED3), while 26.2 percent attend vocational education (*CEDEFOP, 2015*). In several developed countries with educational systems similar to that in Hungary (e.g. Austria, Belgium or the Netherlands), the rate of those attending

vocational training is higher, around 70 percent. In France and Germany, the share of general and vocational education at this educational level is 50-50 percent.

In progressive educational systems, vocational training has a special situation in the sense that this is the space where preparation for the widest labour division happens. In this dynamic process, inter-disciplinary views gain more and more space, and the development of the ICT environment of education prefers solutions more flexible in content and organizational frames against the traditional, rigid vocational education based on the system of subjects. This is justified on one hand by the extremely rapid development of professional content, the rigid nature of subject structures (in relation to Hungarian education we may also refer to the narrowing of the time frames dedicated to theoretical subjects and knowledge transfer in the latest decade), and on the other hand by the relatively low and decreasing tendency in the learning motivation of the students in vocational education (which is an international tendency as well). From an education theoretical view, the methodological modernization of VET searches for answers concerning problems of content and a wider pedagogical spectrum, as well, i.e. the question: *how is it possible to transform rapidly changing vocational content into learning resources, and to make learning more effective within the relatively limited time frames and by increasing students' learning activity*? The creation of open learning resource structures characterized by the constructive participation of active learners has become an important thread in the international educational development of content and methodology. Another feature is the possibility of mass access that is now supported by effective and interactive online interfaces. Although it is the higher education initiatives that lead in this field (MOOC – Massive Open Online Courses), in VET the high number of participants, their professional diversity and their growing age urge the methodological adaption of those solutions.

In Hungary, the legal regulation of public education and VET was renewed between 2011 and 2015, and the system of teacher training took a turn. The Regulation no. 8/2013 (30.I.) by the Ministry of Human Resources on the common requirements in teacher training and the training and output requirements of the teachers' preparation regulated the system of general and vocational teacher training which succeeded the Bologna system and is in force today. It is a general requirement towards teacher training that graduate teachers be prepared and able to:

- implement the tasks determined in the National Curriculum, on the basis of the development fields and pedagogical objectives, transmit the values of educational-pedagogical work as well as knowledge contents, build knowledge and recognize and develop key competences;

- implement pedagogical work in the phases of school work determined in the Act on Public Education in the institutions of the public educational system within the knowledge field of the approved framework curricula based on the National Curriculum as well as in the institutions of training outside the school system and in adult education in the fields corresponding with their scientific and vocational studies;

- actively participate in education development programs according to their knowledge and practice.

Our methodological research is focused, also considering the lessons learnt from international trends and amongst the specific domestic frameworks, on the differentiated

direction of teachers' classroom work and the adoption of effective pedagogical methods and processes. Vocational methodology is of outstanding importance in this context also because through teacher training – as most of the students are practitioners who possess engineer-economist degrees and work at vocational training schools – it is possible to transplant the research results into practice at a pace corresponding to that of the dynamic professional development described above, and in the future, vocational teachers may play a multiplier role by applying the new methodology.

We have focused our work on **the development of vocational methodology and vocational knowledge and the support, organization and direction of learning** because developing open education resources with the active participation of students can improve vocational knowledge (of the students as well as the teachers), and the new way of supporting learning can – according to our experiences – considerably improve the effectiveness, organization and guidance of learning.

The objective of our MSc training implemented within vocational teacher training is to prepare students to teach certain vocational subjects at „the grades of school education offering preparation for vocational qualification, in vocational training and secondary vocational education within and outside the school system, in adults' training and further education as well as the vocational trainings determined in the National Qualifications Register (NQR). From a methodological aspect, it is an important difference, if compared to the methodological researches on general education, that vocational teachers are not only allowed to teach in school system vocational training but outside the school system as well, so besides being prepared to teach the age group of 14 to 18, they must also be prepared to participate in the vocational training of the young adults and SN students. In this respect, our research represents the aspects of life-long learning as well, and beyond formal teaching, it may contribute to the development of non-formal and permanent training, too.

