

MULTI-COUNTRY SURVEY FOR THE TEACHING AND LEARNING PROCESS OF ICT LITERACY IN SECONDARY SCHOOLS

Genci Berati, MSc

Alpen-Adria Universität Klagenfurt (AAU) /
Faculty of Technical Sciences, Austria

Abstract

This paper presents results of a survey in different countries around the world, concerning teaching and learning process of Information and Communication Technology in secondary schools. A quality and quantity description and evaluation is carried out for 35 countries around the world. We have compared and classified those countries based on their performance in Economical and political stability, ICT National Curricular aspects, in ICT Infrastructure, Aspects of literature, in Methodologies of ICT teaching and learning and in terms of teacher competencies and training. All the aspects mentioned are considered as key factors. A process of analyzing this data is carried out in order to figure out the importance and real impact of each key factor in the process of teaching and learning ICT subjects, with the focus in lower secondary schools.

Keywords: ICT National Curricula. Computer Science Education. European Survey. ICT Teaching. ICT Learning

Introduction

This paper consists in partial results of a research with the final goal: Introducing International standards in process of teaching and learning of the ICT concepts in secondary schools in Albania. The second part of our project was monitoring and analyzing in international level the performance of different countries and the third part will be the implementation of a useful set of documents and tools to improve the process of teaching and learning process of ICT in secondary schools according to best international standards.

This paper shows the results of the second phase. We have chosen key factors which in our opinion are most important for teaching and learning performance of ICT in secondary schools. The key factors we have chosen are: 1) Political stability, 2) Economical situation (focus in

educational budget), 3) ICT Curricula for secondary schools (planning for hours/week), 4) General ICT teaching materials and literature for students, 5) Teaching Methodologies used, 6) Teacher qualification and training level.

We have done a survey in 35 countries all over the world. The countries are: Albania, Austria, Belgium, Denmark, Estonia, EU (average), Finland, France, Greece, Holland, Hungary, Indonesia, Ireland, Italy, Kosovo, Croatia, Latvia, Lithuania, Macedonia, Nigeria, Norway, Portugal, Qatar, Check Republic, Russia, Serbia, Sierra Leone, Spain, Sweden, Turkey, USA, Luxembourg, The United Kingdom, Cyprus, Malta and Romania.

In respect to the final aim, this research tries to evidence the level of importance for each key factor in process of teaching and learning ICT subjects in secondary schools and to find the best combination of key factors chosen to be focused, in order to have an optimal performance of the process in accordance with local conditions.

Methodology and technology

To complete the goal we used various methods of research, such are: 1) Survey in international formal reports, 2) Survey in related articles through internet, 3) Visits in different countries, interviews or electronic correspondence with key holders in different countries. 4) Questionnaires 5) Delphi Method (Susanne Iqbal, Laura Pison-Young July 2009) for quantitative evaluation of key factors. 6) Meta-Analysis and Synthesis.

The analysis is done by using a simple tool, made for this purpose. Also is used the functionality of MS-Excel with his statistical functions. We used Matlab 2.2 to do a complete regress analyze.

The outside key factors

We carried out surveys on Political stability and Economical situation with the focus in educational budget in different countries (30 different countries). Choose of countries for the survey is done by trying to find some undeveloped countries, developing countries, and some developed countries. The Political stability and Economical situation are considered as outside process key factors (kf1-kf2) (kf1 is Political stability key factor. There are 4 sub keys like: Democracy scale (kf1.1), Politic stability (kf1.2), Freedom and rights (kf1.3), General local Autonomy (kf.1.4). kf2 is Economical stability. There are 3 sub keys like: kf2.1 is GDP per capita, measured in % vs Qatar which has the value 100. kf2.2 is Educational budget vs GDP, measured in % vs Timor-Leste which has the value 100, kf2.3 is ICT teacher salary, measured in% vs salaries in Luxemburg which has value 100 in this study.). All the other key factors are considerate as inside process key factors (kf3-k7) with their sub key factors. The importance of inside and outside key factors

will be measured and analyzed. The importance of political and economical environment in education quality of a country is well known. We are trying to see the concrete impact on teaching and learning process of ICT in schools and to measure with proportional quantity the importance of this factor compare to the other inside factors. Education has become a political issue in many countries owing to its perceived central role in allocation of social, economic and political opportunities in society (Philip Harris Monchar, 1981). Let's see how the political stability and economical situation is related to the performance of ICT teaching and learning process in secondary schools. The ranking performance is first base in Descriptive-Qualitative. We do it by describing specific situation using interviews, observations, document review etc. We do a qualitative performance by taking in consideration things like: international assessments, international reports and opinions. Below we present the list of countries taken in consideration.

