A Comparative Study of Methodologies of Teaching Web Technologies to Prospective Teachers in India and Latvia

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Abstract

Education and training are the key factors to maintain and improve the efficiency of use of Web technologies in a variety of life situations. In education and training, teachers are the key actors for the enrichment of learners’ use of Web technologies. To support learners’ use of Web technologies, teachers themselves have to be able to use Web technologies. However, methodologies of teaching Web technologies to prospective teachers are different in India and Latvia. The aim of the present research is to analyze the methodologies applied to teaching Web technologies to prospective teachers in India and Latvia underpinning elaboration of a hypothesis on teaching Web technologies to prospective teachers. The meaning of the key concepts of Web technologies and methodology was studied. Exploratory research has been used. The empirical studies were conducted at Dr. Sivanthi Aditanar College of Education, Tiruchendur, Tamilnadu, India, and Faculty of Pedagogy, Psychology and Art of the University of Latvia, Riga, Latvia, in 2012-2013. Statistical analysis of the dependent samples in each group was implemented for secondary data analysis. The research findings allowed drawing the conclusions on the effectiveness of two different methodologies applied to teaching Web technologies to prospective teachers in India and Latvia. The hypothesis has been formulated.

Keywords

Methodology; Web Technologies; Prospective Teachers; Comparative Study; Exploratory Research

Introduction

Looking to the 2030 horizon, a highly competitive and sustainable social market economy will be needed in order to maintain social cohesion (European Council, 2010).

Education and training are the key factors to achieve this aim. But for now, the 2030 horizon requires teacher training reform in order to facilitate teachers’ creation of new products, new patents, new entrepreneurial activities and new jobs as prospective teachers succeed harder to find a job in the light of enormous socio-economic and unprecedented demographic challenges. Therefore, innovative teacher training should teach how to turn challenges into advantages, thereby producing innovative products and services of the highest quality and improving their competitiveness.

Teachers’ innovativeness and competitiveness more and more depend on their use of Web technologies. A lot of research efforts were made to investigate teachers’ use of Web technologies in the classroom. These studies have highlighted how ICTs reconfigure classroom practice, create new variety of learning practices, change teachers’ and students’ role or improve students’ engagement and outcomes, among others (Crook, Park, Lawson, Lundqvist, Drinkwater, Walsh, 2010). However, little attention has been given to the analysis of teaching Web technologies to prospective teachers.

Such a lacuna has to be filled in as teachers and, consequently, prospective teachers have a two-fold role:

- in society, teachers are the agents of change and,
- in education and training, teachers are the key actors for the enrichment of learners’ use of Web technologies.

The research question is: how Web technologies are taught to prospective teachers in India and Latvia?

The aim of the research is to analyze the methodologies applied to teaching Web technologies to prospective teachers in India and Latvia.
underpinning elaboration of a hypothesis on teaching Web technologies to prospective teachers.

The meaning of the key concepts of Web technologies and methodology was studied. Moreover, the analysis demonstrated a potential model for development, indicating how the steps of the process are related following a logical chain: Web technologies → methodology of teaching Web technologies to prospective teachers → empirical studies within multicultural environments.

The present research employs comparative study as a qualitative research design (Flick, 2004). The exploratory type of the comparative study has been applied (Phillips, 2006). The exploratory type of the comparative study aims to generate new hypotheses and questions (Phillips, 2006). The exploratory methodology proceeds as follows (Phillips, 2006):

- ‘conceptualisation’ in Phase 1,
- detailed description of educational phenomena in the countries to be investigated, with full attention paid to the local context in terms of its historical, geographical, cultural, political, religious, and linguistic (etc.) features in Phase 2,
- the data collection in Phase 3,
- explanation through the development of hypotheses in Phase 4,
- re-consideration of the initial questions and application of the findings to other situations in Phase 5.

The significant contribution of this paper is the implementation of teaching Web technologies to prospective teachers elaborated in the hypothesis of the present research.

Our target population to generalize the methodology of teaching Web technologies is prospective teachers, by which teachers in teacher pre-service training are meant.