In the present system of vocational teacher training, vocational training can adapt to the changes illustrated by the number of lessons mainly through its professional and methodological content. An important feature of adaptation is the adjustment of education content to the NQR trade group and sectoral vocational training system requirements, i.e. assuring the preparation for the students graduating from vocational teacher courses so that they become prepared to teach as wide range of vocational subjects as possible. This is also reasonable because this is the best way of warranting employment for the vocational teachers at secondary vocational schools and vocational training schools. Preparation to teach the vocational subjects of trade group and sectoral vocational training means that in addition to preparing them to teach 5-6 (or often 4-14) vocational subjects, other competences must be improved as well.

Preparation to teach trade group and sectoral vocational training content is highly limited by the fact that many of the school books supporting the teaching of vocational subjects at vocational training schools and vocational secondary schools, especially those for vocational training schools, are lacked, so teachers are only guided by the aspects defined in the system of requirements of the certain subjects in the vocational framework curricula. At the same time, they lack experiences in content development or methodological preparation, and students' learning can also be considerably limited by the features they face in classes which they did not meet at the preceding grade of their education. All these made it reasonable that content development and so a new vocational methodology was put into the focus of

our activity striving to modernize teacher training within the wider framework of which we established by successful vocational teacher training TÁMOP (Social Renewal Operative Program) projects between 2011 and 2015.

3. The professional background of development

BME is a leading institution in Hungarian vocational teacher training and further education with considerable professional references. Teacher training has been a continuous activity within the university for almost one and a half century, and during the latest 50 years, our institution, within the frames of the pedagogical department and institute, has implemented vocational teacher training of the highest volume in Hungary, and these results have always been completed by vocational methodological developments. Relying on these preliminaries and the measures of the new act on higher education, BME Teacher Training Centre was established within the frames of the Faculty of Economics and Social Sciences, continuing by the activity of the Department of Technical Education as well.

The research group undertaking activities within the project has implemented several researches during the latest years. The professional program of the coming period can organically be built on the projects entitled “Establishment of service and research networks supporting vocational teacher training (TÁMOP-4.1.2-08/2/B/KMR-2009-0002)” and “Teachers’ training for BME educators (TÁMOP 4.1.2-08/2/C/KMR – 2009 – 0005)” both of which were implemented between 2009 and 2011. Teacher Training Centre ensures a vocational methodological background and development resource meaning the impact of which will be felt in the long run. These two projects were followed by the one entitled “E-teaching culture and digital content development at BME (TÁMOP-4.1.2. A/1-11/1-2011-0023A)” which was implemented between 2011 and 2013, and is the direct preliminary of our present project.

The target groups of the developments are:

- participants of MSc vocational teacher training of cyclic and uniform systems, BSc vocational educators;
- concerning humanities, students attending teacher training in health care, pedagogy or special education in the cyclic system;
- teachers and mentors of the vocational training institutions leading and mentoring pedagogical and personal field practices that make parts of teacher training;
- teachers and mentors of vocational training institutions receiving career starter trainees.

The research topic is basically connected to the developments that have already begun: human resource development, teachers’ communication and methods, distance education, e-learning, *best practices* in further education, life-long learning, non-formal learning and the development of technical competencies. In our work group established to implement the research tasks undertaken in the project, the BME Teacher Training Centre connects to the creation of complex subjects in vocational training, in addition to its professionals involved in the research and education of vocational methodologies, by implementing researches in the fields of system theoretical, ICT and mathematical knowledge and educational resource representation, offering a creative representation of the theoretical approach. It is an important factor that teachers who possess practical experiences in vocational education

and may provide valuable contribution to the aspects of practice and applicability through their valuable Scientific Students' Circle researches, outstanding methodological practice, experiences gained in the development of ICT learning resources, methodological solutions adapted to special needs (SN students) and their connection to model schools are also involved in the work. The vocational teachers working at schools offer the possibility of testing our methodological developments, within the frames of a long-term cooperation established with the BME Teacher Training Centre, at the following partner institutions:

- József Öveges Secondary Vocational School and Vocational Training School of the Budapest Mechanical Vocational Training Centre
- János Bolyai Secondary Technical School and Boarding-school of the Budapest Technical Vocational Training Centre
- „Budapest" Baptist Secondary Vocational, Grammar and Sports School
- Elek Kada Secondary Vocational School of Economics of the Human Vocational Training School of Kecskemét

4. The core elements of the concept

In addition to the digital education resource development preliminaries introduced above as references, the concept worded in our current project is content development realized with the active participation of students and teachers, a process in which we form strong and organic connections between visual learning and practical education. The realization of the importance of the vocational methodological paradigm to be elaborated in relation to VET was greatly urged by the "Visual Learning Lab" (VLL) established at BME in 2008 which offered domestic and international scientific and innovation background as well as the international communication process within the frames of which the VLL Conference Series (I-VI.) created a representation interface (http://vll.mpt.bme.hu/index.php?lang=hu), and a book in English (*Visual Learning I-V, Peter Lang Verlag, 2011-2015*) was published each year (*Benedek, Nyíri 2013, 2014, 2015)*.