Quality reports

We have done the quality reports for every country. Based on those reports the groups of countries with best performance in politic and economic key factor are: Sweden, Finland, Norway, United Kingdom, Denmark, Spain, Luxembourg, Usa, Netherlands, Ireland, Austria, and EU. Luxemburg and Qatar. The group of countries with a good performance is: Cyprus, Czech Republic, Malta, Italy, Romania, Croatia, Greece, Turkey, Portugal and Serbia. The group of countries with modes performance is: Albania, Belgium, Hungary, Russia, Latvia, Lithuania, Estonia, Kosovo, Macedonia, Indonesia, Sierra Leone and Nigeria.

Quantity reports

We also created the quantity reports for every country. Those reports are based in international reports (Fridom on the Net, 2013); (Theodora, 2013); (World Bank Report, 2013); (European Report on Quality of School Education, 2000), on Delphi method, and related articles on quantity measure of education quality key factors (Ashraf S. Youssef, 2010). All key indicators are measured with values from 0 to 100. We did a simple normalization process by converting all kind of different evaluations into numbers from 0 to 100. All types of evaluations are converted proportionally in numbers from 0 to 100. We carried out also some aggregations to perform the evaluations for key factors and for overall evaluation. So the numeric value for the key factor is evaluated as average of all normalized values of his sub key factor. Being an average aggregation of columns, the overall evaluation is dependent the sub key variables.

Table 1 below is the final output of measurement process for kf1 and kf2 key factors. The last column is the final quality evaluation taking in consideration all key factors (kf1-kf7) with an equal importance factor:

Nr	Countries	Political Environment					Economical Environment				Total score	Rank
		kf1.1	kf1.2	kf1.3	kf1.4	kf1	kf2.1	kf2.2	kf2.3	kf2		
1	Albania	45,92	40,78	33,33	35,00	38,76	35,00	35,00	35,00	35,00	43,16	30
2	Austria	91,84	98,05	100,00	45,00	83,72	44,00	32,00	49,19	41,73	76,18	8
...

Table 1. Quantitative evaluation for Political Environment and Economical Environment for 2012-2013

Now we do a correlation comparison by calculating the correlation coefficients (The correlation coefficient, measures the strength and the direction of a linear relationship between two variables.).

We expected to have a linear correlation. The figure 2 shows that there is a kind of liner correlation between key factor and total evaluation performance. Let's calculate the correlation coefficient for linear regression (In statistics, linear regression is an approach to model the relationship between a scalar dependent variable y and one or more explanatory variables denoted x .). The kf1 has a correlation coefficient 0,87 to the total score and the kf2 has correlation coefficient 0,817 to the total evaluation. These two coefficients are above 0,5 so the correlation is fair enough.

Insight key factors

The quality reports for inside key factors (kf3-kf7). The third key factor kf3 (kf3 is ICT School infrastructure. There are 8 sub keys like: Pupils per computer (kf3.1), Internet access (kf3.2), Media equipments (kf3.3), School website (kf3.4), School Network (kf3.5), Home computers (kf3.6), ICT outside school (kf3.7), ICT Maintenance school staff (kf3.8)) is ICT School infrastructure.

The quality analyze

The quality reports emphasize the importance of this key factor, but this is not the most important.

There are between three and seven students per computer on average in the EU; the older the student the lower the student to computer ratio in most countries. There are on average over 100 students per interactive whiteboard and 50 per data projector: Malta, Denmark, Finland, Norway and Estonia have lower than average ratios of student to interactive whiteboards at more than one grade. Finland has consistently low ratios of students to data projectors at all grades. Laptops, tablet and notebooks are becoming pervasive, but only in some countries; on average in the EU there are between eight (grade 11 vocational) and 20 students (grade 4) per laptop. On

average in the EU, 37 per cent of grade 4, 24% of grade 8, 55% of grade 11 general and 50% of grade 11 vocational students are in highly ‘digitally equipped schools’, that is with high equipment levels, fast broadband (10mbps or more) and high ‘connectedness’.

No overall relationship was found between high levels of ICT provision and student and teacher confidence, use and attitudes. This and other findings from the survey suggest that supporting and developing teachers could be as important as providing technology, especially once a certain threshold of infrastructure provision is reached (FINAL REPORT, 2013).

According to quality reports, for each of other key factors (kf4-kf7) there are a lot of important findings. We will mention here for each key some findings:

- a. According to Curricular aspects we find that some best performing countries have not a national standard Curricula for ICT in schools (Linda Sturman , Juliet Sizmur, 2012). So they have some national strategies and total autonomy for the Curricula.
- b. For to ICT Literature and teaching materials in schools, for best performing countries we see a full set of useful learning materials and teaching materials like quality school books, ICT dictionary, teacher guides, prepared list of projects to perform with students, supplementary learning materials and alternative learning sources.
- c. For the methodology we see that many classical teaching methods are adopted in best performing countries to give. Methods like Brainstorming (Brainstorming is a group or individual creativity technique by which efforts are made to find a conclusion for a specific problem by gathering a list of ideas spontaneously contributed by its member(s)) or Inserting ((i.e., Interactive Notation to Effective Reading and Thinking) provides students with opportunities for reflection. Students make connections between prior knowledge and text content.) are widely used in schools. Methodology is different in west countries compare to east countries. The difference is caused from the difference between constructivism and behaviorism (Quality education in a multicultural context, 2011).
- d. According to teacher performance, the key success of best performing countries is continuous qualification of on duty teachers.