Our empirical results obtained at Dr. Sivanthi Aditanar College of Education, Tiruchendur, Tamilnadu, India, and Faculty of Pedagogy, Psychology and Art of the University of Latvia, Riga, Latvia, in 2012-2013 showed the effectiveness of the methodologies applied to teaching Web technologies to prospective teachers in India and Latvia. The associated results of empirical studies will be presented in Section 3. Finally, some concluding remarks are provided in Section 4 followed by a short outlook on interesting topics for further work.

**Theoretical Framework**

The present part of the paper provides the definition of Web technologies and comparison of the methodologies applied to teaching Web technologies to prospective teachers in India and Latvia.

Web technologies are not static, but constantly developed. The short overview of the historical development of Web technologies is given in Figure 1.

![FIG 1. WEB 2.0 AND BEYOND](image)

The evolution of the Internet and Web applications has recently reached its next step called Web 3.0 technology.

![FIG 2. FOUR DIMENSIONS OF WEB 3.0 TECHNOLOGY](image)

Web 3.0 technology include four dimensions as depicted in Figure 2:

- the infrastructure dimension,
- the functionality dimension,
the data dimension, and
the social (or socialization) dimension.

In comparison with Web 2.0 technology aimed at socialisation, Web 3.0 technology is characterized by such qualities as mobility and semantics. Mobility of Web 3.0 technology is founded on the concepts of cloud computing and information access anywhere, anytime, on any device. The concept of semantics means to provide a particular Web 3.0 technology’s user with the content that is relevant to his/her social networks. Web 3.0 technology includes but is not limited to online networks. Use of Web 3.0 technology depends on the particular job specifics. Teachers’ profession has its own specifics, too. Teachers’ job is mostly focused on teachers’ administrative duties, teaching and their professional development as depicted in Figure 3.

![FIG 3. ELEMENTS OF TEACHERS’ PROFESSION](Image)

Thus, Web 3.0 technology for teachers includes such online networks for professional applications as Twitter, Xing, LinkedIn as shown in Figure 4 and many others.

![FIG 4. ELEMENTS OF WEB 3.0 TECHNOLOGY FOR TEACHERS](Image)

A social network acts as a means of connecting teachers of distinct expertise across departments and school branches and helps them build profiles in an easy way, and it can do so in a much cheaper and more flexible way than traditional knowledge management systems (Vossen, 2009: 38). Once a profile has been set up and published within the network, others can search for people with particular knowledge or expertise and connect to them. If the social network is to be run outside an enterprise and, consequently, school, providers like Ning allow an easy setup of a self-regulated and self-managed community (Vossen, 2009: 38).

As teachers’ innovativeness and competitiveness more and more depend on their use of Web technologies, teaching Web technologies and, in particular, Web 3.0 technology, have been integrated in teacher pre-service training based on a methodology.

Methodology is defined as a system of principles, practices, and procedures applied to any specific branch of knowledge (Karapetjana, 2008). Hence, Figure 5 illustrates the components of methodology.

![FIG 5. COMPONENTS OF METHODOLOGY](Image)

Against this background, the authors of the present research consider one more methodology’s component, namely advantages of the methodology as demonstrated in Figure 6.

The methodology’s components serve as the basis for comparison of methodologies of teaching Web technologies to prospective teachers in India and Latvia.

![FIG 6. COMPLEMENTED COMPONENTS OF METHODOLOGY](Image)
Table 1 presents the comparison of methodologies of teaching Web technologies to prospective teachers in India and Latvia based on:

- the analysis of research done by Ahrens and Zaščerinska (2011) as well as Hariharan and Mohanasundaram (2013), and
- the complemented components of methodology.