From a pedagogical point of view, it is evident, and does not need to be proven in VET either, that pictures have always played an important role in human communication. "Visual homecoming" (*Nyíri*, *2015*) exerted an increasing impact on everyday communication, and so on education and institutional education as well, especially around the Millenary. The massive spread of ICT tools exerted a considerable effect on learning processes, and at the beginning, it was exactly institutional education (schools, universities) where it was very difficult to bring these into compliance with the knowledge planned and represented according to the algorithms included in the curricular schemes. The visual content and the proportion of the electronic materials representing the current development of the technical infrastructure in the traditional school books has not changed much during the latest one and a half or two decades.

It was exactly the VLL within the frames of which the current interpretation of the nearly half-century long debate on engineer training, which possesses the most important traditions in technical education (*Ferguson, 1977),* has pointed out the fact how limited the current educational paradigm is in building on the enormous potentials hiding in visual learning. The growing importance of practical orientation, which is brought into the foreground in vocational training in our days, urge methodological developments to break

with traditions in the new subject constructions, and to utilize the new technical opportunities offered by digital environment. This environment is especially up-to-date in vocational education, which makes a special part of public education, where teachers are to teach this type of practices and working activities to the students.

Primarily owing to the spread of business IT applications (*Kampffmeye, U.; 2006*), *content management* is used in a wide range of contexts; the lecture, however focuses on the narrower field striving to find the new forms of educational content and the possibilities of permanently renewing it. Technological development and the relatively slow nature of content renewal in the VET systems both require innovative solutions differing from the traditional ones in creating and transmitting educational content and supporting learning. Concerning the research introduced, a kind of peculiar framework is provided by the fact that the innovation, which takes open source content development as one of the approaches of reforming teacher training, is connected to a technical university of long-existing traditions (*Benedek, A; Molnár, Gy, 2014, 2015*).

The theoretical background of this topic is partly of VET didactical features (*Gessler, M.; Herrera L. M.; 2015),* and is partly connected to the endeavours which strive to shape the alternatives of the traditional VET curricula in a learning environment determined by modern IT and which require interactivity not only in the learning process but during the construction of the curriculum as well (*Colons, A.; Halverson, R. 2009; Benedek, A.; Molnár, Gy. 2015*). For community curriculum development, teacher training might provide especially good conditions which we exemplify by presenting our research data. Developing Open Educational Resources (OER) with students' participation means a potential of content and methodology that, through the pilot curriculum development (*Systems in VET*) and the applied IT solutions (open source and commercial LMS systems, memory independent management of complex visual elements and the flexible management of micro-contents) is capable of surpassing traditional, school- and notebook based teaching.

The methodological speciality of our research was modelled based on theoretical analysis and relying on which curriculum development tasks were implemented with the participation of engineer and economist teacher trainees. Some tasks completed in the process of elaborating the online curriculum headed towards the creation of a *content management* model. The queries and interviews made with the students and the management of the micro-contents elaborated by the students can be looked at as new procedures.

The core of our research was to involve students (future vocational teachers) into the process of OER development, and to provide them with a methodological knowledge that can be used in the permanent improvement of active learning using community content development elements. Thus from a methodological aspect, we consider this procedure to be ***Open Content Development (OCD***). This methodological approach is built on the following recognitions:

Starting from the school environment and the students' motivation to learn, which in some cases denies traditional solutions, in our research we presupposed that by relating image learning and practical solutions to the learning material, those undertaking knowledge representation and the learners can be provided with the possibility of improvement in a more organic way. At the level of conclusions, this approach might lead to new pedagogical apprehensions, and we have good reasons to suppose that further research and

development work bears the opportunity of the real methodological modernization of teaching and learning.

