Editorial

This issue of the Journal of Teacher Education for Sustainability consists of ten papers related to various areas of formal and non-formal education in relation to sustainability. I would like to thank all the members of the Editorial board, the language editors and the authors of the papers for their great work.

The first paper in this issue by Mitakidou and Tamoutseli aspires to explore the possibilities of cooperative learning to effectively promote the aims of both education for sustainable development and cross-cultural education. The children of a public school in Thessaloniki, Greece, were involved in the action research related to their local environment. The methodological tools used included walk mapping and landscape analysis charts combined with environmental assessment sheets. The ensuing discussion facilitates reflection on the prospects of cooperation in a class with a mixed ability population.

The paper by Purg investigates whether two opposite assessment methods, open wiki (online text-and-media collaboration) and closed multiple-choice test, can together assure a balanced addressing of the learner both as an information processor and a social entity. Comparing students’ experience and satisfaction with collective knowledge construction in a moderated wiki on the one hand and knowledge testing in an online multiple choice test on the other hand, the research differentiates full-time and part-time students of a blended course. This is presented upon broader data on comparable students’ populations who were assessed with open-ended oral exam questions, regular homework tasks and seminar work papers.

The paper by Klaos highlights Wikiversity – an open environment to all community members. The study methodology is qualitative content analysis, and the data is collected from students’ blogs, online and focus group interviews. Data is based on a monitored course for bachelor students of special pedagogy. There was a possibility to test and assess modern e-learning technologies and use a socio-constructive learning process. The results are studied in light of social-exchange theory. The outcome of this study indicated that learners’ satisfaction increases with free access to fellow students’ works, full and equal membership of the community and an opportunity to compare oneself to the others.

The paper by Gedžūne and Gedžūne reports on the findings of a qualitative study with 39 first year students of pre-school and primary school teacher education programmes who are taking an educational action research based study course “Environmental Pedagogy”. The study aimed at engaging the students in reflection on their experiences of interaction with nature and uncovering their views on ecological consciousness. Qualitative content analysis sought emergent themes in students’ reflections. A conceptual framework was identified containing three frames of reference: (1) inclusion-oriented frame of reference; (2) exclusion-determining frame of reference and (3) solution-oriented frame of reference. Conclusions were drawn about the possibilities of educational action research to encourage students’ reflection on ecological consciousness and building sustainable and inclusive relationships with the world.

The paper by Shahriari dwells upon a method for developing a course curriculum including designing, control and evaluation of the projects as an essential part of the course. Industrial patterns have an important role especially in designing and evaluating the
projects. The learning outcomes and the work efficiency are also controlled and evaluated through a questionnaire and personal interviews.

The paper by Bērziņa illuminates mentors’ and teachers-mentees’ perceptions on the impact of mentoring on their teaching at the primary school level. Data collected by the means of self-evaluation includes teachers’ and their mentors’ views on the role of mentoring and teachers’ collaboration in teachers’ professional development and inclusion of children with special needs. The results of the study show that mentoring and collaboration are a pre-condition for successful teachers’ professional development, which creates, in its turn, a favourable basis for enhancement of inclusive education programmes.

The paper by Ghaemi and Kargozari reports on an exploratory study into the distinctive characteristics of International English Language Testing System (IELTS) instructors. The results of the study demonstrated that knowledge and command of the target language, an ability to organize, explain, clarify, arouse and sustain interest and motivation among students, fairness to students by showing neither favouritism nor prejudice and availability to students were among the most significant characteristics and qualities of successful IELTS instructors.

The paper by Šapkova clarifies the profile of constructivist/traditional beliefs sustained by the mathematics teachers in Latvia. The results show that the beliefs of Latvian teachers of mathematics on efficient teaching are oriented more towards a constructivist approach, yet there exist significant differences for teachers of different social and demographical groups in their beliefs on approaches in teaching and effective instruction. The obtained results provide a possibility to develop pre-service teacher education and teachers’ professional development courses in order to assure sustainability of the learning process.

The paper by Lukanenok elaborates on reading acquisition – one of the most important tasks at the primary school level. The early identification of reading difficulties (RD) enables educators to apply the treatment as early as possible. Rapid naming (RN) is one of the reliable methods used to identify RD and risk for RD. The relationship between RN skills, especially RN speed and reading decoding speed, is investigated as a good tool for predicting reading at decoding level and well-documented in languages using non-transparent orthography. Few researches are carried out on RN skills in transparent orthographies. The current research is the first attempt to investigate RN skills of children speaking Estonian, highly transparent Finno-Ugric language.

The paper by Karetsos and Haralambopoulos highlights a framework based on three ontologies (content, learning design and sustainable energy domain models) which was introduced in order to support teachers to construct learning designs in the field of sustainable energy education. This paper is focusing on the integration of a competency model in the structure of this framework. This model enriches the description of learning resources enabling their search and retrieval via queries based on competency parameters and can also support competency-based reasoning in order for the competency gaps to be filled. The competency model came as an answer to a literature review triggered by some results of a Wizard of Oz experiment along with the aim to integrate into the framework sets of questions supporting learning in sustainable energy domain.

Astrīda Skrinda
Abstract

There is a definite intersection of targets and intentions between education for sustainable development (ESD) and cross-cultural education (CCE), since both ESD and CCE aspire to pursue and develop values such as equity, democracy and quality of life in a multicultural setting. Apart from their common philosophical basis, ESD and CCE endorse similar teaching methods, i.e. experiential and cooperative learning, and pursue the development of abilities such as research interest, critical thought and political awareness, with the intention to develop a learning community intrinsically connected with the wider community and society. This study aspires to explore the possibilities of cooperative learning to effectively promote the aims of both ESD and CCE. The children of a public school in Thessaloniki, Greece, were involved in this action research related to their local environment. The methodological tools used included walk mapping and landscape analysis charts combined with environmental assessment sheets. The ensuing discussion facilitates reflection on the prospects of cooperation in a class with a mixed ability population.

Key words: cooperative learning, education for sustainable development, cross-cultural education

Introduction

The effectiveness of cooperative learning in relation to more traditional forms of teaching has been amply researched and theoretically explored for several decades now (Matsagouras, 1987; Sharan & Sharan, 1992; Slavin, 1995; Haralambous, 1996, 2000; Johnson & Johnson, 1998). The model of cooperative learning has taken the form of an organized educational movement that promises better learning results. Research studies have shown that, among other benefits, it facilitates the development of thought and socialization of young children and it contributes to better educational management of diverse school populations (Cohen, 1994; Stavridou, 1999).
In the framework of cross-cultural education, an abundance of research findings have confirmed the efficiency of cooperative learning in organizing mixed ability, multicultural classes (Sharan & Sharan, 1992; Kagan, 1994; Slavin, 1995). As Sharan and Sharan (1992) point out, “since their inception, cooperative learning methods have been directed at creating positive conditions for effective instruction and social integration in the ethnically heterogeneous classroom. Classroom learning conducted with cooperative small groups of students provides a social setting conducive to the development of friendly relationships among students from different ethnic and social group” (p. 143). Cooperative classroom organization contributes to the enhancement of children’s self-esteem and the development of harmonious interpersonal relationships, without impeding the cognitive performance of any group of students. On the contrary, it enhances the development of high order abilities, such as problem solving, decision making, critical thinking and assessment (Slavin, 1995).

Similarly, the significance of cooperative learning is stressed as a basic component of all teaching techniques proposed by the education for sustainable development (Skoullos & Malotidi, 2004) and as one of the best methods for its successful application (Ghosh, 2009). The Report of the International Committee of UNESCO for education in the 21st century has declared that the third pillar of education is that children learn to coexist and cooperate (UNESCO, 1998). Abilities promoted by education for sustainable development, such as decision making, conflict management, initiative for action, personal and social communication abilities and the development of mutual trust and acceptance of difference, may flourish through cooperative learning (Ghosh, 2009). Cooperative learning, then, is high on the agenda of both CCE and ESD, since research has shown that children achieve better performance through cooperation (Haralambous, 1996), develop positive attitudes to school, learn to respect their classmates and sustain quality interpersonal relationships (Johnson & Johnson, 1998).

In the Greek context, where teacher-centred teaching is deep-rooted, cooperative learning was part of the innovative curriculum that the Ministry of Education has been trying to introduce since 2003 (Alahiotis, 2003). However, the most difficult part in introducing an innovation in education is its application, as research studies have demonstrated that teachers are reluctant to attempt innovation; they usually raise significant or insignificant obstacles to its use (Fullan, 1993; Hargreaves, 1995). This may be the main reason why, despite positive results of its application, cooperative learning has not been adopted and established in class, as it requires that both teachers and students embrace new roles and responsibilities (Rogoff, 1994). Teachers need to be persuaded of the need to change their teaching practice and be allowed the chance to acquire the knowledge so that the idea of transformation matures in them and motivates a change of attitudes (Connelly & Clandinin, 1988). This coupled with the fact that the Greek educational system, despite progressive announcements, remains centrally controlled and based on a strict, uniform curriculum makes change a hard and complex process.

With this study, the authors attempted to explore the option of promoting cooperative learning in a diverse classroom through topics related to sustainable and cross-cultural education. This study is part of a wider ongoing research that examines if and how in-service training on sustainable and cross-cultural education that suggests significant changes in teachers’ and students’ roles affects the teaching methods of teachers.
The study

Research field

The study was conducted at a public primary school in Toumba, Thessaloniki, Greece. The group of participants included 25 nine years old children, comprising a whole fourth form. Eighteen children of the class were boys; seven children were girls. The class included seven children of immigrant families and one boy with mental disability and mobility difficulties. Toumba is a densely populated area of Thessaloniki. The school population consisted exclusively of neighbourhood children, an element that facilitated the topic selection of the study, i.e. “My neighbourhood”. 

The authors were intrigued to conduct the study when, on visiting the school for the needs of the wider research, they realized that, despite the fact that the school accommodated children of diverse cultural and linguistic backgrounds and also despite the fact that it was a school open to the local community and all kinds of educational innovation, the traditional frontal teaching model prevailed over the cooperative. The school principal enthusiastically endorsed the study and was keen on playing the role of cooperating teacher in planning and implementing it in cooperation with the researchers (the two authors). Therefore, the study took the form of action research, i.e. it was a short-scale participatory and collaborative intervention that generated discussion and reflection among participants on the possibilities of cooperation for increasing student participation and achievement. It occupied 12 hours (four 3-hour sessions) in the span of four weeks during “flexible zone”, a time designated, according to the curriculum, for innovative activities and interdisciplinary projects. The cooperating teacher was responsible for the flexible zone session (3 hours weekly) in the class of the study. Even though the flexible zone is included in the timetable of each school, in reality, most teachers use this time for catching up on regular school work and consolidation of the taught syllabus. This was true for the class of this study, as well.

Aim

This study is aimed at exploring:

- the children’s views on cooperative learning;
- the influence of cooperative work on a class accustomed to traditional teaching modes and, therefore, the possibility of change of the children’s views towards cooperative work through their active participation in their own learning;
- the possibility of change of the children’s views towards the inclusion of children of minority groups;
- how a class intervention and the possible change it brought about in the teachers’ views and attitudes could serve as a model for school-based teacher training;
- children’s sensitization to the environmental problems of their neighbourhood;
- the development of harmonious and equitable relationships between children with diverse cultural origin;
how educational techniques introduced for CCD and ESD and used for teaching topics related to local issues can motivate children’s participation in cooperative learning activities.

Research planning and procedure

At the onset of the study, a questionnaire was distributed to the students intended to explore their views towards cooperation and group work and their previous experience with it. After completing the questionnaire, the students were involved in a discussion on the merits of cooperation in class and, eventually, they were asked to be divided into groups of five. This process proved more difficult than anticipated as children had a lot of difficulty deciding the scheme of groups. It took two whole teaching hours, a lot of discussion and a range of interventions on the teacher-researcher’s part, such as role play, for instance, to sensitize children, make them bring themselves into the position of undesirable members of the groups to accept their teacher’s suggestion for the makeup of groups. The cooperating teacher’s main intention was to create groups of students based on cultural diversity and differentiation as to their needs, abilities and skills so that the classroom atmosphere could aim at acceptance of every group member’s individuality (Nichols, 1996).

The class with the cooperating teacher decided on the topic of the project. The chosen topic was “My neighbourhood.” As supported by ESD, sensitization on problems of the local environment is a prerequisite if interest is to be gradually extended to topics of the wider regional and global environment (Shallcross, Robinson, Pace, & Wals 2006). Choosing familiar places to have children involved in the observation, identification and promotion of problems related to these places and encouraging them to make suggestions for their amelioration facilitates the attraction and maintenance of interest on their part. Moreover, this process not only contributes to children’s gaining an awareness of place value and skills, but it also develops attitudes of active citizenship, all traits promoted by both CCD and ESD. According to Orr (2005), the study of space in education is very important as it constitutes the basis for sensible coordination and planning of space. It involves children in direct observation, research and experimentation and helps them turn theory into practice.

At the onset of the project, children changed the layout of their classroom to facilitate working in groups. The brainstorming technique was used to stimulate children’s interest on the topic of their neighbourhood and to expose their prior views and sentiments about it. The cooperating teacher asked the children to use first adjectives and then nouns to express their feelings about their neighbourhood. All nouns and adjectives suggested by the children were written on the board. In the discussion that followed, children were asked to justify their choices of words. Then, the adjectives and nouns were classified in two columns on the board: one column was entitled social issues and the other environmental issues. The words were further classified into negative and positive thus creating two sub-columns for each of the original columns. The ensuing discussion focused on the causes of negative characteristics and the interrelation between social and environmental issues.

In the subsequent sessions, children cooperated in their groups to complete a two-column table with all the things they would like and they would not like in their neighbour-
Engaging learners in cooperative learning through environmental and..  

hood. A short presentation of the table of each group was made by an elected member of the group. Through whole class discussion and reflection, the cooperating teacher finalized and wrote on the board a comprehensive list of all the children’s views. Then each group of children was given two sheets with the “diamond” provided in Figure 1. The children were also given the nine statements from the two columns they themselves had produced to delineate their likes and dislikes in their neighbourhood. The children had to cooperate and agree on how they should rank their likes and dislikes in each one of the diamonds. The children eagerly cooperated to prioritize their preferences and complete the two diamonds one for their likes and one for their dislikes ranking them in ascending order on the two separate diamonds.

The diamond is a useful technique for getting someone to locate and demonstrate their priorities; encouraging pupils to cooperate with an aim to take a decision, make a selection, etc.; developing skills like listening, defending, questioning, comparing, judging and evaluating. The prioritising involved in making the “diamond” requires a range of evaluative and discussion skills, such as clarifying and expressing values, motivating and taking action (Shallcross, 2004).

![Evaluation diamond](image)

Each group’s ratings were presented by the group’s representative and, in the discussion that followed, the similarities and differences in the groups’ choices were discussed. Through discussion, an effort was made so that all groups would agree on two common diamonds, one for the positive and one for the negative characteristics. Agreement on common ratings and choices in the diamonds was accomplished on the basis of frequency of appearance of each characteristic in all groups.

The characteristics chosen by children as the most desirable for their neighbourhood were cross-examined through drawings the children drew at home, so that they would not be influenced by one another. Children’s drawings have traditionally been used as a tool through which children represent and come to terms with their feelings (Roberts-Holmes, 2005). Eliciting their representations of their desired neighbourhood through drawing is a very common activity for children of this age (Lewis & Greene, 1983). Moreover, by draw-
ing, children are given more time to express themselves compared to the quick responses an oral discussion demands, thus probable language difficulties are overcome (Chambers, 1983). As Crook (1985) maintains, the content of children’s drawings may offer information on children’s feelings for the world. Children’s drawings may be windows to children’s thoughts and feelings, mostly because they reflect a picture of their mind (Thomas & Silk, 1992). The children’s drawings depicted their ideal picture of their neighbourhood. The authors classified the various elements included in the children’s drawings in two categories: natural (for instance, trees, flowers and grass) and manmade (for instance, houses, cars, roads) and evaluated them on the basis of quantitative data, i.e. their frequency and the space they occupied in the drawings (Cronin-Jones, 2005).

Analysis of these data revealed that nature (trees, flowers and grass) had a prominent place in the children’s desired picture of their neighbourhood, considering that it occupied two thirds of the space in most drawings. The wish for a more humane residence with green at the entrance and balconies came second in the children’s preferences, closely followed by the desire for pets and playgrounds. Overall, the children’s drawings included all of the characteristics that they rated as the most important for their desired neighbourhood during group activities and discussion in class.

A whole hour of a teaching session was dedicated for the class to formulate cards with indices of environmental assessment on the basis of their discussions and activities on the desired characteristics of their neighbourhood and their relation to the quality of life. In the rest of the teaching session, pairs of children were given a map of the area and the cards with the indices of environmental evaluation. The cooperating teacher suggested a route of study and mapping of the field, and the children located the route on their maps so that they could follow it easily.

The children participated with enthusiasm in the field study; they worked harmoniously in groups of three and there was a lot of intergroup discussion throughout the route. They exhibited excellent observation skills, and they critically commented on and accurately recorded their findings. One group of children were given digital cameras to take photos during the field study. Using cameras is an engaging strategy for children and their photographs are likely to reflect their interests and concerns (Cook & Hess, 2007).

Table 1. Card of environmental assessment

<table>
<thead>
<tr>
<th>Characteristic/evaluation</th>
<th>Very good</th>
<th>Good</th>
<th>Mediocre</th>
<th>Bad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Houses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Means of transportation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian streets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycle trails</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Playgrounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sequel to Table 1 see on p. 11.
In the final teaching session, children’s photos were projected in the classroom; there was a class discussion on neighbourhood images shown in the photos. The children’s findings were analysed, and views were expressed for the reasons, the responsibilities – personal and collective – as well as the governmental liability for the current situation. The children cooperated in their groups to come up with a group list, which they presented in class in order to formulate a collective list where the various categories of responsibility (personal, collective, governmental) were classified. At the end of this session, the children created a personal plan of action, the application of which demanded their family’s contribution.

The children then discussed in class their experience from participating in the project. In the end, a new questionnaire was distributed to the children aiming at recording their views regarding their experience from working in groups.

**Findings**

Analysis of the two questionnaires addressed to pupils, before and after the intervention, revealed that working in groups was not a usual teaching routine in this class. The children acknowledged that individual work was the only way of carrying out tasks in their class. Discussion with the class teacher confirmed the children’s statements, as he claimed that he never organized his class or planned activities in ways that favoured group work. It is interesting to notice that most children expressed a preference for group work before the intervention and gave good explanations to justify their preference, despite the fact that they had little experience of group work.

The development of good relationships, enjoyment in working with friends and giving and receiving help are all assets characterizing cooperative learning, according to the children. The students thought that, by working in groups, work became a joyful play, and they liked the fact that different ideas were expressed and taken into consideration: “Work becomes a joyful play, and we suggest different ideas”; “They [peers] give me new ideas, and I have a good time”; “They may know something I don’t know”. The children found problem solving became easier when working with other children: “I find solutions easier along with other children”; “They [peers] help me when I get stuck”.

With reference to the criteria according to which they chose group members, the first was the gender (nine boys; five girls), followed by friendship, mostly for boys (five boys; one girl). The criteria suggested by the children for the formulation of groups coupled with the usual teacher-centred organization of teaching explain the difficulties the cooperating teacher encountered in creating groups.

In-class observation showed that the children willingly participated in all activities related to the project. In the first session, intending to stimulate the children’s interest for the selected topic when the children were asked to describe their neighbourhood, they mostly
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used positive characteristics (for instance, amazing, good, green, love, pleasure), probably attributed to the children’s emotional relationship with their neighbourhood. In the discussion that followed, however, they could not justify their characterizations, so social and developmental problems started to emerge.

Green (trees, bushes, flowers) houses, parks, playgrounds, parking space, quiet, pets, large open spaces were common preferences among all groups of children. One of the groups added their preference for a theatre, a cinema and a bicycle trail. The numerous cars, traffic jams, sound pollution, the occupancy of sidewalks by cars, vandalisms, disputes and rows, trash, filth and pollution were the characteristics of their neighbourhood they disliked.

The preferred image of the neighbourhood as it emerged from the children’s drawings included mainly homes, large streets, lots of trees, a lot of green, flowers, playgrounds and no cars. It was impressive that only one picture showed a car, which was parked in a designated parking space. Apartment buildings appear in only two of the drawings.

Examination of the classification in evaluation diamonds revealed that “green” and “trees” occupy the top of children’s choices, with “pets” being the second and “parks” being the third most chosen preferences. The other choices that are diversified in the children’s ratings but appear in all four diamonds are “open spaces,” “playgrounds,” “peace and quiet.” Concerning the negative characteristics of the neighbourhood, “pollution” and “sound pollution” are placed at the top in all ratings. In lower ratings, follow “traffic jams,” “vandalisms,” “quarrels” and “trash”.

The children demonstrated great interest for the field research. They asked for more time on the field but school regulations did not allow extension of time. During the field trip, they completed the environmental evaluation cards very carefully and their comments in the walk mapping were accurate and critical.

In their evaluation of the project, the children described as “very positive” the fact that they observed things they had not seen before: the garbage outside buckets, the scarcity of buckets, the broken sidewalks, the cars parked on sidewalks, the lack of green, the narrow sidewalks, the lack of trails for the blind and people with mobility difficulties, the pollution, the lack of bicycle trails, the narrow streets, the lack of green and flowers in the balconies, the trunks of cut trees, the ugly buildings. As a result of their walk and the discussion that followed in class, the children decided to put together a list of actions, both personal and family, as well as to write and address a letter to the local authorities in an effort to contribute to improving their environment.

Decisions in groups were reached with relative ease. All views were voiced and considered with respect. The group presentations were followed by everyone with great interest and attention. The seven immigrant children also participated very willingly, they were eager to present their views and comments and were included by their peers in all activities. It should also be stressed that the children tried to include the child with disabilities in all the activities, something that we were told had not happened previously.

The children’s views regarding cooperation were recorded in the final questionnaire but there was also a final discussion where the children were invited to assess the experience of their participation in the study, their opinion about the types of activities as well as their work in groups. The children’s reactions to all fields of inquiry were very positive. Without exception, all children embraced cooperative work and expressed their wish for
this teaching scheme in all school subjects. Their justifications for their preference in the questionnaires included:

“I would love us to work in groups because we learn that way”.  
“...because we had no disputes”.  
“...because we had a wonderful time and we liked it”.  
“...because I collaborated with friends”.  
“...because we were together”.  
“...because we helped each other”.