**TABLE 1 COMPARISON OF METHODOLOGIES OF TEACHING WEB TECHNOLOGIES TO PROSPECTIVE TEACHERS IN INDIA AND LATVIA**

<table>
<thead>
<tr>
<th>Component of methodology</th>
<th>India</th>
<th>Latvia</th>
</tr>
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<tbody>
<tr>
<td>System of principles</td>
<td>DMAIC Principles: &lt;br&gt; D: Define the instructional process with learning objectives and outcomes &lt;br&gt; M: Measure student learning in the classrooms of prospective teachers by a tool &lt;br&gt; A: Analyse student learning in the classroom by statistical process &lt;br&gt; I: Improve student learning based on the data analysis in the analyse phase &lt;br&gt; C: Control plans that institutionalize the improvements for the future to ensure that student learning stay at a desired level.</td>
<td>- mutual sustainability &lt;br&gt; - mutual complementarity &lt;br&gt; - mutual reflexivity</td>
</tr>
<tr>
<td>Practice and procedure</td>
<td>Six sigma is an organized, parallel-meso structure to reduce variation in organizational processes by using improvement specialists, a structured method, and performance metrics with the aim of achieving strategic objectives (Brue, 2003).</td>
<td>The practice proceeds as shown in Figure 6 &lt;br&gt; - from self-evaluation in Phase 1 &lt;br&gt; - through internal evaluation in Phase 2 &lt;br&gt; - to external evaluation in Phase 3.</td>
</tr>
<tr>
<td>Methodology’s advantages</td>
<td>Six sigma is the quality analytic method which has been extensively used for operational improvement. This six sigma based experimentation analyses of various psycho-somatic factors, which may tend to change abruptly in particular situation and governs the process improvement in learning of the prospective teachers.</td>
<td>- widening opportunities for each student to construct social experience (experience in social interaction and cognitive activity) and - promoting opportunities for self-realization.</td>
</tr>
</tbody>
</table>

It should be noted that Hariharan and Mohanasundaram (2013) have defined the academic six sigma as a comprehensive and flexible system of achieving, sustaining and maximizing the process outcome through adopting the societal needs, efficient use of facts, statistical quality control principles and effortful consideration to manage, improve and reinventing the educational process. This definition is comprehensive as it may be newly practiced in teacher educational research.

**Empirical Analysis**

The present part of the contribution demonstrates the design of the empirical research, survey results and findings of the research.

**Research Design**

The design of the present empirical research comprises the purpose and question, samples and methodology of the present empirical study.

The empirical study was aimed at analysing the effectiveness of methodologies applied to teaching Web technologies to prospective teachers in India and Latvia. The research question is as follows: Are the methodologies applied to teaching Web technologies to prospective teachers in India and Latvia effective?

The present empirical study involved two independent groups, namely:

- a group of 10 prospective teachers who study one year Bachelor course in Education at Dr.
Sivanthi Aditanar College of Education, Tiruchendur, Tamilnadu, India.

- a group of 5 prospective teachers who are involved in part-time studies of the professional bachelor programme “Social Pedagogue” at the Faculty of Pedagogy, Psychology and Art of the University of Latvia, Riga, Latvia.

Thus, the prospective teachers are from different countries, namely India and Latvia. Therefore, the samples are multicultural and multilingual as the respondents with different cultural backgrounds and diverse educational approaches were chosen. That emphasizes the analysis of each prospective teacher’s achievements in use of Web technologies (Luka, Ludborza, Maslo, 2009) within the present empirical study. However, whereas cultural similarity aids mutual understanding between people (Robbins, 2007), the prospective teachers’ different cultural and educational backgrounds contribute to successful learning. Moreover, different cultural and educational backgrounds become an instrument of bringing the teachers together more closely under certain conditions such as appropriate materials, teaching/learning methods and forms, motivation and friendly positioning of the educator (Abasheva, 2010). Thus, the groups’ socio-cultural context (age, field of study and work, mother tongue, etc.) is heterogeneous.

Interpretative research paradigm that corresponds to the nature of humanistic pedagogy (Luka, 2008) has been applied to the empirical study. The interpretative paradigm allows creating an environment for the development of any individual and helps them to develop their potential (Luka, 2008). The core of this paradigm is human experience, people’s mutual everyday interaction that tends to understand the subjectivity of human experience (Luka, 2008). The paradigm is aimed at understanding people’s activity, how a certain activity is exposed in a certain environment, time, conditions, i.e., how it is exposed in a certain socio-cultural context (Luka, 2008). Thus, the interpretative paradigm is oriented towards one’s conscious activity, and it is future-oriented (Luka, 2008). Interpretative paradigm is characterized by the researchers’ practical interest in the research question (Cohen, Manion, 2003).

The exploratory type of the comparative study has been applied (Phillips, 2006), with the aim to generate new hypotheses and questions (Phillips, 2006). The empirical study consisted of the following stages:

- data collection,
- data processing, analysis and data interpretation,
- analysis of the results and
- elaboration of conclusions and hypothesis for further research.