Concerning traditional learning material constructions, the improvement of the efficiency of education dominated by verbal elements and the new methodological approaches (co-operative methods, project works, forms of community learning) (*Siemens, 2005*) are rather limited because of considerable time and information capacity needs as well as slow correction mechanisms. The "modern" learning materials having developed by the end of the 20th century remained unchanged concerning their linear structure, the dominance of written texts (80 percent in average), static image conveyance in terms of verbal, and image communication. Although electronic learning resources and multimedia e-learning representations include more dynamic (flash, video) content, the "logic" of building up learning materials has changed little – in fact, visual content is only a (written and oral) completion to verbal communication. Therefore, as a core element of our concept, we strive to make the process of content development open, and involve teachers and students/pupils as active participants by dedicating constructive activities, the results of which can be suitable to complete or colour the learning material, or represent possibilities of practical adoption.

A core characteristic of the introduced paradigm is the increased share of the visual content elements in order to achieve a more effective construction and learning of the information to be transmitted. This increase, however, should not be of an unproportioned measure but should comply with certain interconnections, which could assure that the rate of the two necessary forms (verbal and visual) can evolve in compliance with the specialties of a certain topic, age and vocational didactics. From a methodological point of view, especially in the cases of mathematics and scientific disciplines as well as the applied sciences closely related to these (technical sciences and their application offer good examples of these), at the theoretical dimension, learning resources usually contain verbal elements in the form of texts (***t***) that are completed with visual elements (***v***) and mathematical formulas (***M***). Traditional learning material representations (notes, books) generally include the combinations of these, and are mainly organized sequentially, in a linear way. For example: explanation, figure, explanation of a formula, etc. In many cases, the example or case (***C***) referring to practice and introducing certain special applications is casual and incidental.

In the course of our researches on new digital learning material constructions we do not visualize the knowledge elements (***L₁…L₃***) sequentially (which in most cases means printing) but, with the help of electronic tools and procedures, in a virtual space, where the knowledge elements ***L₁…L₃*** are placed on the surface of a quasi-endless plain. Later new and new knowledge elements can be added here. As a domestic preliminary, we can refer to the Hungarian Virtual Encyclopaedia in which image representation shows the essence of the structure, i.e. that knowledge elements can be organized into a scale-independent system. *Figure 1.* shows all this in a simplified way:

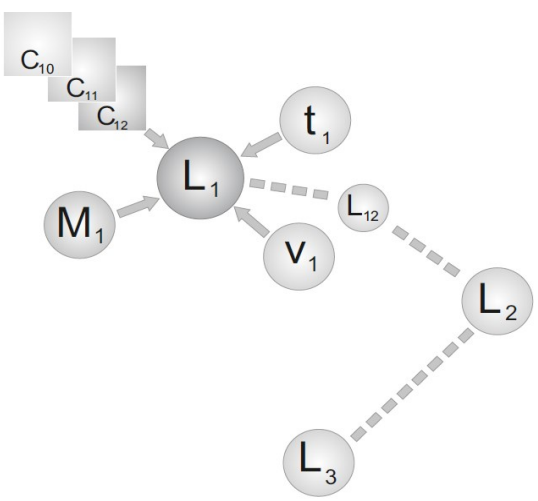


Figure 1.: Knowledge elements(L) and their visual (V), verbal (t) and mathematical (M) components

In the cases of open learning material structures, new components can be built in "between" the learning elements. At the same time, it is an important possibility that the graph structure can be completed with case studies and examples (***C*** components) which can make the resource unique, and provides the opportunity of active participation and creation for the student and the teacher, the motivation impact of which is probably of considerable strength. *Figure 2.* represents the connection of knowledge elements: in case it is wanted or necessary, an optional set of ***C*** components can be added to the learning material elements.

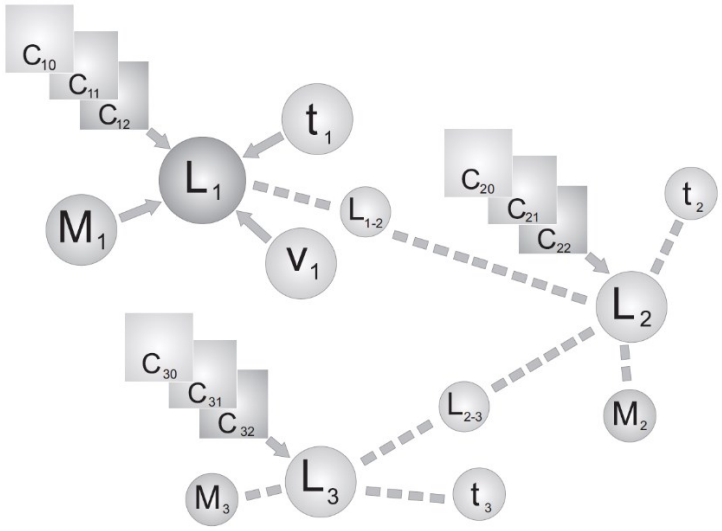


Figure 2.: Connection of knowledge elements $L_1 – L_2 – L_3$ and the possibility of completion (L_{12} and L_{23})