Similar views were expressed in the final discussion in class:

“We liked this way of working very much, we would like to repeat it”.  
“Our teacher rarely encourages us to work this way. It’s always subject after subject, homework after homework. We rarely have a chance to discuss among us. We sometimes place our desks in a Π class arrangement but even then we are not asked to work in groups”.  
“We had some difficulty in reaching an agreement at the beginning but, at the end, we managed to agree and had an excellent result”.

The authors asked the teachers of the school to complete questionnaires expressing their views on cooperative learning. Open-question questionnaires were distributed to the teachers by the cooperating teacher. Questionnaires were chosen so that teachers could feel free to express their views. Half of the teachers agreed to complete the questionnaire. The ones that refused justified it by saying that there was no reason to waste time for something that is inapplicable in the Greek school. Their negative attitude can be explained on the basis of the structure and organization of the Greek school that is completely centralized, traditional and teacher oriented. This is parallel to findings in other research studies mentioned above (Fullan, 1993; Hargreaves, 1995).

All of the teachers that completed the questionnaire claimed that cooperative learning was superior to teacher-centred instruction. Some of the advantages of cooperative learning they offered included children’s socialization, the development of positive relations, mutual respect, solidarity and acceptance among children. Interestingly, all these advantages are related to psychosocial rather than cognitive development. Only one of the teachers referred to the advantage of building internal motivation for learning and respect for the school. These views correspond to the views expressed in two wider research studies among Greek teachers (Piliouras, Kokkotas, Georgiou, & Nikolaou, 2002).

Despite their positive attitude to cooperative learning, the teachers who responded to the questionnaire admitted that they hardly ever used it. Their reasons for this distinct discrepancy between theory and practice were in a descending order: 1) the suffocating curriculum (“curriculum and school schedule are very strictly structured”); 2) the load of syllabus and the time restrictions that allow no time for such approaches to learning (“you cannot catch up with the syllabus,” “such approaches stop you from running to catch up with the programme”); 3) difficulty in assessing children in the various subjects individually
(“sometimes the teacher makes erroneous judgments on the students’ abilities”) and 4) loss of control in class management (“too much noise,” “a lot of commotion in class”).

The school principal and our collaborator in carrying out the intervention claimed to be a “big fan of cooperative learning”, but she also admitted that she rarely found herself able to use it for the same reasons that school teachers mentioned, adding also reasons related to the basic education of pre-service teachers and the in-service training of in-service teachers, and the parents and children’s attitudes to teaching and learning. The school principal thought that “even new teachers do not work cooperatively, not because they are assimilated by the system but because their basic education does not prepare them effectively”; “old teachers need in-service training on cooperative learning techniques”. The school principal continued by saying that “even children lack the education, they act individually, they are reluctant to cooperate in class”; “parents fear that cooperative learning is against their children’s best interest, especially the parents of ‘good’ students. I have been an educator for 30 years, but I have not met a parent who is in favour of cooperative learning”.

The principal’s interpretations for the minimal application of cooperative learning in this school is directly related to the findings in research studies that highlight the need expressed by teachers to feel confident in order to attempt innovations in their practice (Piliouras, Malamitsa, Theodoridou, Fisfi, & Kokkotas, 2000).

This need is confirmed in a comparative study between Greek and Cypriot teachers related to the application of cooperative learning in the teaching of science. The study demonstrated a significant difference between the two groups of teachers, with Cypriot teachers applying cooperative learning in their teaching due to their frequent participation in in-service teacher training programmes (Piliouras et al., 2002).

The cooperating teacher asserted that collaboration with the two researchers through a practical in-class application consolidated her confidence in her abilities to use cooperative learning. She confirmed that ESD and CCE activities carried out in the flexible zone, where there are no strict curriculum restrictions, may help the teacher realize and be persuaded about the efficacy of cooperative learning and thus decide to apply it across the curriculum.

**Concluding remarks**

This study took place in a school that is very active in a large range of programmes and innovative educational incentives but with a steady inclination for traditional teaching and learning arrangement. The results confirmed the appeal of cooperative learning among children. An interesting finding was also that through properly designed ESD and CCE projects, schools, apart from giving young children opportunities to explore, engage, connect with and contribute to their local community a range of experiences, skills and talents, can also effectively promote the development of cooperative learning, an approach to learning valued by both teachers and children. To overcome the difficulties in practical application, as they were pinpointed by teachers, school-based research projects can prove functional.

In addition, this study demonstrated the significance of school-based in-service training and two-way teacher-researcher cooperation in applying interventions. The small range
of the intervention limits the prospects of generalizing findings. However, there is ample evidence in the relevant bibliographical literature that supports the effectiveness of cooperative learning especially in primary classes like the one of our study (Matsagouras, 1987; Sharan & Sharan, 1992; Slavin, 1995; Johnson & Johnson, 1998).

The topic of this study was closely associated with the children’s immediate environment, so it motivated their interest. At the same time, through research of their immediate environment, the children demonstrated a sense of shared responsibility skills. Shared responsibility skills will enable them to recognize the importance of their participation in local, national and even global environmental decisions (Hart, 1997).

The lack of competition and formal assessment facilitated learning in groups, so the children worked together in harmony. They became familiar with new communication, observation and evaluation skills, critical thinking and decision making skills; they took initiatives and planned to take action. Equal participation in all activities was another positive outcome of the intervention, when compared with the difficulty the cooperating teacher faced to place children in groups at the beginning. That initial difficulty revealed covert biases on the children’s part, but cooperation helped come to the surface and was deconstructed. The teaching techniques employed for involving the children, the topic that focused on the quality of neighbourhood life proved interesting for all the children regardless of ethnic, social cultural origin. This contributed to overcoming initial difficulties and children’s willingness to cooperate came as a natural development.

The children’s views of their neighbourhood and their visions of its future development are quite interesting. Through techniques such as brainstorming, dialogue, study and mapping of the field and evaluation the children identified with great accuracy the basic problems that hurt the quality of everyday life in their neighbourhood and in neighbourhoods in all major cities in Greece. Problems such as lack of green spaces, the bad condition of streets, sidewalks and public areas, the multiple pollution of the atmosphere, the dominance of the car, the lack of cleanliness and tidiness harm the children’s everyday life. Equally interesting were the children’s conclusions as to the distribution of responsibilities and their suggestions in the form of individual or collective plans of action for improving the conditions of living in their neighbourhood. The choice of topic that concerned the immediate environment of children helped them realize the need for cooperative and participatory activities for improving their quality of life not only at the school but also at the social level. This constitutes a common approach in most ESD programmes that focus on closing the gaps between knowledge and attitudes aiming at the development of active citizens (Shallcross, Robinson, Pace, & Tamoutseli, 2007). Education can empower pupils by equipping them with the skills they need to assist schools and their local communities to become more sustainable (Defe, 2006).

This research confirms the importance of cooperation for equal participation of all children in the learning process and reveals the need for its systematic promotion at all levels of the educational praxis. A welcome development could be the cooperation among student teachers, their university supervisors and classroom practitioners in the framework of CCE and ESD cooperative projects that, among other benefits, would serve as a model of cooperation for children. This substantiates the need for a change of the overly structured
curriculum that limits initiatives for creative development of a school programme, so that the school caters to the multiple needs and possibilities of all children.

References:


Engaging learners in cooperative learning through environmental and..


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Open versus Closed Forms of Knowledge Assessment in a Blended Learning Ecosystem

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Abstract

The article investigates whether two opposite assessment methods, open wiki (online text-and-media collaboration) and closed multiple-choice test, can together assure a balanced addressing of the learner both as an information processor and a social entity. Comparing students’ experience and satisfaction with collective knowledge construction in a moderated wiki on the one hand and knowledge testing in an online multiple choice test on the other hand, the research differentiates full-time and part-time students of a blended course. This is presented upon broader data on comparable students’ populations who were assessed with open-ended oral exam questions, regular homework tasks and seminar work papers. An updated notion of media ecology conceives knowledge testing and instructional feedback as parts of an informational ecosystem: only a coherent yet internally differentiated learning environment can accurately define significant educational trends and recommendations – such that question assessment methods and signpost the development of education towards sustainability.

Key words: assessment, wiki, test, blended, media ecology

Learning as Information Processing

The information society of the recent century has been progressing towards the so-called knowledge society for more than a decade now, which means that the (formative) competence of information linking and application should have surpassed mere (informative) ownership of data. It seems as if the immanent dependence of knowledge construction and management on information and communication technology (ICT) is becoming stronger ever since, even more so from the perspective of sustainable development. The rapid social-economic changes in the contemporary society indeed call for flexibility of knowledge and skills not only among the workforce, the citizens, the students, but first and foremost among teachers and trainers as primary media of education. So-called new media, such as the internet (especially in its recent mobile developments towards omnipresence), address the human natural information processing potential – that has albeit ever since been multi-
channel, parallel and complex (Giesecke, 2002). So-called multimedia is innately pertaining to the human body and concrete space experience, and, as such, it is being increasingly emphasized in all educational areas (Mishra & Sharma, 2004). On the other hand, computers – especially with their current global networking, potential and accessibility of the so called cloud – can not only s(t)imulate natural but also facilitate technical information processing, enabling both improved learning performance (as knowledge quality) and accessibility (as quantifiable knowledge availability). The reflection of this (multi)media dimension has been insufficiently coded into memorandums on lifelong learning and digital literacy, as both the man- as well as the machine-centred ICT development agendas seem to lack this important aspect.

ICT is indeed closely connected to the globalization process playing an important role in renewing educational processes. That, in turn, significantly correlates with social and cultural change. Sustainable development, thus, needs to influence all areas of human existence by connecting and balancing the many possibilities opened up by new technologies. This becomes even more apparent after the United Nations (UNECE, 2009) and the European Union (EC, 2008) declaratively accepted sustainable development as a priority paradigm in implementing the important strategies of cultural, social and economic development. The Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability promote the use of ICT to help students take responsibility for finding information and evaluating it as well as ultimately taking responsibility for aspects of their own learning (UNESCO, 2005). Yet, these visions and strategies so far fail to recognize the sustainability potential of e-learning not only as a mere vehicle for promoting values and contents of sustainable development, but also as a method that can immediately implement such guidelines. The great potential of ICT to support knowledge management (Mansell & Wehn, 1998) is critically neglected, as there has been little understanding of how new technologies in education can unburden and motivate the learner and promote communication and collaboration among people and cultures. Educators can link natural human communication and collaboration potential with multimedia interaction possibilities of the new media in so-called blended learning settings (combining online and presence teaching phases). Together these methods can contribute to realizing the vision of a sustainable society, both in the field of formal and non-formal education.

**Media ecology updated**

During the historical development of ICT, the modes of communication were gradually restricted to (i.e. made dependent of) machine-processed or -mediated signs and signals. But soon, though the ICT boom was still in full swing, the technology was being pragmatically optimized, the human body as the primary communication medium was revoked and revaluated. This was first done by the way of counter-dependency, followed by balanced autonomy (Giesecke, 2002) integrating face-to-face, mediated, sign-based and multimodal communication. Currently, information-to-knowledge society may be facing quite a similar balancing process in the realm of education: the e-learning euphoria has hardly begun ebbing, yet there are already sound considerations of various forms of face-to-face communica-
tion compensating for the lack of motivation as an inherent problem of technology-mediated learning (Purg, 2006). This can be countered by a balanced use of social and other digital (multi)media (Purg & Zakrajšek, 2009) that, however, should be used consequently and in a differentiated way. Such use shall be highlighted in this paper, providing empirical data on the comparison of closed and open forms of knowledge construction and assessment.

In order to consistently contextualize the dichotomy of open versus closed information processing, there is an evident need for a new conceptual framework that would allow a balanced implementation and representation of (and sensitization for) all information-exchange types. The author believes that these are dealt with particularly convincingly by media ecology as a discipline initially defined by Postman (1970) to look “into the matter of how media of communication affect human perception, understanding, feeling, and value; and how our interaction with media facilitates or impedes our chances of survival” (p. 161). Nystrom (1973) defined the concept of media ecology with a viable reference to information processing within complex communication systems as environments. Sandbothe (2004), however, offered a more contemporary understanding of media ecology as the one of counterbalance, re-establishing the “neglected” media. In the nineties, this may have been ICT – computer and the internet, yet nowadays there is an evident regain of body media and the institutionalized media of verbal and non-verbal scientific communication (Sandbothe, 2004). This could readily explain the mainstreaming of blended learning models, where face-to-face teaching and learning is closely intertwined with online communication and the use of the web or mobile media. Many recent cultural developments and phenomena show that forms of collective intelligence, as enabled technically through the internet, are deeply rooted in the bodily experience of the human self – and of the other. These dimensions of (the so called emotional) intelligence have been neglected by educational and training systems far too long and were surely missing in the reason-dominated e-learning conceptions of the recent two decades. Indeed, according to Sandbothe (2004), there is an evident need for a “synaesthetic” revalidation of these dimensions under the new conditions of the media society.

A viable paradigm for a well balanced usage of technical and physical media (as forms of communication) may be offered by Giesecke (2002) in his vision of media ecology that qualifies no leading medium as the “key” (Ger. „Schluesselmedium”) that could assure perfect knowledge and/or skill acquisition, but instead a well-balanced structure of different information systems. It is important to note that the concept of an information system in this context may be scoped at the level of culture as common, collective practice and on the level of both a singular human being and a group of people, for instance, learners or trainees. An integration of technical, psychological, biogene and social information systems is mandatory in order to defy the monopoly of one sole processing type: as it was the case for written communication in the past half millennium, the contemporary situation shows clear signs of ICT (computers, mobile phones, tablets, etc.) gradually taking the leading role and gaining the grounds of “the book” as the declining “monomedium”. Moreover, face-to-face communication is gradually coming into the position of counterbalance against the aforementioned two, offering a fair chance of (polycentric) media balance across cultures – note
here that multimedia technologies have always been seeking to challenge the complexity of present face-to-face communication, unbound by the limits of space and time.

The so-called new media are, according to Sandbothe (2004) and Giesecke (2002), to be considered as only one further barycentre in the newly balanced media-scape. After an initial euphoric and overvaluing of ICT and multimedia, a sober coexistence is to be sought historically with other paradigms of information processing. So the new media – every time they emerge as new – not only enable original ways of structuring and distributing knowledge, they also offer new contexts for re-evaluation and rediscovery of old media, such as writing by hand or face-to-face communication. At the present point of equally held stakes and flexible positioning of (meta)perspective, instead of the mono-causal information processing in terms of “either or” – a fair chance for an inclusive “as well as” paradigm is evident. In the realm of teaching and training, this would mean that, by keeping up and reflecting upon the differences, all channels or modes of communication should be carefully balanced. Practically, this would probably call for a carefully investigating the prevalent modes and adjusting the portions of differently mediated (or indeed assessed) learning materials to the topic, the pedagogical aim and the (cultural, disciplinary, generational, etc.) structure of the trained/taught group (Purg, 2006). Still, this paper focuses on text-based knowledge construction and assessment, since it is presumed that the comparison of their radical closed (multiple-choice test) and open (wiki) forms presents an evident-enough instance of different information exchange types.

**Learning together in an ecosystem**

A wider ecological perspective also offers several other relevant considerations that cannot be dealt with in the scope of the present paper, but ought to be considered for further investigations of this kind. Their relevance for the present topic may be drafted through themes such as mutual dependency of beings (as, for instance, information entities), dynamic equilibrium of systems and the postulate of resource scarcity – both well-applicable to information processing in the context of ICT. It is thus, even in a stricter context of educational informatics, quite obvious that “the educational domain is an excellent place to explore the ecological approach, since there is every chance of a very high bandwidth of interaction between the learner and the system” (McCalla, 2004, p. 6). According to McCalla (2004), such an approach could, in a rather pragmatic way, underlie the designs of, among others: a study aid, a recommender system (content relevant to learner’s current task), an instructional planner (individualized curriculum of study), a group formation tool (grouping learners according to tasks or subjects), a peer-help seeker, a reminder system (for instance, RSS feed, the “Real Simple Syndication” of website updates to clients, mobile devices etc.), a learner-type-sensitive evaluation tool (for instance, for instructional and cognitive scientists), an end-use (automated, learner-type-adjusted) tagging system, an “intelligent garbage collection system” (reviewing relevance of educational contents and methods) etc. (ibid.)

Tilbury (2007) defines several key competencies of education for sustainable development (ESD) that support the implementation of ICT for sustainability: complex systems in the context of educational settings demand a system(at)ic approach to communication
that should incorporate both human and technological factors. Peled, Peled and Gad (1994) understand classrooms and schools as culturally dependent systems within a “cultural-ecological framework” (p. 58) that enables a definition of several indicators for the identification of ecological change processes (in classroom or school): cultural-ecological change generates educational innovations (ibid.), although it needs to be paralleled by “treatment-specific types” (p. 58); interactions with information technology (IT) should be “extensive and varied” (p. 58), but IT must be “mindfully integrated” into the (historically) print-dominated classrooms. Here, interestingly, the print-oriented situation of 1994 still holds a comparative potential to the continuous book-and-paper heavy teaching practices of 2011 worldwide and across cultures. In such a case, the use of multiple perspectives proves crucial not only in terms of online versus offline knowledge construction, but also in different combinations within the multimedia model (picture-text, sound-picture, etc.), which relates to a heterogeneity of knowledge construction and knowledge assessment practices highlighted in this paper. Alternating learning environments should be understood as awarding “unique contributions” (ibid.) calling for continuous and “mindful” (ibid.) change of course designs and learning methodologies.

The 21st century is seeing important developments in the use of technologies for social networking – not only in real life (for instance, Facebook) and career (for instance, LinkedIn) or marketing and citizenship (for instance, Twitter), but also in the realm of e-learning. All the major course management applications, such as Moodle or Blackboard, have long started introducing aspects of web 2.0 into educational ICT, ranging from individual elements, such as wiki, blog or instant messaging, to systemic solutions, such as hub-functionality, fostering learning in trans-local settings and intercultural community-building in educational contexts. Results in a recent research of Lambert, Kalyuga and Capan (2009) suggest that prior experience in distance education and technology is associated with lower anxiety and higher engagement, which agrees with the present author’s own preliminary research (Purg & Zakrajšek, 2009) showing that web 2.0 technologies do not impose excessive levels of mental load, if proper curricular design and implementation are secured. It is obviously important that intrinsic and extraneous cognitive loads are reduced sufficiently by providing an organized and clear course design and selecting engaging materials and activities suitable for different levels of learner experience and expertise (Lambert et al., 2009).

**Formative versus informative – Wikis versus tests**

In this study, the aforementioned assumptions and predictions are checked against a representative body of quantitative empirical data from a topical questionnaire and complemented with qualitative observations. The research has been carried out for two years on several comparable groups of students attending the same course “Introduction to Media” as the introductory course of a recently Bologna-renewed higher vocational education programme “Media Production” in Slovenia. The course was conducted under the leadership of the same teacher (author of this paper), with exactly the same contents, aims, outcomes and also learning, teaching and assessment strategies – yet conducted at three different
schools. As a rule, full-time students attend courses in the morning or at midday, whereas part-time students attend courses in the afternoon and mostly combine studying with regular work. All course runs lasted 8–10 weeks in the winter semester, beginning in October and completing in mid-December. Moodle learning management system for blended learning (no paper materials were transacted whatsoever) was adopted. Table 1 shows the comparison and calculation of “hours per ECTS credit point” in order to illustrate the workload differences (Purg & Zakrajšek, 2009), as assessed by the students themselves.

Table 1. Workload questionnaire response overall statistics in the academic year 2008/2009 and the academic year 2009/2010

<table>
<thead>
<tr>
<th>Year of study</th>
<th>2008/2009</th>
<th>2009/2010</th>
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<tbody>
<tr>
<td>Mode of study</td>
<td></td>
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<tr>
<td>Full-time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part-time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group size (students in group)</td>
<td>36+38</td>
<td>22</td>
</tr>
<tr>
<td>Hours of work per ECTS credit</td>
<td>24</td>
<td>20</td>
</tr>
</tbody>
</table>

The group sizes of all runs were comparable (the smallest group had 20 and the largest had 42 students), a total of 96 students were included in the academic year 2008/2009 run, and 166 students were included altogether in the academic year 2009/2010. The questionnaire response was always between 50 and 80% per group. Apart from typical workload-focused questions, the students were also asked to assess their general satisfaction with specific elements of e-learning used in this blended course (10 face-to-face meetings combined with intensive online work). The results of selected, topic-relevant elements related to knowledge assessment are compared in Figure 1, presenting the average response by each type of students within an academic year.

![Figure 1. Students’ satisfaction with specific e-learning elements](#)

*for multiple-choice test online, there is no data for the academic year 2008/2009

1 – completely unsatisfied; 5 – completely satisfied
It is possible to conclude that all other forms of assessment and activities were preferred better than the wiki collective homework assignment (introduced only in the academic year 2009/2010). In this assignment, students had to, within a course-internal wiki, collectively construct answers to subject-related questions that (in the form of a website) contained text, pictures, links (also to video content), etc. Another form of assessment, short (online, time-limited) multiple-choice tests was introduced besides the methods used so far (regular homework submission online, seminar work development and submission online, seminar work presentations live and through online video, final oral exam). Interestingly, this most restrictive and stressing assessment element scored only slightly below all others, yet was surprisingly preferred by all surveyed groups over the wiki, whereby wiki even had a considerably lower (cumulative) final-mark impact than the tests. Part-time students generally show higher appreciation levels of e-learning elements than full-time students – which could be due to their increased absence from live meetings because of work- and family-related obligations that they can compensate for by studying online. Whereas, surprisingly, a significant increase of study stress can be indicated with full-time students, who in the academic year 2009/2010 obviously show greater dissatisfaction with the further step in assessment methods differentiation – tests and wikis were the only newly introduced assessment element as compared to the previous year’s (the academic year 2008/2009) course design. This could also be the main reason for the increase in average hour-per-credit value of the course (Table 1), showing that students had to work more hours per credit than before.