The qualitatively oriented empirical study allows the construction of only few cases (Mayring, 2004). Moreover, the cases themselves are not of interest, only the conclusions and transfers we can draw from these respondents (Mayring, 2007). Selecting the cases for the case study comprises use of information-oriented sampling, as opposed to random sampling (Mayring, 2007). This is because an average case is often not the richest in information. In addition, it is often more important to clarify the deeper causes behind a given problem and its consequences than to describe the symptoms of the problem and how frequently they occur (Flyvbjerg, 2006). Random samples emphasizing representativeness will seldom be able to produce this kind of insight; and it is more appropriate to select some few cases chosen for their validity.

**Survey Results**

In order to analyse the effectiveness of the methodologies applied to teaching Web technologies to prospective teachers in India and Latvia, the prospective teachers’ learning achievements in use of Web technologies were compared by the correlation coefficient of the dependent samples.

By dependent samples, the samples in both pre- and post-survey are understood.

Effectiveness is defined as the educator’s contribution to the prospective teachers’ knowledge, skills and attitudes (Zaščerinska, 2011: 110). Improvement of knowledge, skills and attitudes by prospective teachers is realised as prospective teachers’ learning achievements, by which quantitative evaluation of qualitative level of prospective teachers’ learning results made by the educator with use of marks or grades are meant.

The prospective teachers’ achievements of the India’s and Latvia’s groups are analysed by use of Pearson’s correlation analysis the asymptotic version of Statistical Package for the Social Sciences Exact Tests (Statistical Package for the Social Sciences (SPSS), 2009: 2) to reach correct conclusions with small samples (Statistical Package for the Social Sciences (SPSS), 2009: 1). The choice of the method for correlation analysis is based on the scale type of the gauge of the obtained
data and the type of the relationship between the variables: if the scale of the gauge of the variable is ordinal (including the present empirical study), Pearson’s correlation analysis is applied (Raizis, 2000: 220). As well, Pearson’s correlation analysis is the parametric method for correlation analysis between variables (the non-parametric method is Spearman’s correlation analysis). Correlation coefficient ranges from -1 to +1. A value of 1 implies that a linear equation describes the relationship between X and Y perfectly, with all data points lying on a line for which Y increases as X increases; while that of -1 implies that all data points lie on a line for which Y decreases as X increases. A value of 0 implies that there is no linear correlation between the variables. Correlation coefficient of the sample is marked by r (Raizis, 2000: 220). Table 2 presents the interpretation of correlation coefficient.

<table>
<thead>
<tr>
<th>Value of correlation coefficient</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>r to ±0,2</td>
<td>very low correlation</td>
</tr>
<tr>
<td>r to ±0,5</td>
<td>low correlation</td>
</tr>
<tr>
<td>r to ±0,7</td>
<td>average correlation</td>
</tr>
<tr>
<td>r to ±0,9</td>
<td>high correlation</td>
</tr>
<tr>
<td>r greater than ±0,9</td>
<td>very high correlation</td>
</tr>
</tbody>
</table>

Table 3 demonstrates the results of the correlation analysis of the independent samples in India and Latvia.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Correlation coefficient</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective teachers’ learning achievements in use of Web technologies</td>
<td>India</td>
<td>0.91124</td>
<td>Very high correlation</td>
</tr>
<tr>
<td></td>
<td>Latvia</td>
<td>0.90025</td>
<td>Very high correlation</td>
</tr>
</tbody>
</table>

**Findings of the Research**

The findings of the research reveal very high correlation of the dependent samples in each independent sample group, namely in India and Latvia. Thus, both methodologies applied to teaching Web technologies to prospective teachers in India and Latvia are effective.

However, the methodology applied to teaching Web technologies to prospective teachers in India has received a higher correlation coefficient than that in Latvia.

**Conclusions**

The findings of the research allow drawing the conclusions on the effectiveness of both methodologies applied to teaching Web technologies to prospective teachers in India and Latvia shown by the correlation coefficient of the dependent samples of the prospective teachers’ learning achievements in use of Web technologies in India and Latvia.