Our conception is aimed at involving students and willing teachers and undertaking active participation in building a learning material construction that is created with an open access approach – providing the possibility of community content development for the concerned learners' groups or classes as well. It is also an innovative activity of ours to provide huge background storage and cloud services which this process needs. This way, we are able to provide a development infrastructure for the teachers, teacher trainees or students involved in the development of the vocational methodology and the learning resources better than ever before, directly through the Hungarian Academy of Sciences and indirectly through the utilization of the services.

In 2015, we undertook to elaborate a new complex curriculum that, on the one hand, offered a framework for a general course on the analysis of system theory, and on the other hand, allowed students to prepare case studies by which they could participate in the development of the curriculum of the course. We followed the general rules of OER development, and in the autumn of 2015 we started teaching the "System theory" course to a major group of the students questioned in our survey; an e-learning resource was also

made for the course (*Bars, Vámos, Nagy, Monos, Max, Benedek (ed), 2015*), and the solutions of the exercises were administered in the Moodle system.

The e-resource was created within the frames of a development which strived to surpass the usual forms of traditional learning materials and even their e-learning adaptions. We do not consider the written resources closed and finished, the curriculum is supplemented by exercises completing it with visuals (pictures and illustrations) thus learning will be even more closely related to activities and practice. The examples might urge the reader, the students elaborating the materials in groups and within study frames, to participate in further common thinking.

Since 2015, a tool - ***Sysbook***[1] - is linked to the learning material; it makes, in terms of openness, the thematic connections more colourful and perhaps even raises them to a higher level by visual and mathematical inter-connections and complex examples. This possibility is, of course, dependent on the vocational interest and previous competences of the users of the resource as well. We introduce this type of perspective through several everyday examples: for instance, we analyse the processes of cooking or car driving to discuss what our system and its environment is like, how it can be modelled and how we can influence our system so that it will behave the way we wish it to. System perspective helps professionals with no engineering background as well, so that they will be able to examine the systems of their own professional field with this type of outlook, too, and so be able to make decisions that are more advantageous. Fields like this are, for example, health care, medical technology, economics, etc.

The very wide spectrum of VET and the dynamics demanding continuous changes mean a permanent development task in the case of education resources as well. In our case, the dual functional linkage of teacher training (learning and transmission) gave us the opportunity to examine the first phase of the evolution of student activity, the nature of their attitudes. This is followed by the construction phase in which the students actively participate in the development of OERs by elaborating case studies and micro-contents.

According to our hypothesis based on the previous researches, the mutual connection system of knowledge elements, at the level of the micro contents used in an increasingly wide range in education development, can appear in complex learning materials. Adopting micro-contents as micro learning units in practice seemed also reasonable owing to the fact that with the spread of “smart” devices the information gathering habits have also changed. The common features of the most popular mobile communication applications are the provision of the experience of promptness, the possibility of directly addressing the others involved in the service and the “quantum-like” nature of the transmitted information, having

[1] The original objective of the Sysbook, which has permanently been and is still being developed since 2014, and which is now registered in the volunteer work registry by the National Office of Intellectual Property (Registration no.: 004873), was to introduce the basic notions of system theory and control engineering in a descriptive way easily comprehensible by anyone on one the hand and more deeply through explanations and mathematical descriptions on the other. This is partly more than the students dealing with this topic in vocational teacher training must undertake. Therefore, from the aspect of teaching methodologies and teaching itself, it was especially important to indicate the optional relations to ***Sysbook*** in the learning resource by providing links in the curriculum.

been tailored to fit size. This latter is dependent on the size and resolution of the mobile display, the limited nature of the user's divided attention, the characteristics of the user interface of the certain application and the strategy to neglect the disturbing environmental effects caused by mobility.