In Figure 2 it is possible to see that multiple-choice tests were agreed by the students to be the most exact indicator of their knowledge.

Figure 2. Students’ opinion on assessment relevance of wikis and tests
Thus, they were unanimous in the opinion that quick multiple-choice online tests are the most suitable assessment method, even if they often reported high levels of stress due to a strict computer-controlled time limit (5 minutes for 8 randomly chosen questions). Checking knowledge in a time-limited multiple-choice form obviously suited students much better than open questions (final oral exam). Whereas collaborating on the homework task collectively through wiki suited them far less than individual homework assignments submitted into a drop-box. It should be noted that each collective homework wiki assignment was topically linked to the respective individual homework assignment, submitted in a document file. Still, the wiki-homework enabled most of the students a better organization of subject matter, thus after all proving to be of positive impact to knowledge construction, even if not enjoyed as an assessment form. It needs to be added here that – for experimental reasons – the wiki process was not explicitly followed or participated in by the teacher, instead, only short oral feedback was given to students after each session as to stimulate a more spontaneous and equal participation. A next possible step of course design development could, thus, be towards participatory assessment forms, since Knipe and Edwards (2009) prove that, by using a wiki to create exam questions, a web-2.0 version of the traditional open-book exam is possible, bringing about credible assessment results and raising motivation – if conducted correctly and carefully. Quite similar, as in the example provided, this could only be possible if careful moderating of the collective wiki usage is provided interactively by the teaching authority.

Blended classrooms for sustainability

As a typical and up-to-date form of formative assessment, wikis, much like other web 2.0 elements in education (Greenhow, Robelia, & Hughes, 2009), call for mindful implementation. This is because, by enabling quick and simple access – and by false analogy to non-educational uses in social networking or other collaborative online processes – new technologies can easily mislead the student into unpremeditated construction of text or media-rich contents. Then again, they may seem just a misused assessment form, or even pose a threat to students’ individuality, identity or privacy. Such unbearable lightness of web participation as in a collective wiki assessment can obviously be positively counterbalanced by rigid informative assessment, such as through individual closed tests. Different types of information processing can thus be – and especially with(in) new technologies – sustained together in a type-different yet internally balanced informational ecosystem. Such a claim can be further supported by the fact that the aforementioned course has achieved high students’ satisfaction scores, even though it was heavily laden with online, live activities and manifold forms of assessment. It also showed particularly high and increasing learning motivation indicators – even in the face of a comparatively immense self-assessed workload.

In terms of media ecology, the aforementioned arguments plead for a careful and well balanced use of resources, combining different and complementary ways of information processing for a clearly defined learning objective (Purg, 2006). Emerging computer technologies increasingly implemented in the realm of education, such as cloud computing or social operating systems, are, according to Greenhow et al. (2009), likely to intensify the
participatory and creative practices in both virtual and physical classrooms. The author finds that dependence on data and information – arguably here also within assessment processes – shall be equal to or even replaced by an emphasis on creating, developing, and sustaining human relationships. New media in education can foster interactive knowledge acquisition that is more sustainable in terms of being focused onto the learner’s actual needs, information-processing preferences and social (network) capacities. And, indeed, only if a learning environment is coherent in terms of social structure and information-processing and also internally differentiated, can it allow for accurate revelations of significant educational trends and practical recommendations – such that question and signpost the development of education towards sustainability.

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FACTORS INFLUENCING LEARNERS’ SATISFACTION IN AN OPEN E-LEARNING ENVIRONMENT

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Abstract

A number of new open learning environments have risen aside to common e-learning environments. Wikiversity is an open environment to all community members. Students’ behaviours change in the community creation process, and their self-satisfaction impacts learning. The study methodology is qualitative content analysis, and the data is collected from students’ blogs, online and focus group interviews. Data is based on a monitored course for bachelor students of special pedagogy (n=21). There was a possibility to test and assess modern e-learning technologies and use a socio-constructive learning process. The results are studied in light of social-exchange theory. The outcome of this study indicated that learners’ satisfaction increases with free access to fellow students’ works, full and equal membership of the community and an opportunity to compare oneself to the others. The future research should focus on optimization of policies and sustainable development in education to establish successful exchange systems.

Key words: satisfaction, e-learning, self-directed learning, social-constructive learning

Introduction

The satisfaction of learners in the classroom has been extensively researched (Astin, 1993; DeBourgh, 1999; Navarro & Shoemaker, 2000; Bolliger & Martindale, 2004) just as the contentment of learners in an e-study environment with limited access (Artino & Stephens, 2009). However, not so much research has been conducted in open study environments. Wikiversity is a diffused e-study environment, which is not strictly limited and does not have a login, restricted users or set up procedures. Thus, Wikiversity is a place with a new approach to e-studies. “It is a training delivered on a computer (including CD-ROM, Internet, or intranet) that is designed to support individual learning or organizational performance goals” (Clark & Mayer, 2007, p. 7).

The creators of educational software cannot ignore the influences of technology that impact social life. Certain different computer systems or web browsers can also be a problem for some learners. Thus, it is important that the tools are compatible with each other.
For instance, the equal access to Web Sites has been ensured and HTML (XHTML) – language standards have been agreed on. The conditions can be consulted on World Wide Web Consortium page.

Web 2.0 and various social media programmes are based on cooperation and internet access which forces both learners and teachers to be aware of such concepts and problems. For instance, the well-known social environment Facebook does not pass an access control, hence, these pages are not valid. Although the learners nowadays use mobile communication tools (smart phones, notebooks), information is not always available. This is a problem for learners with special needs whose financial possibilities are often limited. According to UNESCO Declaration of Human Rights, every human being has a right to have access to scientific and technological knowledge (UNESCO, 2005). Therefore, we should not forget that, if the equal opportunities and free access are ensured to the learner, it leads to certain expectations. Valuing the connection between education and working life becomes increasingly important. According to studies conducted in Finland, the greatest obstacles for the execution of learning through work result from a lack of co-operation between education establishments and enterprises in planning training programmes and building partnerships. A dynamic and many-sided partnership between education and working life creates new opportunities to meet the challenges of the future (Niemi & Ruohotie, 2002). On the one hand, we are open to the innovation; on the other hand, we have to follow the rules and regulations of community.

The learners of the aforementioned (Wikiversity) environment have to realize that their contribution is not connected solely with their role as recipients but their active participation presupposes the characteristics of a self-directed learner. The notion of a self-directed learner has to be considered one of the main educational tools of an adult student (Cunningham, 2010). Brookfield (1986) showed that self-directed studying is something more than a modified transfer of knowledge. He (Brookfield, 1986) defined it as follows:

> Self-directed learning in this second sense occurs when learners come to regard knowledge as relative and contextual, to view the value frameworks and moral codes informing their behaviours as cultural constructs, and to use this altered perspective to contemplate ways in which they can transform their personal and social worlds (p. 47).

Thus, real self-directed learning arises from the student’s internal transformation that has been planned and is in accordance with one’s self-discipline. The latter brings about social change.

**Review of literature**

A contented learner is the one who has perceived his/her experience of the educational institution as an acquisition of education supplied by a trusted educational body (Astin, 1993). One of the determiners of the learner’s satisfaction with him/herself is self-perception, when he/she feels that his/her expectations are fulfilled or even surpassed and
he/she has gained one more enriching experience (Juillerat, 1995). The same is confirmed by the latest surveys showing that, if the student’s expectations are in accordance with or surpass the aims set for him/herself at the beginning of the course, he/she appears to be content. If the expectations are higher than reality, the student is clearly dissatisfied (Artino & Stephens, 2009).

Furthermore, the learner can be seen as a consumer. Giese and Gote (2000) have in the past 30 years studied twenty different definitions connected with satisfaction. On the basis of literature, validated data groups and personal interviews, they (Giese & Gote, 2000) have arrived at the conclusion that the contentment of an e-learner is influenced by three main components: 1) it is a sum of intensively variable affective conditions (such as ‘I like’, ‘I feel good’ or ‘I feel comfortable’); 2) a certain time period which varies with the situation but still, in most cases, has a limited duration; 3) the core of satisfaction is study content, i.e. choice, acquisition and use of the product.

Therefore, learner’s satisfaction can be defined as a sum of intensively variable affective conditions that can be observed via asynchronic e-learning activities. The latter are, however, stimulated by different central factors such as content, user interface, learners’ community, adjustability and realization of the studied material (Giese & Gote, 2000; Wang, 2003).

The learner’s satisfaction increases if the studied material is important for him/her, immediately related to his/her life and linked to the achievement of the long or short term studying goals, which have been interpreted as his/her own (Soini, Pietarinen, & Pyhältö, 2008). At the same time, acquisition of experience in the learning process cannot yet be considered a sufficient factor for ensuring student’s contentment. Finnish researchers (Pyhältö, Pietarinen, Soini, & Huusko, 2008) have discovered that if the learner experiences him/herself as an active doer and participant in cooperation with others, an even greater feeling of satisfaction can be achieved. Thus, the more time students invest in their studies, the higher is the level of their efforts and the more they study (Demaris & Kristonis, 2008). The aforementioned devoted students can be characterized as self-regulated learners who efficiently monitor their studying experience in different ways, organizing and trying out new information they have acquired, observing their intellectual processes and seeking help if they do not grasp the meaning of the material. They are positively motivated and believe in their abilities and learning values (Schunk & Zimmerman, 1998; Boekaerts, Pintrich, & Zeidner, 2000).

It has been found that highly motivated and independent learners need e-learning environment just because of its autonomous character compared to a traditional classroom (Dabbagh & Kitsantas, 2004). Moreover, academic motivation is also influenced by the learner’s age (Ke and Xie, 2009).

Another important condition securing satisfaction is the simplicity and user-friendliness of the technology employed in the course (Belanger & Jordan, 2000). The students who are frustrated by the course technology have a lower satisfaction level (Chong, 1998; Hara & Kling, 2000; Bolinger & Martindale, 2004). Dubois’ (1996) survey showed that older learners are not so apt to use the technology because they have family and work duties.
Social Exchange Theory (SET) supplies a theoretical framework and gives guidelines on how to increase students’ participation activity. The crux of the aforementioned theory is the explanation offered by Homans (1958):

*Social behaviour is an exchange of goods, material goods but also non-material ones, such as the symbols of approval or prestige. Persons that give much to others try to get much from them, and persons that get much from others are under pressure to give much to them. This process of influence tends to work out at equilibrium to a balance in the exchanges. For a person in an exchange, what he gives may be a cost to him, just as what he gets may be a reward, and his behaviour changes less as the difference of the two, profit, tends to a maximum” (p. 606).*

Hall (2001) suggests four main factors which ensure motivation and obliges members of a community to share their knowledge:

1. personal needs: expectations that are accepted during the activity and ensure useful information in return;
2. reputation: learner feels that he has been visible and able to influence other community members with his opinion;
3. altruism or a notion of efficiently shared knowledge in one’s community which has been publicly approved;
4. tangible reward.

In this study, the author has made use of the general format of open learning environment Wikiversity within a landscape of social media tools and services to support students’ self-satisfaction in open learning environments.

**Sample and methods**

**Overview of the course, participants and landscape of social media**

The bachelor’s level course “Educational Technology and Special Needs” was designed to challenge participants into advancing their dispositions for self-directing learning to understand the problems of educational technology that people with special needs have with the support of social media tools and service.

The choice of the aforementioned course was determined by three different factors.

1. The target group the course participants will be working with in future is unique and forms a minority in society. However, UNESCO Declaration of Human Rights and the EU Council of Ministers’ decree for 2006 – 2015 states that the rights of the people with special needs have to be protected and their full participation in society has to be promoted.
2. An awareness of the various possibilities of ICT which are relevant and accessible for the people with special needs is to be highlighted.
Factors influencing learners’ satisfaction in an open e-learning environment

3. These possibilities are to be regarded in a fresh perspective, and using open e-learning environment which includes the instruments of WEB 2.0 is to be considered.

21 undergraduate students (3rd course) majoring in special pedagogy participated in an e-learning course lasting for half a semester in autumn 2009. These participants were 12 full-time students and nine distance learning students. The students’ age range was from 20 to 54.

The form for this particular e-learning course was blended learning, where full-time students had a chance to meet each other once a week in a computer class. Distance learning students lacked this opportunity, hence, they met only twice during the course, at the beginning and at the end. The course lasted for seven weeks.

The course facilitator used a distributed technological landscape (Figure 1) of social media, leaving aside any centralized and close systems hosted by institution (Fiedler & Kieslinger, 2006). The central core of this selection was open e-learning environment Wikiiversity, where students’ were provided with an updated overview of ongoing activities, necessary materials and links. All participants could add themselves their contact data: e-mail, weblog and homepage addresses. A synchronic communication tool “Skype” connected facilitators and students in real time conversation. Personal blogs were used for self-reflection and writing essays and the simplest program Notepad was used for making homepages. The reasons for opting to use Notepad were the following: this program does not need installation, it belongs to the operating system Windows (i.e. it does not require additional expenses from the users) and has the simplest text editing system, where the user can enter a clear HTML code and which is compatible with other high technology-based tools (cell phones, IPad, IPod, etc.) The choice of the latter instruments was determined by the awareness of the problems encountered by people with special needs in contemporary information society and the ability to evaluate the accessibility of web-based materials for people with special needs (Kikkas, 2009).

![Diagram of tools and services used in the course](image-url)
Course framework

The course had two general objectives. Firstly, to introduce and perceive the role of information technology (IT) in involving people with special needs through social-constructive learning methods and the support of social media to people with pedagogical background. Secondly, to provide students with a basic practical knowledge of web-making and the ability to become familiar with the accessibility of web materials for users with different disabilities.

Special attention was paid to the notion of self-directed learning and self-satisfaction. Hence, two assignments were completed, one individually and the other in peer-groups. Students had to think of a study activity and come up with the real working technological landscape that would support this particular activity. Reflection was done in an essay format, where students were asked to review a survey of reading materials and their actual learning process of making a simple homepage. All individual and group work was supported and mediated by the tools and services the students had selected.

Students were given complete freedom and full responsibility for their activities. They were encouraged to take control over the objectivities and the means (straight connection SET 1 factors) (Hall, 2001). Although learners had been given a final deadline for assignment completion, they were encouraged to follow their own pace while respecting overall duration of the course. To foster personal responsibility, course facilitator provided different reading materials on various related topics (special needs in different eras; Internet, World Wide Web; (X)HTML and CSS; support of different technological solutions for special needs; accessibility and standards on the Web; characteristics of Internet communication; IT and special needs). The mentioned topics are crucial in the everyday work of the future special pedagogue (connection SET 3 and 4 factors) (Hall, 2001).

Research design

This research is based on content analysis of inductive and deductive category application. The inductive category is based on the students’ personal Weblogs (Krippendorff, 2004). The deductive category application is to formulate a criterion of definition derived from theoretical background and a research question, which determines the aspects of the textual material taken into account (Mayring, 2000). The implementation of the two different categories of content analysis is regarded to enhance the reliability of the results of the given research.

The aim of this qualitative analysis is to study students’ satisfaction in open e-learning environments.

1. Supporting students’ satisfaction and understanding course design, a discussion on the issue “Educational technology and people with special needs” to identify and describe self-directedness and intended changes for the course design was initiated. Overall purpose of Wikiversity and understanding Openness was based on the different factors leading to satisfaction.
2. The section of design and implementation of resource for practical work refers to the actual teaching process where the change in student reflection was observed, their personal characteristics presented in Weblogs were analysed and social aspect (i.e. what they said about cooperation) was considered.

3. An analysis of students’ self-satisfaction in light of Social Exchange Theory was carried out, and reflection of students’ perceptions of their experiences while participating in the course was organized. This study seeks to find out what connections and patterns emerged as a result.

Research questions

The purpose of qualitative analysis was to study students’ satisfaction in open e-learning environments. Social media and learning tasks promoting self-directing were used and students’ responses to that learning situation were investigated. This study seeks to find out the answers to the four questions.

1. What factors support students’ self-satisfaction?
2. Which challenges are presented by practical work (individual and peer) to foster positive self-perception?
3. What is sustainability when talking about learning environment or how to change and increase students’ activeness to participate?

Data collection and analysis

21 students participated in the course and the focus was on data which revealed students’ cognitive and emotional aspects (attitudes, feelings, thoughts). Data was collected in the form of students’ essays, interviews and reflections about their feelings and experiences. This technique of qualitative analysis was recommended by Miles and Huberman (1994) and procedures of inductive category. The analysis involved data reduction through writing and rewriting the findings’ section.

The findings are organized to focus on the research questions. Students’ pseudonyms were used in the discussion.

Students’ reflections on satisfaction factors

The factors of satisfaction were analysed from the following aspects: personal characteristics, self-directedness and social aspect. At the beginning of the course, students had many expectations as well as fears concerning this new experience. The tasks were tackled according to the person’s level of responsibility, independence, motivation, initiative or ability to adjust, according to some of the responses provided.

*S1:* Topic itself is interesting but not treated much, and that is why I hesitated a bit at first.
S2: I approached the subject with big hesitation and prejudice, I admit there was even fear.
S3: Expectations were high, I hoped to get some good tips how to compile study materials on the Internet myself.

The students experienced satisfaction if they were aware of their own study needs and objectives that they wanted to achieve. For instance, one of the characteristics of self-directedness is time management skills.

S4: Work was organized systematically week by week (in the same order the tasks were set) and such work allocation was actually perfect.
S5: I tried to complete one task every week, but then there was a short break and overcoming it took time and effort.
S6: Because I knew that this project would take a lot of time, effort and patience, I decided to start early, so there would be time to experiment/discover as well as make mistakes, but still manage to finish the project in time.
S7: One of the most positive aspects of the course was that you could plan your own time and that way you could concentrate more deeply on these exercises.

Challenges of practical work about feedback

The interviews with the students indicate that the given task was more targeted to the external rather than internal motivation.

S8: As at the beginning of this project many of us had no contact with blogging, we did not know what to do exactly. We were not quite sure how to complete the tasks. Every beginning is hard, it was proven again by this subject.
S9: Making the web page turned out to be more difficult than I expected. Despite my previous experience with making a web page, it did not go without obstacles.

Despite sharing an authentic social situation with students, it became apparent that the language used as a medium of knowledge was not understood by everyone the same way. Understandings within the community were different or problems were approached from different angles (Jonassen, 2004).

The problem actually emerged because initially nobody had questions about how to complete the task or how things should be done. But, after receiving feedback and discussing amongst themselves how everyone was handling a particular task, it came out how differently people understood the same exercise.

S10: When the homepage was up and passed the validator, I thought – yes, I did it. But, after looking over my homepage, the lecturer gave me more tips and recommendations of how my homepage would look even better and how to gain even more points from it. It is done now!
Constant interaction and encouragement during the course supported the student (every task was followed by feedback) and made the learning experience more effective. Presenting and demonstrating the task step-by-step was of great help.

_S11_: I expected the teacher to provide feedback on the work done and the questions which arose and I got it as much as I needed. I was very satisfied with the structure and arrangement of this course, and I expect more courses like that in the future. It’s an excellent form of studying for correspondence course students, and why not in some subjects for full-time students.

_S12_: I expected help of all kind from my lecturer. I would have received it if I had been more active myself. However, I got answers and suggestions for every question I asked.

Dependence of satisfaction factors on sustainable learning environment and change in students’ activeness

Students’ satisfaction with sustainable learning environment arises if they feel included, if they can share their knowledge, if it is an open environment. At the beginning of the course, students do not pay much attention to it; however, at the end of the course they are able to bring out the most important aspects.

_S4_: All expectations were fulfilled. Even in a larger scope than at first expected since the feedback provided by the lecturer was very good. I did not expect that kind of a co-operation.

_S6_: The course finished quickly, but, at the same time, it was very informative and beneficial. I am now more knowledgeable in IT and more liable to help people with special needs in this domain.

_S13_: During this course, we discussed many things with my course mates, how different people understood the tasks, just to be sure. Many of us shared the same problems, most of us thought that making our own homepages was the most difficult task, and, for many of us, it was our first homepage ever.

The study results are presented in accordance with SET and based on deductive content analysis using descriptive statistics. Responses were collected by focus group interviews and the respondents were divided into age groups according to the length of their work experience: Group 1 (work experience 0) – age 20–21; Group 2 (work experience 1 year) – age 22–24; Group 3 (work experience more than 5 years) – age 29–42. Each group comprised from four to six people (Table 1).
The results can be viewed from the left to the right. Based on the four factors of SET (Hall, 2001), the responses were divided into the three categories:

1. Personal needs. A1 – high (values knowledge and skills); A2 – moderate (values knowledge or skills); A3 – low (does not prefer knowledge to skills or vice versa).
2. Reputation and sharing knowledge. B1 – visible to the peers, persistent observer of others; B2 – shares opinions only when guided, observes the others; B3 – does not share opinions, observes the others only at times, does not meet deadlines, shares opinions rarely.
3. Altruism or shared knowledge. C1 – sharing knowledge is highly valued, is interested in enhancing peers’ well-being; C2 – sharing knowledge with peers is moderately valued; C3 – is not interested in peers’ well-being and does not share knowledge with them.
4. Tangible and mental reward. D1 – the result and feedback of the course is highly valued, is aware of the direct material profit that could be gained in the future or current profession; D2 – the result and feedback of the course is moderately valued, is aware of the professional prospects; D3 – the gained knowledge is not valued, is unable to connect the acquired knowledge to the profession.

**Discussion**

The findings suggest that this course provoked both self-satisfaction and dissatisfaction. Reflections on the activities varied considerably among students. The student’s self-satisfaction supports good feelings, his/her expectations are fulfilled and even fostered (S4, S6) (Juillerat, 1995).

Self-satisfaction also depends on learner’s personal characteristics (affective, cognitive, connotative aspects), i.e. emotions, attitudes, concepts and activities. The essay shows that students as users of social media express their emotions and knowledge (S8). When
they learn to use weblogs and see facilitator’s feedback, the participants’ attitudes to the subject and their learning strategies change (S11). The same point is brought out by Giese and Gote (2000), i.e. the core of satisfaction is choice, acquisition and use of the product or people’s development and growth.