The quantitative analyze

The quantitative analyze shows some concrete dependencies between kf3 and total evaluation.

Nr	Contries	kf3.1	kf3.2	kf3.3	kf3.4	kf3.5	kf3.6	kf3.7	kf3.8	kf3	Total evaluation	Rank
1	Albania	30,00	57,00	30,00	40,00	80,00	30,00	40,00	50,00	43,56	43,16	30
2	Austria	90,00	90,00	66,00	86,00	95,00	62,00	85,00	85,00	77,86	76,18	8
.....

Table 2. Quantitative evaluation ICT infrastructure in secondary schools in survey group chosen

The regress analysis shows that the correlation between ICT infrastructure and ICT teaching and learning performance is 0,97. So this correlation number is in discordance with official quality reports. As we see, ICT infrastructure performance is strongest key factor.

Below will do the same think for key factors k4-k7.

The regress analysis for last four key factors relates the overall evaluation with the key factors respectively with those correlation values: kf4 (kf4 is Curriculum quality. There are 2 sub keys like: kf4.1 is Autonomy of curriculum, kf4.2 is Quality.) vs total evaluation correlation key is 0,79 while kf5 (kf5 is Literature, Here we have 3 sub keys: kf5.1 Quality of literature, kf2 Variety of literature and kf5.3 Autonomy of choosing literature) vs total evaluation correlation key is 0,95, kf6 (kf6 is Methodologies, Here we have 2 sub keys: kf5.1 Variety of Methods of teaching, kf5.2 Autonomy of Methods) vs total evaluation correlation key is 0,72 and for the k7 (kf7 is Teacher qualification, here we have 3 sub keys: kf7.1 Teacher background, kf7.2 ICT preparation, kf73 is Teacher didactic qualification) is 0,88. The table 4 shows

kf1	kf2	kf3	kf4	kf5	kf6	kf7
0,88	0,82	0,97	0,79	0,95	0,72	0,88

Table 4. Key factor weight in teaching and learning process of ICT in schools

We can do also a combination of key to see the relation with overall performance, so we can evidence the best combination with or more key factors. We tried to combine all sub key factors related to autonomy and the result is that autonomy is an important key too which has the correlation coefficient 0,93. The combination of Autonomy together with teacher ICT background and teacher ICT qualification is a good combination with the correlation 0,92.

Conclusion

This study is an effort to contribute in one of the most important issue in international level for improving the standards and quality of teaching and learning process, which is monitoring and evaluation of the outputs of the process. Now a day is a need to change from input orientation to output

measuring (Peter Micheuz, 2006). By having an instrument of measuring things from international databases we can find and decide in what to invest more for improving the process of teaching and learning. It seems to have slightly different conclusions from qualitative reports and quantitative measurements. The differences can be analyzed in details to find the reasons, why in International reports the k3 is not the most important and in quantitative calculations it is in fact the most important factor. This study can be expanded with much more related key factors and the conclusions can be more detailed for sub- keys and so on. The study is a good instrument to evaluate other empirical studies in this field, by comparing the rank of the countries performed from other kind evaluations.

References:

- The Delphi method: Susanne Iqbal and Laura Pison-Young with a step-by-step guide Vol 22 no 7 July 2009, pp. 600.
- Regional Educational Inequality and Political Instability: Philip Harris Monchar Comparative Education Review Vol. 25, No. 1 (Feb, 1981), page 1.
- Freedom on the Net is the fourth report in a series of comprehensive studies of internet freedom around the globe and covers developments in 60 countries that occurred between May 2012 and April 2013, April 2013.
- Data provided from <http://www.theodora.com/wfb>.
- World Bank, Annual Report, 2013. The Results 2013 report, the Financial Data and Organizational Information, and the World Bank Corporate Scorecard are available only in English
- European report on the quality of school education, May 2000].
- Key Factors in Achieving Education Quality, Published by Ashraf S. Youssef, 2010, Page 4.
- Survey of Schools: ICT in Education Benchmarking Access, Use and Attitudes to Technology in Europe's Schools, FINAL REPORT, A study prepared for the European Commission, DG Communications Networks, Content & Technology, [2013], ISBN 978-92-79-28121-1, page 33.
- International comparison of computing in schools Linda Sturman, Linda Sturman , Juliet Sizmur and Juliet Sizmur Research Report, January 2012.
- Survey of Schools: ICT in Education Benchmarking Access, Use and Attitudes to Technology in Europe's Schools, FINAL REPORT, A study prepared for the European Commission, DG Communications Networks, Content & Technology, 2013, ISBN 978-92-79-28121-1, page 33.
- Informatics Education at Austria's Lower Secondary Schools between Autonomy and Standards, Peter Micheuz, , 2006, page 3.