The vocational learning material that can be modelled in a scale independent graph structure helps the acquiring and control of knowledge mainly by connecting verbal and visual knowledge elements, mathematical representation (both theoretical and the type offering practical aspects) and case studies and practical examples allowing the users to complete them. The applied ICT solutions make it possible that each of the elements of the graph-like knowledge lumps forming in the virtual space is to be completed by an information text, an image-centred material which demonstrates visual representation and is easy to be transmitted to young people and, if possible, a mathematical representation fitting the knowledge of the certain age group.

Owing to the complex nature of VET, the knowledge elements being formed on a wide professional platform and possible to be verified by the teachers' methodological culture can summarize the interconnections described at a theoretical and general level in an up-to-date form and at an optimal length. Resulting from the open structure, this system is more suitable than traditional solutions for having new components presenting interdisciplinary knowledge elements built in. In addition, case studies and examples may make learning more effective and, supposing there are relevant solutions, can make community content development (done by students and teachers alike) more rapid and targeted. The case studies, good examples and practical applications can make the acquisition of the material, which in many cases seems to be merely theoretical, livelier.

The first learning resource construction of this type has been being elaborated as part of the new type of electronic learning resource meant for teachers working in the secondary level vocational training entitled "*Introduction to systems*" (*Bars, Vámos, Nagy, Monos, Max, Benedek (ed.), 2015*) within the frameworks of the digital education resource development mentioned as a preliminary of these researches, which was initiated and is done with the participation of academician Tibor Vámos, since our preparation for the first methodological tender call announced by HAS and the informal birth of the research team (2014).

Another topic of the research important from a methodological aspect was the use of cloud services. This means the storage of complex ***open access methodological materials*** (being continuously completed in terms of contacts and elements) in clouds. According to the present ideas, this would offer a service for school users in the course of which the certain service would not be provided on a concrete, dedicated hardware but dividedly, on the supplier's hardware; i.e. a high level of availability of divided and redundant servers would be provided together with a strong protection against data loss. The core of the *open access* principle is the provision of open access where the progressive adoption of security protocols is not an obligatory factor. The possibility of collaborative work, continuous data synchronization and backup, automatic refreshment, the shareability of contents and data encryption are all advantageous factors.

5. Expected results

The result of the four-year research will be the birth and practical introduction of a new vocational methodological learning resource development model which is aimed at the open (active participation of students and teachers) development of learning content (OCD) and its practical application. With regards to the complex subject feature of VET, the new electronic learning resources will be elaborated and tested, the results checked and the research results summarized in a wide spectrum of vocational training – mechanics, informatics, electricity and economics – and in terms of the subjects of secondary level vocational training.

Since the narrow research group includes the academic representatives of various disciplines as well as methodological professionals working in vocational teacher training and the school practice of vocational training, as a working method, we organize one-day expert workshops for 15-20 people in every half a year, and plan to have conferences providing professional publicity and dissemination possibilities. From the aspect of the introduction of the first results of our research activities, the preparation of these events is a working form offering the possibility of intensive cooperation and constructive debate for each of the participants of the researches. These workshops are also important documentation phases in terms of the preparation, the plans and the programs that can give important input impulses to the common work.

During research and development, it is a highly stressed task to assure the active participation of the vocational training partner institutions and their teachers in the first phase of the project (2016-2018) at the four vocational training institutions mentioned above. After the first phase of the vocational methodology development process, which is testing, we prepare the extension of the vocational development model in the second part of the project period in a wider range of vocational education institutions, establishing an innovative methodological network consisting of 10-12 schools in which we will analyse the possibilities of student-teacher interactive open education resource development in practice as well, and evaluate its impacts. Relying on the experiences gained in this process, we will make proposals concerning a wider range of testing at vocational secondary schools and vocational secondary grammar schools, and include the lessons learnt from the experiences into vocational teacher training.

6. Referred literature

Bars Ruth, Vámos Tibor, Nagy Dezső , Monos Emil , Max Gyula,Benedek András (szerk.) (2015) *Rendszerek a szakképzésben,* (ISBN 978-963-313-206-7), Budapest: BME Tanárképző Központ, 123 p.

András Benedek, Kristóf Nyíri (eds.) (2015) *Beyond Words: Pictures, Parables, Paradoxes* (Visual Learning; 5.),(ISBN 978-3-631-66385-1) Frankfurt/M.; Berlin; Bern; Bruxelles; New York; Oxford; Wien: Peter Lang Internationaler Verlag der Wissenschaften,, 2015. 260 p.