Cognitive aspects (attitudes and understanding) foster motivation and self-directedness (S4, S6, S7). Students are positively motivated and believe in their abilities, which was also found by Boekaerts, Pintrich and Zeidner (2000). Connotative aspects in this study show different comprehension of the activities, which led to practical tasks being challenging. Feedback was negative due to several reasons: missing competence (S9, S13), bad time management skills (S5) etc.

After the completion of the peer-assignment (analysing a course mate’s webpage), evaluation criteria changed (S4, S6, S13). Firstly, using open environment Wikiversity does not require special training. Secondly, all participants are able to demonstrate their knowledge in the environment regulated by themselves. Thirdly, new values emerge: visibility to others, one’s own prestige, sharing knowledge, altruism (Hall, 2001). These findings indicate sustainability.

Deductive content analysis revealed numerous interesting patterns, which originate from SET and influence learner’s satisfaction. The first category focused on personal needs and showed that all age groups have a specific correlation between academic motivation and knowledge as well as skills acquired at the course (Table 1). The latter is not dependent on learning environment. Similar results have also been reached by Allen, Marby, Mattery, Bourhis, Titsworth and Burell (2004) and Jandaghi (2008), who studied the effectiveness of distance and traditional learning. The second category concentrates on each learner’s reputation and indicates that the learners with no professional experience are the most interested in others valuing their opinions and judgements. However, the inductive content analysis of students’ interviews show a clear connection between students’ time management, families or job responsibilities and ICT skills. Hence, it is evident that satisfaction and sharing knowledge influence each other. The last two factors (altruism and tangible reward) have had a rather heterogeneous response. Sharing knowledge and the practical benefit of acquiring skills, which can be implemented in their profession, are valued. However, it appears that an open environment, different tools, courage to ask for help and constructive feedback and self-reflection encourage the students’ self-satisfaction.

Conclusion

If a student knows and uses communication devices, it cannot be assumed that he/she is able to interact or learn in e-learning environment. We should understand that, while surfing the Internet, students have more and more access to e-tools, gaining, thus gaining more interactive experience.

The factors ensuring student’s satisfaction in e-learning and looking at it in light of SET are the following: open learning environment, which enables reflection (prestige); flexible and student-centred time management (personal needs); encouraging immediate feedback, which promotes discussion (altruism); cooperation with course mates and shared
knowledge (reward). Further research is needed on the frequency of helping questions and the balance between the explanations in determining student satisfaction in e-learning.

References:


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EXPLORING AND PROMOTING ECOLOGICAL CONSCIOUSNESS IN TEACHER EDUCATION: THE POSSIBILITIES OF EDUCATIONAL ACTION RESEARCH IN EDUCATION FOR SUSTAINABLE DEVELOPMENT

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Abstract

The paper reports on the findings of a qualitative study with 39 first year students of preschool and primary school teacher education programmes who are taking an educational action research based study course “Environmental Pedagogy”. The study aimed at engaging the students in reflection on their experiences of interaction with nature and uncovering their views on ecological consciousness. Qualitative content analysis sought emergent themes in students’ reflections. A conceptual framework was identified containing three frames of reference: (1) inclusion-oriented frame of reference; (2) exclusion-determining frame of reference and (3) solution-oriented frame of reference. Conclusions were drawn about the possibilities of educational action research to encourage students’ reflection on ecological consciousness and building sustainable and inclusive relationships with the world.

Key words: educational action research; ecological consciousness; pre-service teachers; frame of reference

Introduction

To contextualize the present study, we will begin by briefly outlining the background of our engagement in educational action research (EAR). The experience of EAR has been accumulated and developed gradually at the Faculty of Education and Management of Daugavpils University (Latvia), which is the affiliation we represent as post-graduate students and novice researchers. EAR at the Faculty is related to the broad aim of designing a learning environment for the development of pre-service teachers’ research skills (Salīte, Mičule, Kravale, Iliško, & Stakle, 2007; Salīte, Gedžūne, & Gedžūne, 2009) and engaging pre-service teachers in constructing their vision of the aims of education for a sustainable future (Salīte, 2002, 2006, 2008). EAR at our institution traces its roots back to the endeavour undertaken first by a few keen and committed individuals and then by a growing group of
like-minded enthusiasts to grasp the potential that action research holds for the implementation of study courses in sustainability oriented teacher education. The insights and experiences gained from tentative explorations of these possibilities were developed into a sound foundation for implementation of study courses related to environmental education and education for sustainable development in teacher education programmes at Daugavpils University on undergraduate and post-graduate levels. In recent years particular attention has been paid to exploring the deeper nuances and shades of EAR that contribute to its considerable diversity (Salīte et al., 2009) and highlighting the essential focus of EAR – that of engaging research participants in reflection on the deeper meanings of their experiences and helping them to identify resulting changes in themselves. It is assumed that EAR experience during pre-service training becomes the grounds for the graduates adopting the stance of a teacher-researcher in their ensuing professional activity.

The present paper focuses on evaluation of qualitative findings from a particular case in an EAR cycle implemented during the autumn semester of the year 2010 with an emphasis on inclusion as a precondition for sustainable relationships between humans and the world they inhabit. The study aims at engaging the students (pre-service teachers) in reflection on their experiences of interaction with nature and uncovering their views on ecological consciousness. We will attempt to answer the following research question: in what frames of reference do pre-service teachers ground their understanding of human-nature interaction and ecological consciousness as its determinant? We will concentrate on analysing the content of the research participants’ views on the phenomenon of ecological consciousness that emerged as reactions to a particular thematic suggestion (an emotionally charged original text outlining the basic ideas of deep ecology).

The basic assumption that underlies the present case of EAR is our belief that person’s inclusion in the social and natural contexts is considered a precondition for achieving sustainability and resolving the tensions in the relationships among humans as well as between human and more-than-human worlds (Gedţūne & Gedţūne, 2010). The natural and the social worlds are deeply interrelated (Bradbury, 2003). Humans are interdependently involved in the web of nature and in the biotic communities that shape and are shaped by human social life (Kasper, 2009). Awareness of this involvement is enclosed in our experience as a human species. As pointed out by Dewey, the human consciousness has evolved on the basis of our experience in and of nature as a means to understand the world of which we are a part (Brereton, 2009). It follows that our consciousness has its roots in our evolutionary oneness with nature. Such perspective is deeply ecological since it views individuals as a part of the human society which, in its turn, is an integral part of the ecosphere (Naess, 1989). It is also an essentially inclusive perspective that envisages extension of self to include all others from the natural and social world.

Yet the quality of relationships between humans and the natural world leaves a lot to be desired. Moore (2005) criticizes the current lack of connection between the social and the natural world. The crisis of sustainability that we are experiencing is seen as crisis of the human mind (Reason, 2007) – the way we perceive ourselves and the world that we are part of. In other words, it is a crisis in our frames of reference – complex webs of assumptions, understandings, values, perspectives, attitudes and beliefs that constitute personal paradigms through which we perceive and make sense of the world by interpreting our ex-
Exploring and promoting ecological consciousness in teacher education: The experiences (Aalsburg Wiessner, & Mezirow, 2000; Cranton, 2000; Mezirow, 2000; Ahteen-maki-Pelkonen, 2002). Humans are more and more overcome by the feelings of estrangement, alienation, individualism, egoism. In other words, we witness a disposition towards exclusion from the ecosystem and its processes in people’s consciousness (Salīte et al., 2009).

Clearly, such relationships between persons and the wider social and natural contexts they inhabit are unsustainable and require transformation. Nowadays education ought to be focused on helping learners become aware of their frames of reference and developing learners’ ecological consciousness to ensure that the humanity forges inclusive and sustainable relationships not only among its individuals and communities, but also with all life and its support system. As Reason (2007) puts it, we need to start understanding the Earth not as a collection of objects but as a community of subjects in which we participate. Such transformation in our frames of reference might help us overcome human exclusion and alienation from nature (Kasper, 2009) and take steps towards achieving the sustainable vision of deep inclusion in the social and natural contexts of the world. How can it be achieved? What should learning be like in education for sustainable development? We will attempt to address these concerns in the following section where we will outline the theoretical framework of this paper.

Educational action research in education for sustainable development

When building the theoretical framework for the organization of our research and analysing the obtained data, we focused on EAR as a viable approach to education for sustainable development (Pipere & Salite, 2006; Salīte, 2008; Salīte et al., 2009; Kinsler, 2010). We especially concentrated on the following features of action research.

New view on knowledge and its generation. As pointed out by Brydon-Miller, Greenwood and Maguire (2003), action research challenges the positivist view of knowledge which posits that credible research is such that can remain objective and value-free. Such a positivistic, values-neutral stance is not characteristic of action research. Action research embraces the notion of knowledge as socially constructed and views research focused on its creation as necessarily embedded within a system of values that is oriented towards justice and democracy (Bradbury & Reason, 2003; Brydon-Miller et al., 2003), flourishing of persons, communities and the ecology of which we are all a part (Reason, 2006). This values orientation makes action research approach to education and generation of knowledge compatible with the ethical considerations at the heart of education for sustainable development and relevant to the basic standpoints underpinning our research.

Concern with the process and reflection on experiences and assumptions. Several studies emphasize that what matters most in EAR is not so much the immediate practical outcomes as the process (Reason, 2006, 2007) – empowering individuals (Bradbury Huang, 2010; Kinsler, 2010) and enhancing their participation through opening new spaces for dialogue (Reason, 2006; Bradbury & Reason, 2003), and encouraging critical reflection on experience-based assumptions, which permits to achieve new perspectives and ways of seeing things (Leitch & Day, 2000) and develop living, situational knowledge (Reason,
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2006). Sustainability demands individual and social transformation, which involves a radical shift of awareness and worldview (Reason, 2007) or transformative changes in our frames of reference (Mezirow, 2000). EAR is thus a viable means for achieving the desired individual and, eventually, social transformation and orientation towards persons’ inclusion in the social and natural contexts they inhabit, which we consider a precondition for a sustainable development and flourishing of the Earth, its ecosystems and communities.

Cooperation. The transformational, participatory and cooperative accents of EAR for sustainability and inclusion are particularly emphasized in such form of action research as second-person research (Chandler & Torbert, 2003; Kinsler, 2010) or cooperative inquiry (Bradbury & Reason, 2003). We believe that the underlying philosophy of cooperative inquiry or second-person research is compatible with the basic tenets of sustainability in education. Moore (2005) argues that sustainability education is a process of creating a space for inquiry, dialogue, reflection, and action about the concept and goals of sustainable living. In the same vein, Reason (1999) points out that cooperative inquiry is a way of working with other people who have similar concerns and interests to understand one’s world, make sense of one’s life, develop new and creative ways of looking at things and learn how to act so as to change things for the better. A characteristic feature of cooperative inquiry is the so-called “critical subjectivity” (p. 212) or building on participants’ living knowledge and experience (ibid.). In Reason’s (ibid.) opinion, cooperative inquiry thus permits to perceive the world as more complex, interconnected and holistic. These standpoints resonate with a characteristic feature of a sustainability-oriented perspective – a deeply felt concern for the wellbeing of future generations and our planet in all its entity and diversity.

The above-described considerations prompted our choice to attempt to organize our study as second-person research or cooperative inquiry. The following section of the paper will outline the research methodology used in this study and specify its design and procedure.

Research design and methodology

This study reports on the findings of a case within a broader EAR conducted during the implementation of an action research based study course “Environmental Pedagogy” at Daugavpils University in the autumn semester of the year 2010. The aim of our research was to engage pre-service teachers in reflection on their experiences of interaction with nature and uncover their views on ecological consciousness. More specifically, we sought an answer to the following research question: in what frames of reference do pre-service teachers ground their understanding of human-nature interaction and ecological consciousness as its determinant?

Three researchers (one course teacher and her two post-graduate assistants), as well as 39 first year students of pre-school and primary school teacher education programmes, participated in the present action research case. All research participants were females, which might be accounted for by the fact that pre-school and primary school teacher’s profession in Latvia is almost exclusively chosen by women.
The learning and inquiry processes occurred in two learning groups – one of them united future pre-school teachers and the other – future primary school teachers. The groups met on a regular basis during lectures which were held for both groups together and seminars which were organized for each group separately. Namely, every first week the two groups had a lecture together and every other week – one seminar was held with each group separately.

During the broader EAR conducted in the autumn semester, the groups explored such issues as ecological/unecological person, ecological identity and ecological attitude, ways of human-nature interaction and ecological consciousness. Reflections on the latter issue (the focus of the present paper) were triggered by introducing the students to a document entitled “A Manifesto for Earth” (Mosquin & Rowe, 2004), hereafter in the text – the Manifesto, which contains 11 principles of an ecocentric worldview (Table 1).

Table 1. Main points behind the principles of “A Manifesto for Earth”

<table>
<thead>
<tr>
<th>Core principles</th>
<th>Action principles</th>
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<tbody>
<tr>
<td>Principle 1</td>
<td>Principle 7</td>
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<td>Principle 2</td>
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<td>Principle 3</td>
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<td>Principle 6</td>
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Sequel to Table 1 see on p. 48.
Sequel to Table 1.

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
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<tbody>
<tr>
<td>Principle 8</td>
<td>Reduce human population size</td>
</tr>
<tr>
<td>Principle 9</td>
<td>Reduce human consumption of the Earth’s parts</td>
</tr>
<tr>
<td>Principle 10</td>
<td>Promote ecocentric governance</td>
</tr>
<tr>
<td>Principle 11</td>
<td>Spread the message</td>
</tr>
</tbody>
</table>

Thoughtful birth control policies (reducing conception) to lessen the pressure of the ever increasing number of environmental users on the planet

Abandoning the homocentric view to reduce the exclusive over-use of planet’s goods by humans that deprives other organisms of their livelihood

Replacing homocentric governance that encourages over-exploitation and destruction of the Earth’s ecosystems with one beneficial for the survival and integrity of the Ecosphere and its components

Sustainable education and leadership to awaken all people to their dependence on the Earth’s ecosystems and to their bonds to all species, thus encouraging a shift from homocentrism to ecocentrism

The choice to select the Manifesto for facilitating students’ reflection was made on the grounds of the standpoint expressed by Bradbury and Mainemelis (2001) who argue in favour of using engaging texts in action research to anchor conversation and experiential engagement with various issues. The process of reflection on the Manifesto occurred in the following way:

**A First encounter with the text – first general impressions.** During one of the seminars, the students were invited to explore human-nature interaction and interrelation by reflecting on the text of the Manifesto. The research participants read it for general comprehension and for about 10–15 minutes discussed their first impressions in pairs or small groups of three. Such discussions in small groups are said to provide opportunities for exchange of various opinions or deepen the understanding of a particular perspective (Taylor, 2000). The question for prompting the discussion was the following: Please relate your personal experience to the issues raised in the manifesto – what principles do you agree with and why/why not. It was not planned, however, to use the data from the participants’ first reaction to the text and ideas imbedded therein for publication, so the researchers merely observed the discussion with an aim to facilitate exchange of impressions or opinions when a group appeared to reach an impasse. In such cases, which were only a few, the researchers asked some of the following additional questions to promote the discussion: What principles/ideas expressed in the text resonate with your personal experience/observations? In your opinion, which ideas of the Manifesto are the most important and pertinent to our society? Did you encounter any new ideas? Which affected you most? In what way? What ideas do you disagree with and why? The purpose of this first discussion was to initiate reflection and prepare the ground for a deeper analysis and a more critical reflection on the given text at a later stage.

**B Second encounter with the text – critical reflection on salient points.** During the following seminar, which was held a fortnight after the first one, separately in each group, the students were asked to re-read the Manifesto once again and focus on the following question: What interpretation of human’s ecological consciousness emerges from the Mani-
The pre-service teachers were encouraged to specifically focus on those ideas in the text that correspond to their personal experience and understanding of ecological consciousness and person’s relationships with the world. The students discussed their insights in pairs or small groups of three, and then engaged in a whole-class discussion, in which the insights gained from the text were again related to the students’ personal experiences of interaction with the social and natural world. Thus, an opportunity was provided for the research participants to coherently formulate their own thoughts and listen to others’ perspectives. Drawing on the insights gained in group discussions and individual reflection, a home assignment was given to prepare a brief essay that would describe the students’ interpretation of ecological consciousness on the basis of the ideas embedded in the Manifesto, which would echo their personal experience and understanding of ecological consciousness and person’s relationships with the world. No special rubric was intended; the pre-service teachers were merely asked to reflect in writing on the following issues: What principles/ideas expressed in the text resonate with your personal experience/observations? What ideas in the text were new to you? In your opinion, which ideas of the Manifesto are the most important and pertinent to our society? Which affected you most and in what way? What ideas do you disagree with and why? The home assignments were duly submitted, and we used them as data for qualitative content analysis.

The above-described format of reflection permits to consider the EAR case that the participants engaged in as containing certain features of second-person research or cooperative inquiry (Bradbury & Reason, 2003; Reason, 1999, 2006, 2007):

- participants are engaged as co-researchers in exploration of issues of pressing and mutual concern (the crisis of sustainability and the deteriorating quality of human-nature interactions);
- the process involves working with rather than on participants (the general intention is not to precipitate desired changes in the participants by external influence, but to engage them in uncovering their own perspectives);
- the process is focused on constructing knowledge from interpretation of and reflection on experiences (experiential encounter with the text, individual and group reflections on the insights gained);
- participants develop new ways of seeing the world (sharing personal views with peers and listening to other interpretations enrich individual perspectives);
- inquiry occurs in a climate of cooperation and mutual support (students discuss issues with peers in a mode of sharing, work as partners of equal status, with little or no pressure from teacher’s supervision).

The written data in the essays were considered to represent the results of the research participants’ continued, individual and collective, in- and out-of-class reflections over a period of about a fortnight. The obtained data were processed by using the method of qualitative content analysis (Mayring, 2000). This particular method was selected because it permits to categorize, classify and systematize relatively extensive pieces of text and make inferences from the content of communication (Cohen, Manion, & Morrison, 2000; Geske & Grünfelds, 2006). The question we attempted to answer was the following: what frames of
reference can be identified in the research participants’ reflections on human-nature interaction and the ecological consciousness as one of its determinants?

We followed the emergent coding procedure (Stemler, 2001), establishing the categories after preliminary investigation of data. Namely, the texts of the essays were transcribed in a Microsoft Word format, read for general comprehension, re-read thoroughly, broken into meaning units and condensed into categories which, in their turn, converged into gradually emerging themes. This procedure permitted to examine not only the manifest content, but also the latent content of the text (Granenheim & Lundman, 2004). Thorough attention was paid to the issues of validity, which are reported to be of a particular importance in a qualitative study (Winter, 2000; Golafshani, 2003; Rolfe, 2006). To increase the credibility and dependability of the drawn conclusions, the categorization process was performed independently by the two authors of this paper (Granenheim & Lundman, 2004). The results were then compared, some of the categories were renounced and some altered (renamed, split or converged). At the same time, we bore in mind that in a qualitative study there is no single correct meaning, but only the most probable interpretation of the meaning in research data from a particular perspective (ibid.).

Our interpretation of the research findings was focused on seeking overarching frames of reference (general themes of the text) that would characterize the research participants’ views on human-nature interaction and the ecological consciousness as its determinant. Our intention was to analyse the research participants’ own perspectives and views that emerged in discussion and reflection on their personal experience, by relating it to the issues raised in the Manifesto. That is why, when performing content analysis, we focused on the excerpts that reflected the pre-service teacher’s own interpretation and understanding and were phrased using expressions such as I think..., I believe... In my opinion..., I feel that..., I suppose..., etc. The obtained findings are presented and analysed in the following section of the paper.

**Frames of reference underlying pre-service teachers’ perspectives on ecological consciousness**

Content analysis of the research participants’ reflections on ecological consciousness that were triggered by the Manifesto permitted to distinguish three broad frames of reference which we termed: (1) deep-ecological or inclusion-oriented frame of reference; (2) recognition-of-the-uneccological or exclusion-determining frame of reference; (3) practically-recommendatory or solution-oriented frame of reference. We will now focus on each frame in detail, describe the categories that were identified in each of them, illustrate them with quotations from the research participants’ essays and try to determine which principles of the Manifesto are thus mirrored in the research participants’ reflections.
(1) Deep-ecological or inclusion-oriented frame of reference

In this frame ecological consciousness was manifested as person’s inclusion in the ecosystem in mutual and harmonious interrelation with own and other species. Table 2 depicts the main categories that were identified in this frame and draws parallels with the principles embedded in the Manifesto. Since the number of research participants is not great, our aim was not to precisely determine, how many students share similar ideas. Rather we were interested in determining the richness and diversity of pre-service teacher’s discourse on ecological consciousness and the underlying frames of reference.