Validity and reliability of the research results have been provided by involving other researchers into several stages of the conducted research. External validity has been revealed by international cooperation as following:

- the research preparation has included individual interdisciplinary consultations given by other researchers,
- the present contribution has been worked out in co-operation with international colleagues and assessed by international colleagues, and
- the research has been partly presented at international conferences.

Therein, the findings of the present research are validated by other researchers.

The following hypothesis has been formulated: prospective teachers’ learning achievements in use of Web technologies are successful if

- the methodology of teaching Web technologies is represented by a system of principles, practices, procedures and the approach’s advantages,
- a favourable educational environment for prospective teachers’ use of Web technologies is organized within teacher pre-service training,
- prospective teachers actively use Web technologies.

The present research has **limitations**. The interconnections between methodology and Web technologies have been set. Another limitation is the comparison of two methodologies, namely the methodologies applied to teaching Web technologies to prospective teachers in India and Latvia. A limitation is the empirical study conducted by involving only the prospective teachers of two educational institutions. Therein, the results of the study cannot be representative for the whole area. Nevertheless, the results of the research—the comparison of the methodologies of teaching Web technologies in India and Latvia, the complemented components of methodology and the research design—may be used as a basis of analysis of prospective teachers’ use of Web technologies in other institutions.
If the results of other institutions had been available for analysis, different results could have been attained. There is a possibility to continue the study.

Prospects for development include modelling of a favourable educational environment for the enrichment of prospective teachers’ use of Web technology.

The contemporary concept of Web 3.0 technology remains as an open point for further research.

Further research tends to focus on the search for relevant methods for evaluation of each criterion of the development of prospective teachers’ use of Web technologies as well as data obtaining, processing, analyzing and interpretation in an empirical study within a multicultural environment. Analysis of qualitative data for checking the effectiveness of both methodologies applied to teaching Web technologies to prospective teachers in India and Latvia is proposed to be carried out in future.

Empirical studies in other institutions are proposed to be carried out. Another direction of further investigation is considered as evaluation of efficiency of prospective teachers’ use of Web technologies. Efficiency of the educational environment for teaching Web technologies to prospective teachers has to be evaluated. A comparative research of more countries could be implemented as well.

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Ramar Hariharan obtained Master degree in Marine biology and oceanography from the Centre of Advanced Study in Marine biology from Annamalai University, Tamilnadu, India. Subsequently, he accomplished Master degree in Education from Madurai Kamaraj University, Tamilnadu, India in the year 1996 along with MPhil in Biotechnology in 2006 and MPhil in Education in 2007. He has been given an opportunity to teach since 1999.

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His research paper has been accepted by the well learned organising committee of the International Conference on Learning and Teaching (ICLT, 28 – 29, June 2013) conference conducted by Taylor university of Malaysia. Finally, his academic pursuits is moulded by the research topic entitled “Impact of six sigma–DMAIC approach in learning the ICT concepts by the prospective teachers” which was presented before the August presence of the well esteemed organising committee of the prestigious ATEE and well learned European academicians.

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Jelena Zaščerinska received the diploma in Russian Philology in 1994 from the Daugavpils University, Daugavpils, Latvia, Master Degree in English Philology in 2002 from the University of Latvia, Riga, Latvia. In 2011 she was awarded Dr. paed. Degree for her promotion thesis “Development of Students’ Communicative Competence in English studies for Academic Purposes” focused on evaluation of efficiency of the process of the development of students’ communicative competence within English for Academic Purposes studies.

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Pon Swamydhas has been performing as the principal of Dr. Sivanthi Aditanar college of Education since 2008 and he possesses rich experience in teaching over 20 years. With his indomitable spirit, he attained the Doctoral degree from Alagappa University, Karaikudi, Tamilnadu, India, under the title “Analysis of the process of teaching zoology in higher secondary schools”.

He has made the institution march ahead by accomplishing the remarkable Grade B’ status from the NAAC (National Assessment and Accreditation Council, India). He has been appointed as research supervisor for doctoral program in Periyar University, Salem, Tamilnadu, India. He has guided nearly 10 M.Phil. Scholars of various universities in Tamilnadu.

For his outstanding service, he has been awarded “Life time achievement award” by International Institute of Educational Management, New Delhi in collaboration with solidarity council, New Delhi, India.