András Benedek, Kristóf Nyíri (szerk.) (2014) *The Power of the Image: Emotion, Expression, Explanation.* (Visual Learning; 4.),(ISBN 978-3-631-64713-4) Frankfurt/M.; Berlin; Bern; Bruxelles; New York; Oxford; Wien: Peter Lang Internationaler Verlag der Wissenschaften, 287 p.

Benedek András, Nyíri Kristóf (eds.) *How to Do Things with Pictures: Skill, Practice, Performance*
(Visual Learning; 3.) (ISBN 978-3-631-62972-7) Frankfurt/M.; Berlin; Bern; Bruxelles; New York; Oxford; Wien: Peter Lang Internationaler Verlag der Wissenschaften, 2013. 224 p.

Benedek András - Golnhofer Erzsébet (szerk.) (2013) *Tanulás és környezete.* Tanulmányok a neveléstudomány köréből, (ISBN 978-963-508-751-8), MTA Pedagógiai Tudományos Bizottság, Budapest, 298 p.

András Benedek, György Molnár (2014) *ICT in Education: A New paradigm and old obstacle*
In: Arno Leist , Tadeusz Pankowski (Eds.) ICCGI 2014 : The Ninth International Multi-Conference on Computing in the Global Information Technology . (ISBN: 978-1-61208-346-9), Sevilla , Spain, pp. 54-60.

András Benedek, György Molnár (2015) *New Approaches to the E-content and E-textbook in Higher Education*, In: L. Gómez Chova, A. López Martínez , I. Candel Torres (eds.)INTED2015 Proceedings: 9th International Technology, Education and Development Conference. (ISBN 978-84-606-5763-7) Madrid, Spain, International Academy of Technology, Education and Development (IATED), pp. 3646-3650.

Cedefop (2015) *Vocational education and training systems in Europe. Spotlight on VET*, Luxembourg, doi: 10.2801/5006-978-92-898-1374-8, 70 p.

Ferguson, Eugene S. (1977) "The mind's eye: Nonverbal thought in technology." *Science* 197. 4306: 827-836.

Grenfield, P. (2009) „Technology and informal education. What is taught, what is learned.” *Science*. 323, pp. 68-71.

Gessler, Michael; Herrera, Lázaro Moreno (2015) *Vocational didactics: Core assumptions and approaches from Denmark, Germany, Norway, Spain and Sweden*, International journal for research in vocational education and training 2,) 3, S. pp. 152-160.

Kampffmeyer, U. (2006), *Enterprise Content Management*, Unternehmens beratung Dr. Ulrich Kampffmeyer GmbH.http://www.project-consult.net/Files/ECM_White%20Paper_kff_2006.pdf (letöltve: 2016.04.19.)

Kristóf Nyíri (2014) *Meaning and Motoricity-Essays on image and time* (ISBN: 978-3-631-65134-6) Frankfurt/M.; Berlin; Bern; Bruxelles; New York; Oxford; Wien: Peter Lang Internationaler Verlag der Wissenschaften, 152 p.

Molnár, György (2014) *Modern ICT based teaching and learning support systems and solutions in higher education practice*, In: Milan Turčáni, Martin Drlík, Jozef Kapusta, Peter Švec (ed.) 10th International Scientific Conference on Distance Learning in Applied Informatics. 654 p. Praha: Wolters Kluwer Law and Business, pp. 421-430.

Molnár György (2014) *Pedagógiai megújulás tapasztalatai a szakmai tanárképzésben - új IKT alapú eszközök és koncepciók a tanárképzésben*, In: Ollé János (szerk.) VI. Oktatás-Informatikai Konferencia Tanulmánykötet. Budapest: ELTE PPK Neveléstudományi Intézet, pp. 434-452.

Siemens, G., Connectivism (2005) ”A learning theory for the digital age.” *International Journal of Instructional Technology and Distance Learning* (ISSN 1550-6908),Vol 2. No. 1. http://www.itdl.org/journal/jan_05/article01.htm (letöltve: 2016.04.20.)