Table 2. Deep-ecological or inclusion-oriented frame of reference

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples (content units)</th>
<th>Principle(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a person – species among species, living with and among others</td>
<td>a person – only part of the great Earth’s “orchestra” that is conducted by nature’s force of life; a person is only a (component) part from the great whole of the Earth</td>
<td>P1, P4</td>
</tr>
<tr>
<td>equality and equivalence of species</td>
<td>a person is nature’s equal rather than superior; part of the whole rather than something more important; all are equal – humans, animals, plants, no one is superior, higher, mightier or more important than other</td>
<td>P1, P6</td>
</tr>
<tr>
<td>closeness and awareness of mutual links</td>
<td>Earth is our home, our mother and simultaneously our child that we need to take care of; we are united, and it is the only truth that exists in this life</td>
<td>P3, P4</td>
</tr>
<tr>
<td>interdependence in human-nature relationships</td>
<td>humans are excessively dependent on nature and wouldn’t be able to survive without it; humans depend on nature the same way that nature depends on us</td>
<td>P2, P4</td>
</tr>
<tr>
<td>species’ rights to existence and making use of their opportunities</td>
<td>every being has a right to live and realize their potential; every creature has its place and role</td>
<td>P6, P5, P4</td>
</tr>
<tr>
<td>ecocentric attitude and worldview</td>
<td>it is not humanity, but the ecosphere that is at the centre of attention; nature is the principal essence and a person is only a species that adapts to its conditions</td>
<td>P1, P4</td>
</tr>
<tr>
<td>ecosphere and the diversity of Life ensuing from it as core values</td>
<td>ecosphere as the never-fading basic value; our dear land is valuable and its diversity is even more so, thus it needs to be cherished and loved</td>
<td>P1, P4, P5</td>
</tr>
<tr>
<td>evolutionary perspective (common origin of species; Mother Earth as primary source of life)</td>
<td>we all come from one primal source; we are the Earth’s offsprings; person has appeared from the Ecosphere and evolved in it</td>
<td>P1, P3</td>
</tr>
</tbody>
</table>

As shown in Table 2, the research participants’ interpretation of ecological consciousness in the deep-ecological or inclusion-oriented frame of reference is based on an ecocentric worldview and evolutionary perspective which acknowledges the common origin of species and Mother Earth as primary source of life. These ideas are particularly emphasized in the 1st, 3rd and 4th principles of the Manifesto (Mosquin & Rowe, 2004), which speak of the “awareness of self as an ecological being” (p. 6, P4) and state that “people are Earthlings”
Inga Gedžūne and Ginta Gedžūne

(5. p., P1) since “we share genetic material and a common ancestry with all the other creatures that participate in Earth’s ecosystems” (p. 5, P3). These perspectives are also close to the research participants’ claim that humans are species among species on the Earth, which, according to the Manifesto, “shifts the center of values away from the homocentric to the ecocentric” (p. 5, P1). The pre-service teachers also acknowledge the mutual interdependence of humans and the earth and express deeply felt closeness and awareness of mutual links and connections that unite human and other than human world in a common web of life. A similar perspective is mirrored in the 2nd, 3rd and 4th principles of the Manifesto, which underscore cooperation and interdependence of communities and ecosystems (P2), “a sense of connectedness and reverence for the abundance and vitality of sustaining Nature” (p. 6, P4), and admit “the important roles of mutualism, cooperation, and symbiosis within Earth’s grand symphony” (p. 5, P3). Moreover, the research participants’ inclusion-oriented frame of reference emphasizes the diversity of Life as a core value and defends the idea of ensuring equality of different species, their rights to existence and full realization of their potential. Similarly, the Manifesto declares “Diversity with Equality” (p. 6, P6) a general standard and major ecological law, supports an ecocentric worldview which “values Earth’s diversity in all its forms, the non-human as well as the human” (p. 6, P5) and venerates Mother Earth as the one who surrounds her every child, nourishes it and grants the precious gift of life (P4).

(2) Recognition-of-the-uneological or exclusion-determining frame of reference

In this frame ecological consciousness was expressed as a tendency to recognize the grim reality of our life – manifestations of the unecological in the society. In other words, this frame was focused on identification of exclusion in the widest sense of the term – as a person’s or society’s orientation towards egoism, alienation, discrimination and dominance over others, their use for satisfaction of one’s needs and fulfilment of one’s purposes. Table 3 depicts the main categories that were identified in this frame and draws parallels with the principles embedded in the Manifesto.

Table 3. Recognition-of-the-uneological or exclusion-determining frame of reference

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples (content units)</th>
<th>Principle(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a person’s isolation from nature</td>
<td>people separate themselves from nature</td>
<td>P1</td>
</tr>
<tr>
<td>egoism</td>
<td>our species is the most egoistic of all;</td>
<td>P9</td>
</tr>
<tr>
<td></td>
<td>we only care for ourselves and for our own well-being</td>
<td></td>
</tr>
<tr>
<td>lack of a sustainable perspective</td>
<td>living for one day;</td>
<td>P9</td>
</tr>
<tr>
<td></td>
<td>people do not think what will happen afterwards</td>
<td></td>
</tr>
<tr>
<td>dominance of material values</td>
<td>striving for material values;</td>
<td>P9</td>
</tr>
<tr>
<td></td>
<td>selfishness and self-assurance – short-term profit, but a wide and deep crisis</td>
<td></td>
</tr>
</tbody>
</table>

Sequel to Table 3 see on p. 53.
As shown in Table 3, the research participants’ interpretation of ecological consciousness in the exclusion-determining frame of reference is based on awareness and explicit acknowledgement of the deep ecological and social crisis we are currently living in. The pre-service teachers express their uneasiness with person’s isolation from nature and failure to appreciate the mutual interconnectedness between the humans and the wider ecosystem. Similar concerns are reflected in the 1st and 11th principles of the Manifesto which stress the current individualistic focus (P1) that permeates the contemporary human consciousness and ignorance of our functional dependence on the earth’s ecosystems (P11). In line with that, the research participants criticize person’s assumed superiority over nature and other species, the ruling anthropocentrism. In the Manifesto this “selfish homocentric view that humans have the right to all ecosystem components” is condemned as “morally reprehensible” (p. 7, P9). The exclusion-determining frame of reference also reflects the pre-service teachers’ admission of people’s egoism and irresponsible use of nature for satisfaction of their whims. This awareness is mirrored in the 5th, 7th and 9th principles of the Manifesto which emphasize the society’s thoughtlessness, selfishness (P9), satisfaction of human wants rather than needs (P7), culminating in the ever-increasing consumption of natural elements which is termed as a “recipe for destruction” (p. 7, P9). Essentially, this frame of reference reflects concern about the dominance of material values and lack of a sustainable perspective which would guide individual and public activity. Similarly, the 9th principle of the Manifesto denounces the dominant ‘eternal growth’ ideology of the market” and warns that the growing overuse of natural resources threatens our planet and its diversity of life with extinction (P9). Crucially, in this frame of reference the research participants observe the interconnectedness of ecological and social challenges of the contemporary world. Namely, the pre-service teachers actualize the inequality within the human species and between humans and other-than-human world, and point at the growing amount of conflicts which de-
teriorate social relationships and contribute to the ever increasing exclusion. A similar perspective is particularly pronounced in the 6th principle of the Manifesto which deals with the injustices and inequities that permeate the social world as well as the wider ecosystem and foreclose the possibilities for sustainable living (P6).

**3) Practically-recommendatory or solution-oriented frame of reference**

In this frame, ecological consciousness was expressed through suggesting practical recommendations which can serve as solutions for the current ecological and social challenges and for healing the human-nature relationships. Table 4 depicts the main categories that were identified in this frame and draws parallels with the principles embedded in the Manifesto.

Table 4. Practically-recommendatory or solution-oriented frame of reference

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples (content units)</th>
<th>Principle(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>unity as a precondition for solving ecological and social problems</td>
<td>we must unite to be able to solve the problems in human-nature relationships and live in harmony with nature; unity gives an opportunity to change the world, because it is grounded in understanding and willingness to help each other</td>
<td>P2, P11</td>
</tr>
<tr>
<td>effective use of resources to decrease the pressure on nature</td>
<td>the need to use natural resources to the maximum effectiveness; the need to sort waste; the need to learn to satisfy only our needs rather than whims</td>
<td>P7, P9</td>
</tr>
<tr>
<td>need for transformation in people’s consciousness and frames of reference</td>
<td>it is not the new technologies that will solve environmental problems, but a transformation of human consciousness; an urgent need for a change of attitudes and actions we should start with ourselves, with changing ourselves, and only then we shall be able to change other people’s views on nature; we need to start with our inner world</td>
<td>P11</td>
</tr>
<tr>
<td>role of information and education in transforming frames of reference</td>
<td>informing the public as a strategy for decreasing the endangerment of ecosystems and cultural diversity; informing the public to attract attention to problems in the relationships between humans and the environment; ecological consciousness has to be developed in children (starting from the family)</td>
<td>P11</td>
</tr>
<tr>
<td>ecological policy and governance</td>
<td>the need for ecologically minded persons in leading offices to defend the ecosystems and their fundamental processes from threats</td>
<td>P10</td>
</tr>
</tbody>
</table>

As shown in Table 4, the research participants’ interpretation of ecological consciousness in the practical and recommendatory solution-oriented frame of reference is based on the underlying fundamental need for change, i.e. transformation in people’s consciousness and
frames of reference. This idea is implicit in the entire Manifesto, but is especially evident in the 11th principle which urges towards a “new and promising path toward international understanding, co-operation, stability, and peace” (p. 9, P11). The research participants also advocate effective use of resources, which would permit to decrease the pressure on nature. A similar suggestion is presented in the 7th and 9th principles of the Manifesto through the call for “curbing exploitive economic expansion” (p. 8, P9) in favour of more sustainable economies, based in ecocentric philosophy that aims for “preservation and restoration of natural ecosystems and their component species (p. 7, P7). According to the research participants, the above-mentioned transformation needs to be advanced by education, as stated in the 11th principle of Manifesto, which encourages “to spread the word by education and leadership” (p. 8, P11) and promote “a quest for abiding values” (ibid.). Besides education, in pre-service teachers’ perspective, a crucial role in bringing about this transformation is attributed to ecological policy and governance. Likewise, the 10th principle of the Manifesto actualizes the need for “ecopoliticians” who would “give voice to the voiceless” (p. 8; P10). Finally, the research participants are convinced that only together it is possible to solve the current social, economic and ecological challenges in favour of a more sustainable living. In line with that, the Manifesto reflects the need to “awaken all people to their functional dependence on Earth’s ecosystems” (p. 8, P11) and to promote “integrity” (p. 5, P2) which is understood as wholeness and ability to fully function in togetherness.

Discussion and conclusions

This study was aimed at engaging pre-service teachers in a cycle of EAR for exploring their perspectives on ecological consciousness and their underlying frames of reference. The research participants’ reflection was triggered by acquainting them with the ideas embedded in the 11 principles of “A Manifesto for Earth”. The findings of this qualitative research reveal a conceptual framework built around three broad themes or frames of reference that were identified in the research participants’ reflections: (1) deep-ecological or inclusion-oriented frame of reference, (2) recognition-of-the-uneccological or exclusion-determining frame of reference, (3) practically-recommendatory or solution-oriented frame of reference. This framework illustrates the research participants’ view of ecological consciousness as determinant of the quality of relationships between person and nature. Comparison of the pre-service teachers’ perspectives with the principles of the Manifesto permitted to discern which ideas of the Manifesto resonate with pre-service teachers’ experiences and which they find most relevant and topical with regard to the world we are now living in.

Beginning the discussion on the findings of our research, we would like to stress that seeking abstract generalizability as a prime validity criterion does not apply to action research based studies that operate in a different paradigm, emphasizing reflection on personal experience and interpersonal dialogue (Bradbury & Reason, 2003; Fisher & Phelps, 2006). Thus, the validity of knowledge or truth claims in action research is ensured by person’s ability to substantiate them to critical colleagues (Leitch & Day, 2000) through discourse in communication (Reason, 2003). According to Reason (ibid.), the research partici-
pants in action research thereby contribute to their “knowing” which is understood as a living and evolving process of coming to know rooted in everyday experience (p. 112). Following this standpoint, the pre-service teachers’ perspectives on ecological consciousness can be considered valid and credible, because they were arrived at by means of individual reflection on the principles of the Manifesto, relating the ideas implicit therein to the participants’ experiences and discussing the gained insights with peers. The dialogical substantiation as a standard of validity, reliability and trustworthiness in action research also entails that researchers diffuse their insights to the wider scholarly community and stimulate open discussion by explicitly relating the conclusions they draw from their studies with relevant perspectives from current theoretical literature (Reason, 1999; Bradbury & Mainemelis, 2001; Bradbury & Reason, 2003). Such discussion will be provided in the final section of this paper.

Pre-service teachers’ perspectives on ecological consciousness were the primary focus of our study. The issue of consciousness is widely explored in theoretical and philosophical literature. Ryland (2000) examines the issue of environmental consciousness in close relation to the Gaia theory. She (Ryland, 2000) considers the image of the earth as the Great Mother or Gaia to be the central theme in our environmental consciousness. The idea of the world as a whole, living, self-sustaining system of interrelated and interdependent elements was also present in the research participants’ inclusion-oriented frame of reference. The image of the Earth as a mother is evident in their statement that Earth is our home and our mother, we are all Earth’s offsprings and share the same origin, come from the same primal source.

Current studies actualize the idea that nowadays we are witnessing a conflict between two parallel and competing worldviews – commitment to the living world of nature or the world of money, the new ecological paradigm or the money-oriented dominant social paradigm (Ryland, 2000). This conflict of paradigms permeates all spheres of human activity, including education. In our study, the influence of the consumer’s philosophy and market paradigm (O’Sullivan, 1999; Ryland, 2000; cf. Moore, 2005) can be seen in pre-service teachers’ acknowledgement that our society lacks a sustainable perspective, is ruled by material values, ideas of personal profit, competition and irresponsible consumption (exclusion-determining frame of reference). O’Sullivan (1999) poses a salient question: are we educating for the global marketplace, or for peace, social justice, diversity and integral development, in other words – sustainability. He (O’Sullivan (1999)) presents a vision of the 21st century education that envisages a shift from consumerist frames of reference to an alternative consciousness and holistic understanding of the Earth (ibid.), which can otherwise be described as deep inclusion in the social and natural worlds. A tendency towards this orientation was discerned in the research participants’ frames of reference, particularly in the deep-ecological or inclusion-oriented frame. From the pre-service teachers’ perspective, we need an ecological consciousness which would be based on a holistic awareness of the interdependence and equal worth of all the elements of the ecosphere, and coordinated effort on both local and global levels to stop the current overexploitation of nature. Essentially, it presupposes abandonment of anthropocentric attitude and calls for nurturing eco-centric relationships with the surrounding world, which would be based on respect, responsibility and care (cf. Salīte, 2002).
Ilisko (2006) emphasizes the importance of developing deeper and more extended relationships with others on the basis of personal growth on a level of inner experience. Macy (1990, as cited in Ryland, 2000) perceives humans’ bondness with the earth and magic synergy with nature as examples of deep wisdom which is the only basis for sustainable living in harmony with nature. To a great extent, humans have lost access to the wisdom that has been accumulated in the course of evolution and even to the fruits of their personal experience (Charlton, 2003, as cited in Reason, 2007). As observed by the pre-service teachers involved in our study, people’s relationships with the environment are deteriorating. This is particularly evident in the exclusion-determining frame of reference, which essentially reflects the research participants’ concern about insufficiently developed ecological conscience in our society and indicates that a new course of action and transformation of our ecological consciousness is required. Robert (1995, 1997, as cited in Ryland, 2000) advocates the necessity for adopting a set of restorative moral principles of action for the common good. In fact, it is an appeal for phronesis (Birmingham, 2004; Flyvbjerg, 2004; Grint, 2007; Salīte et al., 2009) or moral practical wisdom that guides actions concerned with enhancing the well-being of others rather than only four individual selves. We suggest that the identified frames of reference hold the seeds of this moral practical wisdom which is embedded in the research participants’ ecological consciousness.

These findings highlight the urgent need for such education which would assist the learners in reflecting about their ecological consciousness through exploration and ultimately transformation of their frames of reference towards inclusion. Undoubtedly, all this is of particular importance in teacher education since it is the teachers who are considered as major agents of change (Iliško, 2007) in implementing education for a more sustainable, inclusive and ecocentric world. We believe that EAR is a useful tool for reorienting teacher education towards sustainability since it helps pre-service teachers to come to recognize reflection on experience and its discursive evaluation as legitimate sources of insight that can contribute to building the wisdom for sustainable and inclusive relationships with the natural and social world. We argue that the present research case can be considered an example of how a rich, emotionally and ethically charged and multilayered text that illustrates an inclusive, sustainable and deep-ecological perspective on human-nature interrelations can be used as an instrument for instigating critical reflection and exploration of pre-service teachers’ frames of reference. We consider it to be an important step towards helping pre-service teachers become conscious, dedicated, wise and creative agents of change, able to recognize unsustainability and exclusion in human activity and reorient it towards inclusion and sustainability.

Acknowledgements:

This work has been supported by the European Social Fund within the Project “Support for the implementation of doctoral studies at Daugavpils University”. Agreement No. 2009/014 0/1DP/1.1.2.1.2/09/IPA/VA/015.
We would also like to thank professor Ilga Sālīte, dean of the Faculty of Education and Management (DU), for her helpful and insightful comments on earlier versions of this paper.

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Abstract

Training of engineers as one of the main factors for implementing sustainability in industry is a key task. Due to this fact, the courses given in Chalmers should be adapted to the goal of sustainability. This could not be gained without integrating of risk assessment, as a tool of loss prevention, into different course curricula. To meet the demands, a course entitled “Risk Management and Safety” is offered two times a year to pre-service teachers that study in Chalmers master and doctoral programmes. This paper is concerned with presenting a method for developing a course curriculum including designing, control and evaluation of the projects as an essential part of the course. Industrial patterns have an important role especially in designing and evaluating the projects. The learning outcomes and the work efficiency are also controlled and evaluated through a questionnaire and personal interviews.

Key words: course development, curriculum development, sustainability, risk management, teaching

Introduction

Quality and sustainability are the main principles behind teaching in Chalmers University of Technology. In fact, sustainable development is increasingly achieving an interdisciplinary position in developing curricula of the courses given by different departments of Chalmers. The basic aim is to enable the learners as future teachers and engineers to make a sense of life and to develop the potential for peaceful coexistence with nature.

Sustainable development is maintaining a delicate balance between the human need to improve lifestyles and feeling of well-being, on the one hand, and preserving natural resources and ecosystems, on which we and future generations depend, on the other hand (Srinivas, 2009). The goal of sustainability in industry is to achieve safety in production activities, ensure human health, protect the environment and run the world ecosystem in
Teaching risk management and safety as a tool for supporting sustainable development

acceptable steady-state conditions with regards to material, energy and population. In other words, to achieve sustainable industrial development, there is a need to minimize the losses in terms of human life, environmental damage, economy, life style quality and well being due to unknown factors/uncertainties. Therefore, risk management and safety as a state of freedom from unacceptable losses is an important element of sustainable development.

Rapid development of industries and human activities has created uncertainties and risk as the potential of unwanted events followed by some kind of losses. In fact, uncertainty is a major factor in matters of science, technology, health and the environment. New forms of technology, new medical treatments, the impact of certain substances on the air, water, and/or soil all have effects, both long and short term that cannot be completely predicted (Schultz, 2004). Therefore, risk management has rapidly developed as a tool for the regulation of industrial activities or environmental control as well as decision making for investment in different sectors (de Rocquigny, 2009). In addition, skilled people are needed to use risk management as a tool for controlling the losses. Importantly, universities are responsible for training teachers and engineers as the main actors in sustainable industrial development. Therefore, a course curriculum should be developed in order to meet the future needs and demands of engineers having both the knowledge and skills necessary to design and operate a plant free of unacceptable losses as one of the most important criterion of sustainable development. In addition, the learners should be trained in a way to be able to develop, improve and apply the products and processes, which are environmentally sustainable and economically sound. To fulfil these requirements, the students should be able to integrate principles of sustainable development and risk management procedure in their future careers (Kolluru, Bartell, Pitblado, & Stricoff, 2006; Migilinskas & Ustinovicius, 2008; Mock & Wernke, 2011). It is of utter importance to be able to identify the uncertainties one might be faced with and also when something should be changed or a decision should be taken; to identify the hazards existing in the workplaces that may cause some kind of losses; to identify the causes of poor efficiency and increasing productivity by making highly efficient use of raw materials and energy; to reduce or eliminate the use and generation of hazardous substances; to reduce or eliminate the wastes that may cause economic losses; to reduce or eliminate the release of substances harmful to humans and the environment.

The tasks that need to be undertaken in future are much more complex and include the optimization of plants with the goal of finding safe and environmentally adapted and economically competitive processes. The design and control of the process or the production system and single pieces of equipment must, therefore, be improved in terms of reliability and safety. Accordingly, there is a need for engineers who know how to implement engineering disciplines in order to develop safe and environmentally sustainable processes/systems. Good knowledge of engineering disciplines is, however, not sufficient as engineers must also be able to make a simultaneous analysis of hazards and risks existing in a system. They must set up the global goals concerning safety, environmental and economic demands and avoid uncoordinated sub-optimization to protect the subsystem under his/her responsibility against any possible losses (Irandoust, Shahriari, & Niklasson, 1999).
As a matter of fact, accidents cost money and must be mainly paid for by the company. This cost is not like the cost of materials, equipment or wages. There is no return for the company or the injured employee on money spent as the result of an accident. Hence, an accident-free business is a profitable business and, of course, in the frame of the concept of sustainable development. Due to the aforementioned reasons, considerable efforts have been made to develop safer and more environmentally sustainable production systems and processes during the past decades. Most of this work has been enforced by national and international legislations (Rikhardsson & Impgaard, 2002).

Indeed, risk assessment and management is viewed as a lens inside the sustainable climate, as a body through which all potential of losses can be reviewed. It can also be used as a lens for reviewing learning outcomes in preparing the students for implementing sustainable industries and society. In this case, integrating of risk assessment in other curricula could direct the students as the future operators towards sustainable thinking. Now, the question is how effectively do the students learn?

In a paper by Murray (2000), a debate on teaching students how to learn was initiated. The debate was based on research studies and also the opinions articulated by experts who have been involved in learning. The most important aspects that could be extracted from the debate were numerous.

1. The students learn best when they self-regulate the learning process. However, they should learn how to do it.
2. If faculties integrate self-regulation strategies into their teaching, students may absorb course materials more quickly.
3. The students need an instruction in using the strategies to increase their learning efficiency.
4. The research findings show that a way that teachers can help students structure their time and learning is by setting a clear course objective, giving plenty of examples to explain the main concepts, quizzing students frequently through regular assignments, providing a feedback on students’ work and using mnemonic aids and learning devices.

In addition, the learning outcome should be assessed based on the programme learning goals by focusing on how students can demonstrate that the goals are being met. The learning outcomes must be measurable. Measures are applied to student work and may include: assignments, examples, tests, measuring student ability (project/case study) and students’ attitude (course evaluation) (CSU Chico, 2011). The aforementioned principles were used as the base to design a course for teaching risk and safety at Chalmers University of technology.

**Aim of the study**

This study focuses on a case in development and evaluation of a 7.5-credit course curriculum in Chalmers entitled “Risk Management and Safety” as a tool to support sustainable
Teaching risk management and safety as a tool for supporting sustainable development. The curricula development carried out was based principally on the relevant national and international teachers and industrial experts’ ideas. The aim of this course is to give training to the master students and PhD candidates in how to apply their knowledge and technical skills more efficiently to protect people and the environment. The course prepares students to approach the technical skills required to identify hazardous scenarios in a complex system, to improve and modify it in terms of safety, productivity, quality and remaining environmentally benign. Besides, students should be able to handle the situations under uncertain conditions. The goal is to integrate safety into different engineering education and curriculum.

The main purpose of this paper is to highlight a method for developing the course curriculum as well as designing, carrying out, control and evaluation of the project works. The method of project design and control was applied to some case studies, i.e. a study concerning waste water, treatment of the ethylenediamine plant at AKZO NOBEL in Stenungsund, Sweden (Irandoust et al., 1999).

Methodology

Various models have been suggested for the development of curricula for study programmes in engineering (Kristin & Moore, 2005; Chandra & Kumar, 2006; Cowan & Harding, 2006; Wiggins & McTighe, 2006). However, the method suggested in this study is a simple three-stage backward method which is designed based on Wiggins and McTighe (2006) and Kristin and Moore (2005). In this study, the curriculum was designed in three stages by, firstly, identifying the design results, secondly, structuring the curriculum and, thirdly, implementation and evaluation.

In developing of the curriculum, some teachers and master students from Chalmers University (representing different fields including sustainable development) and some safety experts from industries, for instance, from AKZO NOBEL Stenugsund and Preem refinery Gothenburg, Sweden were involved.

The curriculum implementation was assessed and evaluated through the results of home assignments, workshops and the project works. Home assignments were designed based on the lecture given by the teachers. Individual subjects were evaluated by getting feedback from the course participants through filling in a questionnaire and an interview. The feedback from the students in terms of preparing and distributing the questionnaires, making interviews and analysing the points of view was performed by the students, and the results were discussed and finalized by the examiner. The final results of this qualitative evaluation were reported to the relevant master programme coordinators and the teachers as well. The examiner took advantage of the final analysis and results for improvement of the course. The method of the curriculum development is shown in Figure 1 (Appendix).

There are numerous advantages of this method compared with the traditional method of curriculum development.
1. The students have been and are involved in the development and improvement of the existing state.
2. The students have an important role in developing the course through sharing of their project works with others in the course material.
3. The students are not limited to the course material given by the teachers. The assignments are designed in a way that the students find the answers by doing research.
4. Most of the time, the students are involved with team work.
5. Taking advantage of guest lecturers representing various experiences and involving the students with different activities could bring up a good interest for learning among the students.
6. To encourage the students in their own learning, an opportunity to propose and formulate/define their own projects, with supervisors’ assistance and facilitation, is provided.

Course structure and teaching methods

The course consists of lectures given by different teachers, including experts from industries, workshops, seminars, project works/mini case studies, study visits and home assignments.

The course material is prepared on the basis of the participants’ backgrounds. Every year, the contents of course material are changed on the basis of the course products and the results of the research in the fields of risk and safety. One of the most important principles in course material preparation is simplifying the models and submitting them in a more understandable way.

Any subject or lecture is followed by some workshop problems. The workshops are conducted by a group of students and are designed to provide more examples and real cases which help the students to understand the main concepts; to increase the effectiveness of learning by means of discussion between the group members and to increase the effectiveness of team working.

Confusing concepts are considered a major hazard in any course causing problems in understanding and communication. In this course, workshops together with assignments are used to eliminate/minimize this problem. Workshops help the students to increase their perception by means of group discussion. Assignments are mostly used for evaluation the level of individual understanding, for instance, to see whether the students can either recognize the distinction between hazard, risk, uncertainty and accident or understand the relationship between reliability and safety. In fact, 40% of the total mark of the course is allocated to the assignments. It should be noted that the course has no written exam.

In order to increase the knowledge of students and also to show how risk assessment is integrated into different field of activities in the real world, some key subject seminars are arranged. The main tasks of student seminars are to extend the involvement of the students
in learning activities and to increase their knowledge concerning some important subjects as a part of the course curriculum. The lecturers in these seminars are invited from industries, and the rest are conducted by the students who have participated in the course. As far as the students’ seminars are concerned, the students are requested to present some cases concerned with integration of safety into their field in the classroom. A seminar is an optional part of the course.

Study visit is another tool to give the students an opportunity to compare what they have learned in the course with what is applied in reality. During the course, the students visit one or two plants/workstations.

Project work by which risk assessment is integrated into other fields is an important and crucial part of the curriculum design. In other words, it is an essential section where the knowledge obtained from the course is applied assessing the risk of a complex system, for instance, production system. The project is carried out by a group of students and is expected to encourage critical thinking, creativity and involvement among both students and supervisors.

Zhou, Dalsgaard, Kolmos and Xiangyun (2009) have developed a model based on an empirical study regarding group creativity development in engineering students in a problem/project based learning environment. According to Zhou et al. (2009), in problem/project based learning (PBL) context, the students can develop their group creativity by self-directed learning and peer learning focused on teamwork. In the meantime, group creativity will be influenced by the roles of the project and supervisors. In PBL, the supervisor is expected to be able to provide good strategies for learning and thinking.

Peer learning has been noted to be among the most effective learning approaches (Zhou et al., 2009). This study and many other studies show that though creativity initiates in the mind, individual actions and interactions among or between the learners and the environment makes the creativity fundamentally a social-cultural concept, especially when we focused on creative work in collaboration (Zhou, et al., 2009).

Due to the aforementioned facts, the project was recommended to be compulsory. Furthermore, 50% of the mark of the course is allocated to the project work. About four weeks of work are required for a group of students to fulfil the objectives of the project.

The project ideas concerning the integration of risk assessment and safety in production, product quality, maintenance, hazardous waste, etc. are generated mainly in cooperation with industrial companies, for instance, Preem refinery in Gothenburg and AKZO NOBEL in Stenungsund, Sweden. The progress of the project and the learning outcomes is controlled in different ways by the supervisor in co-operation with the examiner. Projects should be conducted with regards to the goal and the learning outcomes of the course. The students are required to present the project, both in writing and orally.

Each project is to be assessed by the supervisors and the examiner. The following mark format is a general guide to assessment, indicating the relative significance of different aspects of a completed project (Table 1).

The course is evaluated through a written questionnaire and personal interviews. The results are used to improve the course further. The former evaluations showed that the stu-
dents highly appreciated a close relation to and input from the industrial partners through seminars, study visit and project works. The results of qualitative interviews showed that the students strongly approved of being oriented towards a real case of industrial relevance.

Table 1. General guide of project assessment (modified after Irandoust et al., 1999)

<table>
<thead>
<tr>
<th>Oral presentation</th>
<th>Project mark (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Quality of the slides is good.</td>
<td></td>
</tr>
<tr>
<td>2. Presentation reflects the content of the report.</td>
<td></td>
</tr>
<tr>
<td>3. Presentation is acceptable from the logical and pedagogical points of view.</td>
<td>10</td>
</tr>
<tr>
<td>4. Performance could bring up a good interest among the audience.</td>
<td></td>
</tr>
<tr>
<td>5. Questions could be answered properly.</td>
<td></td>
</tr>
<tr>
<td><strong>Report</strong></td>
<td></td>
</tr>
<tr>
<td>1. Abstract gives a clear picture about the project.</td>
<td></td>
</tr>
<tr>
<td>2. Problem is formulated properly and the aim of the study is explained clearly.</td>
<td>20</td>
</tr>
<tr>
<td>3. The methodology is selected and used properly.</td>
<td></td>
</tr>
<tr>
<td>4. Theoretical framework supports the study.</td>
<td></td>
</tr>
<tr>
<td>5. Analysis of the case/problem under the study is carried out in a reasonable way.</td>
<td></td>
</tr>
<tr>
<td>6. The study is supported by relevant and reliable references.</td>
<td></td>
</tr>
<tr>
<td><strong>Report organization and structure</strong>: different parts of the report are properly coordinated. Lines of argument are clear throughout the report.</td>
<td>15</td>
</tr>
<tr>
<td>1. Objectives of the study are fulfilled.</td>
<td></td>
</tr>
<tr>
<td>2. Title is relevant to the contents of the study.</td>
<td></td>
</tr>
<tr>
<td>3. Results: the quality of interpretation and discussion of the results is within the context of the related knowledge and can reach the aim of the study.</td>
<td>40</td>
</tr>
<tr>
<td>4. Conclusion is extracted correctly from the existing material.</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
</tr>
</tbody>
</table>

It was also interesting to find out what and how the students have learned, how they have understood and on what level they have been taught. This is by no means an easy task. Continuous follow-up in this matter was important in determining how the students developed their skills. There is always a variation in the level of understanding among students. In order to reveal both the variation and level of understanding, deep discussions on qualitatively different types of questions between some individual students and the examiner are to be used, though these activities are time-consuming.

**Conclusion**

The master’s course programmes require active pedagogy. Attempts have been made to design different effective tools, such as workshops, assignments and project works to satisfy the students’ needs. One basic requirement of crucial importance is the industrial relevance of the chosen problems/projects to motivate active students’ participation.
As far as the project work is concerned, essential abilities for students’ learning should include problem identification and problem formulation related to risk assessment in their fields.

On the basis of course evaluation, some achievements are the following: clear definition of course objectives, clear description of requirements and instructions, communication and timely feedback, encouraging workshops, especially when the industrial cases are provided. Moreover, study visits provide a forum for discussion, exchange and learning. During the study visits, the students have an opportunity to establish professional contacts that might potentially be used for developing ideas for new projects or their master thesis, or a future job.

A central factor in the project supervision has been the regular meeting between the students and the supervisor and/or the examiner, where the actual case could be discussed. The main role of the supervisor is to be the catalyst during the students’ analysis and solution of the problem. Every project should encourage critical thinking, creativity and involvement among both students and the supervisors. The keys to success are engagement of students in problem definition and formulation, efficiency of the teamwork, communication between the supervisor and the group and also between the group members, clear definition of objectives and goals of the study, explicit and clear criteria for assessment and judgement of the work at both individual and group levels, taking advantage of different cultures and backgrounds among the group members when the group is heterogeneous in terms of different ways of analysing problems. In the assessment of projects, the industry representative should be strongly involved.

References:


Appendix

Figure 1. Methodology for designing course curriculum (developed based on Wiggins and McTighe, 2006)

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SCHOOL-BASED MENTORING FOR PROFESSIONAL DEVELOPMENT OF INCLUSIVE SCHOOL TEACHERS

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Abstract

Because of the importance and the complexity of inclusive education, the implementing of a new teaching method in fifteen schools of four regions of Latvia was integrated with school-based teacher mentoring in a two-year project. A new method of teaching basic concepts for children with learning disabilities was a crucial part of in-service teacher training mentoring program. This paper illuminates mentors’ and teachers-mentees’ perceptions on the impact of mentoring on their teaching at the primary school level. Data collected by the means of self-evaluation includes teachers’ and their mentors’ views on the role of mentoring and teachers’ collaboration in teachers’ professional development and inclusion of children with special needs. The results of the study show that mentoring and collaboration are pre-conditions for successful teachers’ professional development, which creates, in its turn, a favourable basis for enhancement of inclusive education programmes.

Key words: mentoring, professional development, inclusive education

Introduction

In the recent international and local research, most teachers express their belief that inclusion of children with special needs is possible. At the same time, many of them are not sure if the general classroom is the best place for those children, if special classrooms must be organized for them in the general schools. They consider that celebrations, sports events and sightseeing are the best ways to include the disabled children in school or class activities. One of the most common arguments against inclusion of children with special needs in the general classroom is the lack of knowledge and skills for teaching them (Scruggs, Mastropieri, & McDuffie, 2007; Nīmante, 2008). Numerous studies also show that inclusion is directly connected not only with teachers’ beliefs, knowledge and skills, and their continuous professional development, but also depends on collaboration (Bricker, 1995, 2000; Ainscow, 2003; Hamre & Oyler, 2004; Bourke & Carrington, 2007; Florian, 2008). Fullan (1998) states that “student achievement increases substantially in schools with collaborative
work cultures that foster a professional learning community among teachers and others” (p. 8).

It should be noted that in Latvia the requirements for teachers’ in-service education set by the Ministry of Education and Science are minimal, and they cannot meet the needs of teachers’ professional development in the conditions of educational reforms. However, in collaborative schools, teachers can draw from their own and their colleagues’ experience, knowledge and understanding. In collaborative schools, teachers’ topical needs can be met. Nowadays, teachers’ professional development cannot be realized based only on external resources. The school-based professional development during a teacher’s career is a good solution (Carrington & Robinson, 2004). Moreover, Wang and Odell (2002) state that “…the best staff development is not when “experts” teach “novices”, it is much more when continuous sharing and dialogue happens (p. 481). In the conditions of the crucial need to prepare teachers to work in inclusive classrooms, and of the limited financial resources for teacher in-service training, teachers’ collaboration becomes even more crucial.

One of the successful ways to enhance collaboration and to improve teachers’ competencies is school-based mentoring (Wang & Odell, 2002; Tillman, 2005). The research demonstrates the extremely important role of mentoring in the periods of change, which requires different thinking and approaches in education. Mentoring is particularly helpful for the professional development in the organizations where human relationships, support and learning have the central role for organizational growth. Undoubtedly, schools are organizations of this kind. As stated by Hargreaves and Fullan (2000), mentoring has enormous but not fully used potential to support continuous school change.

In his book “Experience and education” (1963), which was first published in 1938, Dewey emphasized the social character of learning. An individual participates in activities oriented to social participation; therefore, people need support from others in their learning. The idea of learning together and school-based mentoring is rooted in Vigotsky’s (2002) socio-cultural approach to human development. Vigotsky (2002) determined that we learn better when we are involved in a dialogue with those who challenge our present knowledge and structure our future learning. Based on the social aspects of learning and research in learning organizations, the researchers’ interest about mentoring has increased. Wildman, Magliaro, Niles and Niles (1992) state that mentor’s role is less about teaching, it is more about understanding of the context of the mentee’s learning and guiding of the mentee’s learning. “Just as good teaching, mentoring should be defined from the perspective of both parts” (Wildman et al., p. 212). Fibkins (2002) concludes that mentoring is based on adults’ ability to develop and learn, and that their development can be influenced by different means that are supportive and challenging. The mentor structures the mentee’s learning, shares his/her knowledge and supports the mentee’s effort, but, at the same time, he/she does not protect the mentee from failure (Jonson, 2008). Freire (1997) emphasizes that the mentee’s desire to attain insight and distinguish new opportunities with pleasure, which is crucial for the success of mentoring. He (Freire, 1997) also considers that it is important to risk. With support, critical thinking and reflection the mentor encourages the mentee to explore the benefits of risk-taking and learning in the process of change. According to Hargreaves (1992), “[t]rust which appears through collegial sharing and mutual support results
in risk taking on higher level, and in teachers’ inner necessity to continuous improvement as an obligation of the teacher’s profession” (p. 80).

Mentoring is a new direction in teacher professional development system in Latvia launched in the beginning of 2000s. Since then, a few projects have been focusing mainly on mentoring in pre-service teacher practicum by in-service teachers and on mentoring in in-service teacher professional development by university or other external experts on particular subjects, for instance, the English language, mathematics and science teachers. There have been very few programmes which focused on school-based mentoring where the mentor works at the same school and supports the professional development of his/her colleagues.

The school-based mentoring programme which was implemented in fifteen schools within this study included two main components: (1) Nyborg’s concept teaching strategy and (2) mentoring. To support the teachers in their professional development, the acquisition of the new concept teaching strategy was merged with school-based pair mentoring. The concept of teaching strategy is grounded in a conceptual teaching theory (Lebeer, Sonnesin, Roth, & Pokorna, 2006). Lebeer et al. (2006) view learning as a meaningful reflexive activity rather than mechanical memorization of separate phenomena and formulas. The concept-based teaching strategy promotes conscious and meaningful learning; thus, children with learning disabilities are able to transform and utilize more varied concepts in various conditions and situations. Teachers who are ready to try new ideas and methods, take risks and experiment need to feel supported and empowered by their colleagues in the school (Salīte, Mičule, Kravale, Iliško, & Stakle, 2007). Therefore, school-based mentoring was introduced to help teachers implement the new strategy.

Methods

School based mentoring is a way to pro-actively and purposefully enhance inclusion, overcome teacher isolation and promote their collaboration. Moreover, it is a way of active participation, learning and research. Within this study, the mentoring programme was implemented through action research methodolodgy, which was aimed at investigating the impact of school-based pair mentoring for teacher professional development and for the quality of inclusion and cognitive education of children with special needs. The particular value of action research is that it is possible to direct the change process from within (Schein, 2004; Reason & Bradbury, 2008; Salīte, 2009; Salīte, Gedžūne, & Gedžūne, 2009). In this research, the action research was from the classrooms where children with special needs learned together with their peers.

38 primary school teachers and their 38 mentors participated in the action research. The selection criteria of the mentees – primary school teachers – were the following: (1) they should have children with special needs in their classrooms; (2) they should have an interest to acquire and implement the new teaching strategy in their classrooms as well as an interest in action research. The mentors represented different staff member groups: more experienced teachers in the field of inclusion, special educators, a psychologist and deputy heads. It is extremely important to provide continuation of inclusion for children with spe-
cical needs from inclusive preschool classrooms to inclusive primary classrooms. Therefore, the reason why primary school teachers were the focus group of the action research is because too many children who have been included in pre-schools continue their learning in special schools. Some school principals and other teachers who were not directly involved in the mentoring programme were also participants of the action research. Thus, there were 90 research participants in total.

Since learning is the foundation of mentoring, Knowles’s theory of adults learning was applied in the development of the mentoring programme (Knowles, Holton III, & Swanson, 2005). The following principles were set: (1) the programme must integrate theory and practice; (2) it must correspond to the needs of teachers and schools in the context of inclusive education; (3) the programme should be focused on school-based pair mentoring. The following methods were used to explore the effectiveness of the mentoring programme on teacher professional development and its applicability to introduce in other schools that implement inclusive education programmes: (1) teachers and school directors’ questionnaires at the beginning of the study; (2) teachers and mentors’ self-evaluation at the end of the first and the second year of the study; (3) focus group discussions and interviews in the end of the action research. This paper describes the results of only one of the applied research methods – the teachers and mentors’ self-evaluation. In a qualitative research, every social activity is associated with participants’ explanations and interpretations. In this study, teachers’ authentic evaluation of their behaviour in the classroom, their experience of interactions with students in the classroom and with colleagues in the school was the object of the self-evaluation. Both quantitative and qualitative methods were applied for data analysis.

Discussion

At the end of the first and second year of the action research, the mentors and the mentees performed self-evaluation. In the first year, 15 mentors and 15 mentees participated in self-evaluation, in the second year – 23 mentors and 23 mentees. Thus, all participants of the peer mentoring performed self-evaluations. They were invited to evaluate the impact of the mentoring programme in four main directions: (1) enhancement of inclusion of children with special needs, (2) benefits of the mentoring programme, (3) difficulties and (4) future perspectives. The aim of this paper is to describe the results of the data analysis connected with teacher professional development, the increase of the number of included children and improvement of their learning, and the development of collaboration among teachers. To evaluate teachers’ and mentors’ knowledge and skills in concept teaching, the ranking between “low–medium–high–very high” was offered. It was addressed by several questions, which required descriptive answers. Thus quantitative and qualitative data were collected.

The summary of the data collected from the mentors indicates that they are rather self-critical in the evaluation of their skills and knowledge of using Nyborg’s concept teaching strategy at the end of the first and the second year of the study. They are also self-critical in the evaluation of their skills and knowledge in helping teachers to implement the new strategy (Table 1).
An interesting tendency, which appears in mentors’ self-evaluation, is that the average estimation of the mentoring skills is considerably lower at the end of the second year of the study than at the end of the first year. This may be explained by the fact that, in the first year, mainly special education teachers, deputy directors, psychologist and experienced teachers were mentors; thus, it was easier for them to accept and act in the role of mentor.

Table 1. Mentors’ self-evaluation (ranking 1–4)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>year</th>
<th>low</th>
<th>medium</th>
<th>high</th>
<th>very high</th>
<th>nr</th>
<th>average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding of Nyborg’s concept teaching strategy</td>
<td>2009</td>
<td>10</td>
<td>5</td>
<td>15</td>
<td>2.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>16</td>
<td>7</td>
<td>23</td>
<td>2.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mentoring skills</td>
<td>2009</td>
<td>1</td>
<td>10</td>
<td>4</td>
<td>15</td>
<td>23</td>
<td>2.87</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>1</td>
<td>19</td>
<td>1</td>
<td>2</td>
<td>23</td>
<td>2.17</td>
</tr>
</tbody>
</table>

Conversely, in the second year the mentors who joined the action research were mostly teachers, and they may have been too self-critical in self-evaluation. An interesting tendency, which appears in mentors’ self-evaluation, is that the average estimation of the mentoring skills is considerably lower at the end of the second year of the study than at the end of the first year. This may be explained by the fact that, in the first year, mainly special education teachers, deputy directors, psychologist and experienced teachers were mentors; thus, it was easier for them to accept and act in the role of mentor. Conversely, in the second year the mentors who joined the action research were mostly teachers, and they may have been too self-critical in self-evaluation. The mentees have been even more cautious than mentors in assessing their skills and knowledge of Nyborg’s teaching strategy both at the end of the first and the second year of the study (Table 2). The teaching strategy offered within the mentoring programme is quite complex. As stated by the teachers, it asks them “to think about the concepts” and “to repeat and to increase my theoretical knowledge in psychology”.