Sysbook (2016) - Készült a Magyar Tudományos Akadémia Automatizálási és Számítástudományi Intézete tudományos programjának keretében a Budapesti Műszaki és Gazdaságtudományi Egyetem Alkalmazott Pedagógia és Pszichológia Intézetével együttműködésben, http://sysbook.sztaki.hu (letöltve: 2016.04.20.)

Marc GOOSSENS

A strong token of interest for an excellent book about Life Long Learning

For anyone who is involved in Lifelong Learning and wants to get a deep understanding of why and how it fits the present and near future evolution of our knowledge society, Anikó KÁLMÁN's book " Learning – in the New Lifelong and Lifewide Perspectives "[1] is an absolute must.

I have been involved in Continuing Engineering Education for some twenty years and I have known Anikó for about half that time, so, though I knew that her book would be interesting, I was curious to read it. I have to admit, not only that it brought to me lots of 'things' I did not know of, but also that it opened new perspectives for further thoughts.

Jointed in three main chapters, this book can be considered as a system composed of two adjacent rooms (the first and the third chapters) linked by a sort of one-way door (the second chapter):

- The first – and longest – chapter describes the "state of learning" in the first room – which most of us are still living in – and why a change of paradigm is necessary, driven by the impact of globalization and new technologies upon the fabric of society. In this long chapter, the author, in line with the title of her book, presents a perspective of learning as an activity, both along a time axis (historically speaking) and a space axis (with its different systems and sub-systems).
- The second chapter explains the mechanism thanks to which the door linking the two rooms could be opened: a more social innovation process, for which the Knowledge Triangle acts as a conceptual key. In the same way that a door is thinner than a room, this short chapter is just a suggestion of how to push on the handle and open the door.
- And the third chapter describes the "state of learning" that we could expect to achieve in the second room, mainly the relationship between different types of teachers and different types of learners. Although this second room is gigantic, this third chapter is also very short, because we are blind as regards the future, we can only discover it gradually as we build it ; and there is no single way to build our future.

From the beginning of the first chapter, as the author introduces the three main values of modern society and opposes eco-philosophy to the present philosophy, the reader will understand that he or she is bound for a fundamental approach of lifelong learning, considered here as a basic element of our knowledge society.

To that respect, considering – as the author does – that lifelong learning has also to be a lifewide learning, in other words that it is not only the continuation of a learning activity along a temporal

[1] Edited by Tampere University of Applied Sciences, ISBN 978-952-5903-80-5, 2016

linear direction, but that it also comprises – as any educational process – a widening of the 'socle' upon which higher and higher levels of knowledge and understanding can become integrated in a harmonized way, is in my opinion an important – the most important indeed – contribution of this book.

The author shows that, as a result of this reinforcement process, the individual can pass from conformist learning to successively conscientious and autonomous learning (the temporal axis) and integrate nonformal and informal education besides formal education (the space direction). After that, in what forms the main part of her book, the authors analyses the various implications of this premise for all the aspects of learning – and therefore, also, of teaching – from a systemic point of view: learning and teaching become some sort of merged activity, the objective of which is not the individual, but the society in which this one is living. Therefore, the two main challenges are, on the one hand the transmission of knowledge and know-how from one generation to the next one, and on the other hand – as a consequence of the first challenge – see to it that the individual possesses a high enough level of skills to efficiently transfer his or her individual knowledge and know-how to society.

In the second and third chapters, the author considers more practical – and sometimes psychological – implications of the previous theoretical approaches, one being the necessity to link education and research to the needs of society (the motivation counterpart of those activities), and the other one being the requirements that have to be met for developing self-directed learning.

As a physicist, I know that all things in our universe are governed by the same laws, that we stand somewhere between the infinitely great and the infinitesimal, and that we cannot understand one if we don't understand the other one.

As an engineer, I know that, if I have to build some 'system', the environment in which this system is going to work is at least as important as the composition and the working of the system itself.

As a physicist and engineer having developed some expertise in Continuing Engineering Education, I deem education to be a living and extraordinary complex system that can efficiently serve society if – and only if – it takes into account both the needs of society and the requirements and limitations of its constitutive parts.

This is why I consider the concepts and viewpoints that are tackled in this book as being of utter importance to anyone involved in education, particularly in Higher Education and in Lifelong Learning, but also to all professionals who have to regularly update or widen their competencies. This is particularly true for engineers, as they work in a fast evolving sector and must resort to Continuing Engineering Education.

I can do nothing but prompt them to read Anikó KÁLMÁN's book.