Table 2. Teachers’ (mentees’) self-evaluation (ranking 1–4)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>year</th>
<th>low</th>
<th>medium</th>
<th>high</th>
<th>very high</th>
<th>nr</th>
<th>average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding of Nyborg’s concept teaching strategy</td>
<td>2009</td>
<td>11</td>
<td>4</td>
<td>15</td>
<td>2.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>19</td>
<td>4</td>
<td>23</td>
<td>2.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact of mentoring on the improvement of learning of children with special needs</td>
<td>2009</td>
<td>5</td>
<td>7</td>
<td>1</td>
<td>13</td>
<td></td>
<td>2.69</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>1</td>
<td>10</td>
<td>12</td>
<td>23</td>
<td></td>
<td>2.48</td>
</tr>
</tbody>
</table>

Comparing how the mentors have evaluated their mentoring skills with the mentees’ self-evaluation of the impact of mentoring on the improvement of learning of children with special needs, the mentees have valued the mentors’ help more than the mentors valued themselves. It may be because the teachers connect the mentors’ help with the improvement of children’s learning more directly.
It may be explained by two main reasons why teachers and mentors evaluated their knowledge and understanding of Nyborg’s concept teaching lower than average. Firstly, the respondents have been rather self-critical; secondly, the strategy itself is truly innovative and requires meaningful and intensive learning. In fact, these difficulties promoted mutual learning. The participants were forced to risk and experiment, and resolve problems creatively. When asked to evaluate the benefits of the mentoring programme for teaching children with special needs at the end of the first year, the teachers characterize them rather generally: “It’s a new method”; “more attention is paid to using the correct language”; “It’s a possibility to get to know and try out a new method in practice”, or the teachers reduced the use of the new strategy to the individual child with special needs teaching. They state that “the method can be used at individual speech therapy activities”; “the method is very adequate for individual work”. At the end of the second year of the mentoring programme, the teachers and the mentees were more focused on understanding and beliefs connected to the benefits of the programme. The influence of mentoring on the school values is more distinguished. Teachers have a better “understanding about differences in students’ knowledge and skills”; “belief that, as a result of continuous and patient learning, children with learning disabilities are able to learn in general classrooms” and “concept teaching is incorporated in everyday work”. At the end of the mentoring programme, it was typical that teachers spoke of what they had gained, they paid particular attention to the achievements of children with disabilities. They used various arguments to prove the positive effect on children’s learning: “Children have become more easy, they are more involved in the whole class activities”; “This method makes easier the perception of the taught content”; “The students can already read short words”; “Children’s development is seen”; “Children understand concepts better”; “…participate willingly”; “Children’s interest and motivation has increased”. On the one hand, the more frequent use of the singular form “child” when speaking about children indicates that the new methodology was most applied in individual work with children with disabilities. On the other hand, it shows that teachers observe the development of the children and seek the best solutions for their teaching and learning.

The mentors value the benefits of the mentoring programme for the whole school more often. Despite that, mentors have pointed out considerable difficulties in implementing the new teaching strategy because of its novelty and complexity. They state that its implementation in teaching children with special needs has resulted in “more clarity of work with children who have learning difficulties” and in “a more interesting organization of lessons”. “New knowledge” and “getting to know the new strategy” have been valued. It testifies that the correct content has been chosen for learning within the mentoring programme. The mentors have also paid more attention to collaboration and valued it as beneficial for the whole school. They mention “more close contacts and collaboration with teachers”; “successful cooperation with the support staff” and “with students and parents”. Collaboration promotes “sharing of experience, problem solving together” and “a possibility to meet supporters of the same ideas in the school”, with whom “it is possible to discuss the results of the teaching”. In their turn, the mentees have mentioned collaboration surprisingly little, and mostly in the context of “sharing of experience with colleagues”. Interpretation of data about the benefits of the mentoring programme elucidates that, to acquire and
apply the innovative teaching strategy, teachers and mentors required more learning, and that promoted more interest in varied children’s with special needs learning. The formulations, which are used in self-evaluations – “understanding”, “belief”, “attitude” – point towards conscious and purposeful use of the new knowledge.

One third of the mentors at the end of the first year of the action research and one fourth at the end of the second year have mentioned most often the lack of time as the difficulty to fulfil their responsibilities. Many of them connect this problem more with teachers’ lack of time, presuming that “teachers have too little time for individual work with children”, “because of the lack of time, it is not possible to apply this method with full value”. The lack of time is also most often cited difficulty in implementing the new teaching strategy mentioned in the teachers’ self-evaluations. Though the concept of teaching strategy may be used for an individual, small groups and the whole class teaching, teachers complain that “there is too little time for individual work”.

Nyborg’s concept teaching strategy has caused “the sense of insecurity – am I doing it correctly?” and “I have to think of the concepts”. However, as one teacher writes: “It was most important to accept and to try it myself”. The mentors have recommended that, to better use the new teaching strategy, “it would be more effective if the special education teacher was introduced more to the concept teaching strategy and could work with the child individually”. Despite the difficulties to fulfil their role as mentors, some mentors experimented with themselves to apply the new method not only for teaching the children of the primary school age, but also for the older students who had problems in learning concepts. Thus, the implementation of the new strategy required thoughtful and serious learning. Without the challenges and problem solving, and if the programme were not connected with deep changes in the understanding of teaching and in the everyday teaching practice, the mentoring would lose its main function – support for learning and development of the mentee.

The interpretation of the data concerning the future tasks indicate the sustainability of the school-based mentoring. At the end of the first year of the mentoring programme, the mentors mostly plan what they will do to support their mentee. Conversely, at the end of the second year, all mentors’ plans are aimed at the broader school community “in cooperation with colleagues” and “to support the other teachers”. After the first year, the mentors act as change agents mostly by “raising interest”, “introduction” and “encouraging”. Conversely, after the second year, they foresee themselves more as facilitators of the others’ learning, which is one of the most essential roles of a mentor – to be a model for the learner. The data collected about the teachers’ future plans show that they are going to continue to implement the concept teaching strategy. Moreover, they intend to use it more creatively and variedly. Within the action research, the teachers learned how to use the strategy in teaching mathematics. Already during the two-year period of the mentoring programme, teachers started to use it in teaching geography, house-keeping, music. They plan to try this strategy also in teaching foreign languages and science. The teachers plan to observe and evaluate the process and the achievements of children’s learning more accurately and regularly. They have set tasks for their future professional development. The teachers want to “classify concepts in a system when planning a lesson”, “to document children’s development”, “to analyse the results of teaching concepts at the end of the school year”. Cer-
tarily, these expressions contain classroom research elements and show the higher level of creative use of the strategy, which the teachers have acquired during the mentoring program. Both the mentees and the mentors plan to continue their learning and use the new strategy more effectively: “to read through all materials of the courses more carefully”, “to read the theoretical materials once more”, “to improve knowledge in Nyborg’s teaching strategy”, “to clarify the unclear questions” and “to continue to acquire Nyborg’s theory and to prove... that it is possible to reach good results by it”. They also expect that the other teachers will share their experience.

Conclusion

One of the aims of the mentors and teachers’ self-evaluation was to evaluate the impact of the mentoring programme on the inclusion of children with special needs and the improvement of their learning. The two year period of the action research corresponded with two school years. Within that period, the number of children with disabilities had almost doubled. Though there may be more reasons for such a remarkable increase, for instance, the change of the school financing (the principle “money follows the child” had been introduced). However, the remarkable increase of the included children also testifies to the positive effect of the mentoring programme. The enrichment of teachers by a new teaching strategy has echoed in the increase of their sense of security to include children with special needs in their classrooms.

The interpretation of the authentic qualitative data revealed that due to the school-based mentoring through teacher collaboration, learning and self-reflection, the inclusion of children with special needs becomes more meaningful. All participants of the action research have valued mentoring as a positive experience in their professional development. But teachers’ professional development and collaboration become meaningful only if they serve to better the learning of their students. Though both respondent groups have been rather self-critical and careful in evaluation, it was valued unequivocal that the achievements of children with special needs had improved (Figure 1).

Figure 1. Teachers and mentors’ views on the impact of the mentoring on students’ achievement (ranking 1–4)
It should be noted that it was consciously considered that the children’s assessment was not used for the analysis of the research data, because the traditional assessment still prevails in the schools. The authentic dynamic assessment has not been introduced yet; that is the future challenge to overcome. For most children with special needs, it was only the first year of their inclusion. Therefore, the official assessment data was not applied in this study.

As a result of mentoring, the teachers’ learning is not the traditional way of acquiring new knowledge and skills; rather, they seek “wisdom” or “insight” together. Even more, insight – the teacher’s ability to react to the particular learning needs of a particular child in a particular situation and in particular learning environment – is the most important benefit of the action research, and that was developed through collaborative learning and reflection (Figure 2).

Salīte et al. (2009) characterize wisdom as “the ability to find solutions in concrete circumstances on the grounds of past experiences and a common target-orientation that would benefit majority” (pp. 27–28). This study illuminates the impact of mentoring on the majority of other teachers and staff: the mentors and the mentees become disseminators of their ex-

![Diagram of the action research](image-url)
experience and wisdom in their schools and broader. The mentoring programme was finished by the publication “How to teach concepts to children with special needs: Examples of best practices” (Zaķe & Vērzemniece, 2010) where the participants of the study share their best practices generously.

To summarize, the interpretive analysis of the mentors and the mentee teachers’ authentic assessment approves that the implementation of the mentoring programme combined with the action research method was optimal for reaching the aims of this study: to enhance inclusion of children with special needs, promote teachers’ professional development and collaboration in the inclusive school context. This study justifies the proactive nature of action research, which is acknowledged by Ainscow (2003) and Howes, Davies and Fox (2008). The limited two year period of the action research and the present difficulties caused by the economical and financial crisis engender a reasonable concern about the sustainability of inclusive education in Latvia. However, the interpretation of data within this study approves that school-based mentoring as one of the forms of collaborative school culture may promote future development of schools where differences are welcome and respected, and the continuous professional development is an inner need of the teachers.

Acknowledgement:

This work has been supported by the European Social Fund within the Project “Support for the implementation of doctoral studies at Daugavpils University”. Agreement Nr. 2009/014 0/1DP/1.1.2.1.2/09/IPIA/VIAA/015.

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AN INVESTIGATION INTO THE ELEMENTS OF THE INTERNATIONAL ENGLISH LANGUAGE TESTING SYSTEM: INSTRUCTORS’ SUCCESS

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Abstract

Educating for a more sustainable future in its broadest sense includes improving quality basic education, reorienting education to address sustainability, improving public awareness and providing training to many sectors of society. In order to reorient teacher education to address sustainability, we need to examine the major tenets of sustainable development and apply them to education and teacher education. This study reports on an exploratory study into the distinctive characteristics of International English Language Testing System (IELTS) instructors. Six IELTS instruction institutes in Iran were selected. Totally, there were 122 students studying IELTS, distributed in 18 classes available in these institutes, and 15 teachers were teaching IELTS preparation courses there. All 18 classes were videotaped to be used and analysed in more detail. In addition, three questionnaires were developed for the purpose of identifying the most frequently occurring practices and strategies. The questionnaires were filled in by researchers, students and the teachers themselves. The results of the study demonstrated that knowledge and command of the target language, an ability to organize, explain, clarify, arouse, sustain interest and motivation among students, fairness to students by showing neither favouritism nor prejudice and availability to students were among the most significant characteristics and qualities of a successful IELTS instructor.

Key words: International English Language Testing System instructors, International English Language Testing System candidates, teacher development, learners’ perspectives, reflective teaching

Background

Education increases human welfare, and is a decisive factor in enabling people to become productive and responsible members of society. A fundamental prerequisite for sustainable development is an adequately financed and effective educational system at all levels, particularly the primary and secondary levels, that is accessible to all and that augments both
An investigation into the elements of the International English Language Testing..  

human capacity and well being. The core themes of education for sustainability include lifelong learning, interdisciplinary education, partnerships, multicultural education and empowerment. Priority should be given to ensuring women’s and girls’ full and equal access to all levels of education and training. Special attention should also be paid to the training of teachers, youth leaders and other educators. Education should also be seen as a means of empowering youth and vulnerable and marginalized groups, including those in rural areas, through intergenerational partnerships and peer education. Even in countries with strong education systems, there is a need to reorient education, awareness and training so as to promote widespread public understanding, critical analysis and support for sustainable development.

This paper reports on an exploratory investigation into the distinctive characteristics of IELTS instructors. There seems no shortage of ideas regarding what defines a “good” teacher in the context of IELTS instruction. Teachers and teaching have become subjects of conversations by an extensive range of interested specialists. The literature contains a gigantic range of ideas, preconceptions and interests, each with a point of view to develop. One difficulty encountered in reviewing the literature is the way in which “good teacher,” “good teaching,” and “effective teaching” are often used almost interchangeably. They are not the same thing. “Good teaching practices” can be employed by nearly any individual. Employing such practices does not make one a “high-quality” teacher. The problem with “effective teaching” as a measure is that it is generally related to some measure of “student achievement,” most often some sort of standardized test. Are such scores a valid measure of teacher “goodness”? A “good” teacher should definitely be efficient, and use those methods that seem to him or her most suited to the task at hand. However, there is another dimension to all this which distinguishes a “good” teacher from a skilful technician.

The definitions of teacher “goodness” are not commonly applicable. The concern of the teacher must be to determine what “goodness” means within his/her own teaching context (Palmer, 1990).

Language teachers’ characteristics

Two areas of literature informed the research in the field of teacher’s effectiveness and elements of teachers’ success: (a) work on disciplinary characteristics and (b) studies of the good language teacher. Each of these is discussed in turn below.

Disciplinary characteristics

The study of the characteristics of academic disciplines is a recognized field of enquiry in education and psychology (Biglan, 1973; Hativa & Marincovich, 1995; Becher & Trowler, 2001). Most of these works have been conducted in university settings, and, as Neumann (2001) points out in her review, there is evidence of a variety of ways in which teaching practices at university level may vary across disciplines. Work on disciplinary characteris-
tics outside university settings has focused principally on learners rather than teachers (Langer, 1994).

The same is true in the field of language teaching (Mori, 1999), although one exception is Hammadou and Bernhardt (1987), who explore what they call the unique talent of being a foreign language teacher. Five factors that differentiate the experience of foreign language (FL) teachers from that of teachers of other subjects are offered by these authors. These factors are as follows:

1. The nature of the subject matter itself. FL teaching is the only subject in which successful instruction requires the teacher to use a medium the students do not yet understand.
2. The interaction patterns necessary to provide instruction. Effective FL instruction needs interaction patterns such as group/pair work which are desirable, but not obligatory for effective instruction in other subjects.
3. The challenge for teachers of increasing their knowledge of the subject. Language teachers teach communication, not facts. In other disciplines, teachers can enhance their subject matter knowledge through books, but it is harder for FL teachers to sustain and boost their knowledge of the FL because doing so requires regular opportunities for them to engage in FL communication.
4. Isolation. FL teachers experience more than teachers of other subjects feelings of isolation resulting from the lack of colleagues teaching the same subject.
5. The need for outside support for learning the subject. For effectual instruction, FL teachers must search for ways of providing extracurricular activities through which naturalistic learning environments can be formed. Such activities are not very essential in other subjects.

No empirical evidence is provided for the above claims, and we emphasize them here not to argue for their validity but as an example of the approach within which language teachers’ distinctive characteristics have been conceptualized.

**The good language teacher**

Girard (1977) presented a list based on the viewpoints of language learners and which included items such as teaches good pronunciation, speaks good English, shows the same interest in all the students, makes the learners participate and shows great patience. Prodromou (1991) presented a much longer list of characteristics judged by learners: gives good notes, plays games, tells jokes, does not push weak learners and is more like a comedian. Brosh (1996) identified the pleasing characteristics of the effective language teacher as perceived by foreign language teachers and students in Israel (Hay McBer, 2000; Walls et al., 2002).

This is not particularly surprising as language teachers are after all teachers and will consequently represent characteristics of the teaching profession more generally. Also, the purpose of these studies was not so much to define what was distinctive about language teachers but to identify what learners and teachers felt were effective or desirable characteristics.
Successful teachers

Ur (1996) believes that good teachers know how to challenge students. They know their students thoroughly and understand each student’s learning styles, thus they teach in a way that students will not only learn but also be intrigued by the information provided to them. Quality teachers understand students and have the capability to reach them, and know them on a personal level, to help and mentor them. Although it is difficult for a teacher to be able to reach all of his/her students on a personal level, successful teachers try their best because they need to have the students’ attention and respect in order to teach them. There are many different ways to assess teachers’ success. Final exam scores, class observations, students’ judgments and so on.

Beyond the shadow of a doubt, teachers are one of the key factors in the process of language teaching and learning. They can have a fundamental role in their students’ progress or lack thereof. According to King Rice (2003), teaching is a complex activity that is influenced by the many elements of teacher quality, and teacher quality is a powerful predictor of student performance. Sanders and Rivers (1996) argue that the teacher is the single most important factor influencing student achievement. Suwandee (1995) assumed teaching as a two-way interaction between teachers and students and stated that what students learn, to a great extent, depends on the teacher’s commitment to the teaching task.

Haskvitz (2007) considered eleven traits for successful IELTS instructors. These characteristics are as follows:

1. Be unsatisfied. The first trait of a high-quality teacher is that he or she is a good learner. They are always eager and ready to learn new things, increase their knowledge base and experiment with better ways to achieve success. They are lifelong learners and produce lifelong learners. So, the first trait is to be unsatisfied with what is. In other words, the best teacher is always a student who wants to know more, and it is completely true for the IELTS teachers who like to expand their knowledge on how to improve the techniques and strategies they teach to the IELTS candidates. In fact, they are voracious to new ideas regarding the ways they can help the IELTS candidate obtain better results.

2. High expectations. High expectations are the second trait of excellent teachers. Setting high standards causes students to do their best. As a result, it brings out the best in students. It also creates a feeling of accomplishment in them. In other words, good teachers encourage risk taking and accept errors.

3. Create independence. Highly effective teachers are skilful at monitoring student problems and progress. Their classes are not teacher-centred. They encourage students to look for help and answers on their own. They are passionate about not teaching, but facilitating learning. The same as a fine manager who has a team in place that can operate well without him or her, a good teacher creates a sense of self in students that lasts a lifetime. In other words, they create independence.

4. Knowledgeable. Good teachers have a deep knowledge of the subject matter. Because they are masters of the subject matter, they are able to manipulate, simplify and individualize the data more easily. Besides possessing thorough knowledge of the subject matter, they have a passion for the subject. They are able to under-
stand students who might not like the subject and to compensate for the lack of enthusiasm; they present the facts from a different angle.

5. **Humour.** The fifth trait of the first-class teachers is to possess a good sense of humour. They make jokes and accept jokes. They tell stories, mention silly things, make difficult situations joyful, and are not afraid of laughter. They use humour to create a good connection with their students. In other words, excellent teachers try to keep the students’ attention without fear.

6. **Insightful.** The sixth characteristic is to obtain quick and accurate assessment of the students’ work. Good teachers evaluate tests and other projects in a timely manner and through suitable feedback, they improve students’ achievements. At all times, the qualified teachers are looking for the student’s reasoning, rather than the answer. In other words, for the insightful teacher, students’ assessment evaluates the teacher’s performance. Moreover, the results provide the ideas of what changes both teachers and learners need to improve their success.

7. **Flexible.** The best teachers use the community as their resource. For them, education is seen as more than what is done in the classroom. They participate in organizations and use their contacts to enhance student learning. They utilize newspapers and current events to open the students’ minds to what is happening in the world and at all times they search for a teachable moment (any instance where a learner expresses an interest in something that could be used to stimulate his/her learning). Excellent teachers use the community to make for more strengthening teaching. In other words, a quality instructor is a master of flexibility. It is completely proven for the foreign language teachers. They use the community and in particular mass media to teach the EFL learners how, when and to whom to speak appropriately. This fact can be directly seen in the maxims of quality and quantity introduced by Halliday (1984).

8. **Diverse.** First-rate teachers provide various techniques for learners to learn. They use several subjects to present the lessons; they use research papers, artwork, poetry and even physical education as part of the learning process. For example, when a learner is studying an explorer, the teacher talks about how many miles per hour he or she walks, how to create a graph of the calories he/she would need, make a map of the trip with legend, write a journal of what he/she saw, draw pictures of the flora and fauna, and make a presentation of what the student felt was the best and worst part of the discovery. A perfect EFL teacher also uses various techniques to enhance the students’ learning by different tools, such as writing journals and logs, keeping a dairy, portfolios, discussion and problem-solving tasks.

9. **Unaccepting.** Quality teachers are unaccepting. They do not accept pat answers, first drafts and false excuses. This point can be controversial in the case of EFL learners as they should make a lot of errors during the process of learning. Anyway, here the advanced and/or higher intermediate learners are meant since they are not expected to produce pat answers or false excuses. Because of this trait, they are not the easiest teachers. In essence, education is the disciplining of the
mind. A student who knows the rules knows what to expect and what is right. The best teachers are those that have suitable criteria and build good habits.

10. *Uncomforting*. The tenth and perhaps most interesting quality of a teacher is keeping students off balance. The students whose teachers have such a trait are not bored in the class; they are motivated because they cannot expect what their teacher asks them to do each session. When they come home, they talk about what they did in the class. Skilful teachers have different methods for teaching. They show a video, take students to the library, and have them work on a project, create lessons for one another, work on a computer, proofread a classmate’s work and invent a game to play at recess, all before noon. Each day is different from the next, but there is continuity in teaching.

11. *A communicator*. There is not any research paper which outlines good teachers with their tidy rooms, easy marks, ability to write neatly or dress well. All these are important for a qualified teacher. But good teachers deal with the ability to trigger learning, thus the ability to communicate is the most important trait.

**Classroom management**

Classroom management is repeatedly conceptualized as a matter of control rather than as an aspect of curriculum, instruction and overall classroom climate (Borophy, 1988). As the authors’ utmost concern has been to try to avoid prescriptive behaviour within classrooms, there is, in fact, a certain degree of tension between flexibility of control and prescriptive attitudes in the classroom atmosphere. Therefore, we have to persuade ourselves that not everyone will articulate things in the same words or identify them in the same way, and that not everyone will move at the same speed or in the same direction. Based on the findings of the research carried out by Borophy (1988), it is highly feasible that teachers who approach classroom management, as a process of establishing and sustaining effective learning environments tend to be more successful than others who put more emphasis on their roles as authority figures since classrooms are composed of enormously various personal views, characteristics, ethics and values.

In order to find a concrete foundation for relationships, Buddhist psychology suggests that we need to consider what we most value in our connection with someone we care about (Beck, 1993). Improvement would not come into being, especially when learners are aware of the particular ways of “wearing a mask” so as to avoid being hurt again (Craig, 1994). For instance, in a language class, those students whom we call introverts are aware of special ways of protecting their self and try not to participate in any class discussion in order not to be laughed at. The best solution is for the teachers to establish a rapport with their students and make them sure that they will not be punished if they make a mistake.

The classroom atmosphere influenced by the teacher has the main impact on students’ motivation and attitude towards learning. That is to say, for teachers, being equipped with academic and professional characteristics would not be sufficient to set up a positive, learnable and teachable classroom climate. Particularly, the factors that best assist student learning are being purposeful, task-oriented, relaxed, warm, supportive and having a sense of
order and humor in an integrated sense (Kumaravadivelu, 1992). He (Kumaravadivelu, 1992) also considers positively other factors facilitating learners learning in a positive way, such as mutual respect and rapport, etc., all of which stem from conveying to students that you understand, share and value their feelings as individuals on a complete range of matters and experiences, academic, social and personal. IELTS teachers especially can connect with their students as they explain how difficult it was for them to learn the new language. Such a climate enhances learning and motivation of students and their attitudes towards learning process. Moreover, research indicates that certain personality features impact student evaluations of teachers. From the students’ points of view, teacher-expressive characteristics such as warmth, enthusiasm, and extroversion, in fact, separate effective from ineffective teachers (Bousfield, 1940; Feldman, 1986; Basow & Silberg, 1987; Cravens, 1996; Marsh & Roche, 1997; Guerrero & Miller, 1998; Basow, 2000; Best & Addison, 2000; Radmacher & Martin, 2001). Reasoning in this way, out of three commonly accepted characteristics of teachers, namely, professional, pedagogical, and personal, the last one of the three will illuminate the ways of getting a better learning atmosphere and will provide self-confident students.

Disproportionality and classroom management

Instituting classroom management principles has implications for the learning progress of all students of English as a Foreign Language (EFL), especially low-performing, poor, special education and racial/ethnic minority EFL students (Saphier & Gower, 1997). Definitions and expectations of appropriate behaviour and ethics are culturally influenced, and conflicts are likely to occur when teachers and students come from different cultural backgrounds (Weinstein, Tomlinson-Clarke, & Curran, 2004). As Voltz, Brazil and Scott (2003) stated, misunderstanding behaviours or communication patterns of culturally and linguistically diverse students can lead teachers who are unprepared to meet the educational needs of these students to see them as having a disability and request a referral to special education (Voltz, Brazil, & Scott, 2003). The combination of interpreting behaviours through a cultural lens and instructional quality contributes to disproportionality in special education (Harry & Klingner, 2006; Klingner, Artiles, Kozleski, Harry, Zion, Tate, Duran, & Riley, 2005).

Culturally responsive classroom management

Culturally responsive classroom management (CRCM) is a trend to running classrooms with all students in a culturally responsive manner. CRCM is a pedagogical approach that directs the management decisions that teachers make. It is a natural extension of culturally responsive teaching which uses EFL students’ backgrounds, depicting of social experiences, prior knowledge and learning styles in everyday lessons. Teachers recognize their biases and values and reflect on how these influence their expectations for behaviour and their interactions with EFL students as well as what learning looks like. They decide that
the goal of classroom management is not to achieve fulfilment or control but to provide all EFL students with impartial opportunities for learning, and they understand that CRCM is “classroom management in the service of social justice” (Weinstein, Tomlinson-Clarke, & Curran 2004, p. 27).

There is extensive research on traditional classroom management and countless resources available on how to deal with behaviour and ethical issues. On the other hand, there is little research on CRCM, despite the fact that teachers who lack cultural competence often experience problems in this area. Management texts may give some attention to students who are culturally different, sometimes in a separate chapter on students with special needs (Weinstein et al., 2004).

**Essential fundamentals of CRCM**

Weinstein et al. (2004) developed a five-part concept of CRCM derived from the literature on culturally responsible pedagogy, multicultural counselling and caring: recognition of one’s own cultural lens and biases, knowledge of students’ cultural backgrounds, awareness of the broader social, economic and political context, ability and willingness to use culturally appropriate management strategies, and commitment to building caring classroom communities. Consecutively, the goal of classroom management is to create an environment in which students behave appropriately from a sense of personal responsibility, not from a fear of punishment or desire for a reward. As such, the environment must acknowledge and be responsive to who the students are and create a safety net that equitably responds to what teachers know about their students.

**Introduction to teaching IELTS**

Teaching IELTS is a combination of English language training and the IELTS examination requirements and procedures in order to produce the best results when students take this exam (Griffiths, 2009). There is no magic solution for getting a high band score in the exam. Students will have to have a good proficiency in English to achieve a band score that will make them eligible to enter a university abroad. By taking an IELTS preparation course, students are much better prepared for questions types, exam format and good time keeping. Most significantly, students should still take part in the process of English language practice and, possibly, most important is oral fluency coupled with the knowledge of what is essential to do their very best in the IELTS exam.

It is very important to give students an IELTS sample test before giving them IELTS training, and students should be no less than intermediate level or approximately band 4.5 and above, after all they are trying to achieve band six in IELTS, and it is a worthless exercise to permit them to train for IELTS when they cannot possibly achieve it. Most students are very enthusiastic to participate in an IELTS course and eagerly work at any material that has an IELTS label. It is a good idea to test the students on admission to a course and give them a taste of the real exam format and timing. In addition, retest them after a few
weeks to check their progress and give them coaching and encouragement on their weaknesses. A rich diet of test material can sometimes discourage students when they see little or no progress, thus making their learning more difficult. Most IELTS candidates are being hard-pressed along with their families’ desire and are encouraged to accomplish the impossible in a very short time. It may be because of the urgent needs they feel to be successful in this exam.

It is highly recommended that any person who is involved in teaching IELTS experiences some of the stress and strains students endure in taking of the IELTS test. Actually sitting the IELTS exam can give teachers great insight into what a test day is like and is a good investment in their future career. Being able to share firsthand knowledge is of great benefit in the teaching process. As Griffiths (2009) states, when teaching IELTS, the teacher has to be enormously well-prepared with the resources; principally, when proving answers, it is not sufficient just to provide an answer, but it is critical to be able to show why and where and give detailed reasoning which relates to the answer. A good way to do so this is for an IELTS instructor to take each of the practice tests before using and teaching them and thus better realize where students might have problems, and of course no peeking at the answers beforehand!

**Teachers’ sustainability**

Sustainability is not just a concept; it is a practice that inspires us to continually adapt and evolve in our work to support young students. During a classroom setting, the teacher assesses and adapts to the situation; follows tested and proven programming; uses a variety of tools for a dynamic experience; works in any setting to meet real-life demands; evaluates results and integrates learning.

These elements of adaptability, fidelity, creativity, flexibility and accountability converge for a stronger organization. Sustainability is achieved when these elements are brought together intentionally, resulting in a more responsive, resilient organization – just like the strong parent-student relationships parent educators work so hard to build every day.

Teachers’ sustainability turns its strategic focus to sustainability. Each area of operation is evolving to meet the changing demands of today’s families and today’s environment. The groundwork for reenergized programming and evaluation first started being laid in 2000; the details outlined on the following pages of this issue reflect a tighter implementation of an established approach.

Just as sustainability can be understood through looking inside the home visit, parent educators across the country share a common focus on encouraging the positive parenting practices of routine and observation.

When a routine is established for a student, it gives him/her a foundation of stability and confidence so that he/she can then use her energy to learn, grow and develop. It ensures that the core strengths of the proven national teachers’ sustainability programming are embedded, so that each local programme can then grow and adapt to meet the demands of its unique environment.
Accurate observation is a critical part of every classroom setting. Both parents and teachers develop and use their observation skills to ensure that students learn, grow and develop to realize their full potential. At a strategic level, observation is parallel to the assessment and evaluation of outcomes – the quantifiable measurement of impact within local programmes.

Procedure

This study seeks to find out what the features and characteristics of good and successful IELTS instructors are from both qualitative and quantitative viewpoint. Similar to almost all empirical studies, the utilized range of sample population was large. The researchers selected six IELTS instruction institutes across Iran which are quite well-known for their successful teachers and their candidates who have passed the IELTS examination with highly accepted scores. There were totally 18 IELTS classes in these six institutes, and generally 15 teachers were teaching IELTS there. The age range of students was from 18 to 27. All 18 classes were videotaped to be used and analysed in more detail later. All IELTS candidates who were studying in 18 classes were homogenized based on their scores in an IELTS sample test administered by the institutes. These samples included the previous real IELTS exams administered during previous months and were collected from various IELTS books. Totally, there were 122 candidates distributed randomly among these 18 classes, but there were at least eight students in each class. All teachers had passed a teacher training course (TTC) programme specifically designed for IELTS instructors before commencing their teaching in the mentioned institutes, and all participated in the IELTS exam at least once and obtained the overall band score of 7 whether in General or Academic module; therefore, they can be considered as highly qualified teachers.

At the beginning of the study, the researchers developed the three questionnaires. One was filled in by the researchers based on watching the videotapes recorded. This questionnaire aims to find out the most common types of teaching strategies and practices employed by teachers during their instructions. The second questionnaire was given to all subjects to judge about their teachers’ teaching. This questionnaire includes some selected items from the first questionnaire and some other personal questions which reflect the students’ viewpoints and attitudes towards their teachers’ method of instruction, way of behaving and respecting students, presenting the content, of course, covering the whole syllabus specified by the institute, etc. Finally, the last questionnaire was given to all the 15 teachers considered for this study. Through this questionnaire, teachers could reflect upon their own teaching, i.e. they were supposed to read the questionnaire and check the item that best describes their methods, skills, strategies and ethics of their instruction.

All three questionnaires were analysed for the purpose of identifying the most repeated, occurred and recognized elements or factors based on which the results of the study were supposed to be figured out.
Discussion

The most frequent practices and strategies applied by the IELTS instructors are numerous: cooperative learning, small group discussion, class discussion, feedback enhancement, presentation and problem modelling strategies and practices, as extracted from the video tapes.

As articulated by the students, the types of practices and strategies used by the teachers are varied: demonstrating or modelling how to solve a new problem, writing individually on worksheets, journal entries, or other writing assignments, or combined with small group discussion and many others. Also, most students believed that their teachers summarized the main points, provided situations for presentations and student-to-student talk in full class setting, gave directions for the activity, used positive intervention and, most importantly, respected all students.

The third questionnaire, as mentioned before, was distributed among the teachers to reflect upon and evaluate their own teaching. The responses obtained from the third questionnaire include social-interactive classrooms, making each student feel loved and secure. In addition, most teachers reported that the class activities should fit the level of learners’ development. The teachers should manage the consequences and be consistent.

The further findings of this study focused on the types of practices teachers employed to develop speaking, listening, writing and reading skills. The researchers found what kinds of practices and/or strategies were the most successful practices related to each skill.

Getting students to become familiar with the test as early as possible, getting students to be aware of the exact procedure for the test and getting students to use their study time efficiently were mostly reported on and observed in IELTS speaking classes.

Providing students with a lot of samples, giving students materials that are within their reach and are learnable, choosing the most appropriate manner for the specified writing area were the most occurred practices and strategies teachers employed while teaching writing skills. The teacher must choose the most appropriate manner for the specified writing area.

Considering the IELTS reading classes and the data collected through the questionnaires, surveying, scanning, skimming, guessing and predicting from context and previewing before reading the text were most frequently reported on while teachers were teaching reading skills.

Finally, the results obtained from the questionnaires suggested that teachers mostly employed such strategies as recording today’s news bulletin, asking students to listen for some specific information, teaching bottom up listening skills and top down processing while they were teaching listening skills.

On the basis of the data collected from over 15 IELTS instructors in a range of contexts, specific ways in which they and their work are perceived to be unique were identified. The key arguments emerging here were the dynamic nature of language, the scope and complexity of the content of language teaching, the range of materials, methods and activities available to IELTS instructors and, especially, close relationships between instructors and learners.
It was argued that, while these themes provide direction for future research, the specific ways in which IELTS instructors are seen to be distinct may vary in different contexts.

As witnessed in this study, the most frequent practices and strategies employed by IELTS instructors while teaching in IELTS classes, based on the researchers observation of recorded videos, were the following: providing feedback and reinforcement, asking and answering questions, working in small groups.

In addition, based on the results obtained from the second questionnaire, students judged their instructors’ practices and actions as having the following features: summarizing main points, reviewing and reemphasizing main points, pulling information together, asking students to give the main points, providing student presentation.

Also, IELTS instructors were provided with a questionnaire to reflect upon their own teaching and evaluate their teaching practices. The results of this questionnaire proved that almost all of the IELTS instructors agreed that activities should fit the developmental level of the learners. They should make each student feel loved and secure, and they should be able to manage the consequences and be consistent. Social-interactive classrooms are of great significance to them.

Further findings of the present study focused on the types of strategies and practices IELTS instructors used in various language skills. As indicated, most IELST instructors in speaking skill classes helped students become familiar with the test as early as possible, had students become aware of the exact procedure for the test and encouraged students to use their study time efficiently.

In writing classes, most instructors believed that they should provide the learners with a lot of samples and have students work in groups thereby learning from each other. They also maintained that students need to first learn thousands and thousands of phrases and be competent in using all of them. Teachers believe it is important that they give the students materials that are within their reach and are learnable.

As predicted by the researchers, all the IELTS instructors agreed that teaching scanning, skimming and surveying skills, guessing and predicting from context are of great importance to the IELTS candidates’ success in reading skills. They also felt that once students have been taught about previewing and predicting, it is important to give them as many chances as possible to practice these skills.

Interestingly enough, in teaching listening skills, nearly all instructors believed in practicing out of the classroom context, i.e. recording today’s news bulletin, for instance, was highly recommended for the learners. Teaching bottom-up and top-down listening skills and asking students to listen for some specific information and not to concentrate on details until they have understood the main ideas were also found among the strategies recommended by the instructors to learners in listening classes.

A great number of teachers also believed that translating creates a barrier between students and the person who is speaking on the recording; therefore, it was highly ignored and seldom suggested by the instructors.
Conclusion

Having combined and analysed the data obtained from the three questionnaires in more details, the results of the study recommended the following: knowledge and command of the target language, an ability to organize, explain and clarify, provoke and maintain interest and motivation among students, fairness to students by showing neither favouritism nor prejudice and availability to students. These are among the most significant characteristics and qualities of successful IELTS instructors.

Methodologically, the analyses of both beliefs and classroom practices are two measures which this work suggests can enhance future investigations of what is it that makes IELTS instructors different. Finally, to complement a socially constructed perspective on the study of what being an IELTS instructors means continued epistemological analyses of the nature of language as a subject are also desirable.

This study is explicitly linked with the field of teacher education and teacher development. Also it is specifically related to the success factors of IELTS instructors who EFL teachers are. The students found the programme meaningful and valuable. They commented that approaching teachers’ practices in terms of sustainable development deepened their understanding and extended their knowledge of global and local issues. They also spoke about how the questionnaires gave them an opportunity to express negative feelings in a safe place. The students felt that approaching teachers’ practices from a sustainability angle also emphasized their connection between different aspects of life between theory and practice. The teachers saw their students as having an opportunity to explore sustainability issues globally as well as locally. Having introduced this study, many IELTS instructors became more aware of the concept of an education that enables students to focus on sustainability issues creating a better future for society.

References:


An investigation into the elements of the International English Language Testing.


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CONSTRUCTIVIST BELIEFS OF LATVIAN MATHEMATICS TEACHERS: LOOKING INTO FUTURE

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Abstract

The aim of the research is to clarify the profile of constructivist/traditional beliefs sustained by the mathematics teachers in Latvia. The research sample comprised 390 mathematics teachers representing all regions of Latvia. The present study is part of an international research within the NorBa project “Nordic-Baltic comparative research in mathematics education” that makes use of a quantitative questionnaire elaborated by project participants. The initial results show that the beliefs of Latvian teachers of mathematics on efficient teaching are oriented more towards a constructivist approach, yet there exist significant differences of teachers of different social and demographical groups in their beliefs on approaches in teaching and effective instruction. The obtained results provide a possibility to develop pre-service teacher education and teachers’ professional development courses in order to assure sustainability of the learning process.

Key words: teachers, beliefs, teaching of mathematics, constructivist beliefs, traditional beliefs

Introduction

At the end of the 20th century, behaviourism-based theories of teaching were no longer efficiently functional for securing social demands set for the younger generation due to globalization, rapid development of technologies and information media and their active implementation in the life of each individual. Therefore, the year of 2000 became a turning point in mathematics education in many countries as new constructivism-based standards in mathematics were adopted. Besides, in order to deal with the urgent issues in mathematics in a comprehensive way, the European Union structural fund National programme “Improvement of the Quality of Learning in Natural Sciences, Mathematics and Technologies Subjects in Secondary Education” project “Elaboration of the Content of Learning and Teacher Further Education in the Subjects of Natural Sciences, Mathematics and Technologies” was carried out in Latvia from 2005 to 2008. Project staff, experts in their work, attempted to change the education philosophy in schools from
• providing knowledge to learners’ acquisition of skills of learning;
• scientific knowledge and algorithms to learners’ own discoveries and skills;
• a passive to an active participation of learner in the process of learning;
• teacher as a provider of knowledge to teacher as an adviser and counsellor.

From 2008 until 2011, a similar project was implemented in natural sciences and mathematics education in basic school (Forms 7–9).

This study seeks to clarify the profile of constructivist/traditional beliefs of contemporary mathematics teachers of Forms 7–9 mathematics in Latvia. In this context, beliefs comprise an individual’s subjective knowledge of a certain object or concern that may not necessarily be based on objective considerations (Pehkonen, 1994). The profile of beliefs is important because it is a filter that affects decision making of teachers more than their pedagogical knowledge or guidelines of academic programmes (Clark & Peterson, 1986); therefore, even the best planned education reform may not lead to desirable outcomes if teachers’ system of beliefs is not compatible with it.

**Theoretical framework**

Beliefs play an important role in many aspects of teaching. They are involved in helping individuals make sense of the world, influencing how new information is perceived and whether it is accepted or rejected. Beliefs colour memories with their evolution and judgment, and serve to frame our understanding of events (Borg, 2001). It is essential to differentiate between two kinds of beliefs: 1) exposed beliefs (what is said?) and 2) beliefs-in-action (what is done?). This study highlights the definitions teachers’ exposed beliefs.

The term “teachers’ beliefs” is generally used to single out the beliefs that are associated with and relevant to an individual’s teaching. The majority of scholars agree on the following differentiation of teachers’ beliefs:

• beliefs about teaching, learning, and learners (the focus of the present article);
• beliefs about subject matter;
• beliefs about self as a teacher;
• beliefs about the role of a teacher (Calderhead, 1995).

Teachers’ exposed beliefs their own capabilities guide their teaching practices (Kagan, 1992; Pajares, 1992; Ball, 1996; Handal & Herrington, 2003) and the implementation of curriculum reform (Handal & Herrington, 2003). At the classroom level, teacher’s beliefs can enhance curriculum reform (Burkhardt, Fraser, & Ridgway, 1990; Sosniak, Ethington, & Varelas, 1991; Koehlner & Grouws, 1992; Sosniak, Ethington, & Varelas, 1991).

There exist different approaches to studying teachers’ beliefs on teaching. One of them investigates whether teachers’ beliefs are in harmony with the reforms of the process of teaching mathematics (Aguirre, 2009). These studies prove the existence of two types of teachers, traditional and innovative, with their corresponding types of instruction.

1. *Traditional transmission instruction* is based on a theory of learning that suggests that students will learn facts, concepts and understandings by absorbing the content of their teacher’s explanations or by reading explanations from a text and
Constructivist beliefs of Latvian mathematics teachers: Looking into future

 answering related questions. Skills are mastered through guided and repetitive practice of each skill in sequence, in a systematic and highly prescribed fashion and done largely independent of complex applications in which those skills might play some role.

2. Constructivist-compatible instruction is based on a theory of learning that suggests that understanding arises only through prolonged engagement of the learner with relating new ideas and explanations to the learner’s own prior beliefs. A corollary of that assertion is that the capacity to employ skills comes only from experience in working with concrete problems that provide experience in deciding how and when to call upon each of a diverse set of skills (Ravitz, Becker, & Wong, 2000).

One of the first studies on teachers’ beliefs about teaching, learning, and learners was conducted in the USA in 1998 within the framework of the national poll “TLC-1998 Teaching, Learning and Computing”. Differences were located in teachers’ beliefs that may be differentiated in several groups (for instance, according to the education syllabus, the subject taught and gender). The teachers whose responses were described in this study numbered 4083, including 2251 in the Fisnational probability sample of schools. The studied teachers taught students in Forms 4 to 12 different subjects containing mathematics. The teachers selected for the survey were disproportionately oversampled as they made substantial use of computers, had students doing project work and emphasized higher-order thinking in the teaching and learning process.

There are also studies specifically focused on mathematics teachers’ beliefs on teaching. The purpose of an Australian study was to determine whether mathematics teachers’ beliefs and practices could be characterized in terms of behaviourist and constructivist dimensions (Handal, 2003). The focus of the study was the Standard course, which is a syllabus with a mandatory thematic component (Board of Studies New South Wales, 1996; Handal, 2000). The data analyses reveal the existence of two curricular orientations in teachers’ instructional beliefs and practices. These two orientations are similar to the constructivist and behaviourist approaches to teaching and learning mathematics. It was found out that the constructivism-oriented teachers have a more favourable attitude towards the thematic approach than the behaviourism-oriented teachers.

TALIS (Teacher Questionnaire: Teaching Practices, Beliefs and Attitudes Module) survey results (OECD, 2009) demonstrated that endorsement of constructivists’ beliefs is stronger than that of traditional beliefs in most countries. Teachers in North-Western Europe and Scandinavia showed a stronger preference for constructivist views than teachers in Southern Europe. Preferences of teachers in East-European countries can not be identified as traditional or constructivism based.

Hirsch (1996) argues that, influenced by colleges of teacher education where Deweyan world-views have predominated for many decades, most teachers, particularly elementary teachers, adopt a constructivist philosophy. Becker and Riel (1999) argue that teachers’ philosophies are largely constructivist but that the school bureaucratic culture and public expectations for measurable documentation of student “achievement” severely constrain most teachers from implementing constructivist pedagogy in daily practice.
This paper also focuses on the possible traditional and constructivist beliefs of mathematics teachers on the teaching approach in their classroom. The following research questions were set taking into consideration the literature review:

1. Which approach to learning (traditional or constructivist) is preferred by mathematics teachers in Latvia in their beliefs on teaching approach?
2. What are the differences, if any, between the beliefs on teaching approaches of mathematics teachers in Latvia and the USA?
3. What statistically significant differences, if any, are among the beliefs on teaching approaches of teachers belonging to different socio-demographical groups?

Method

Instrument

The present research is a part of an international comparative study NorBa project “Nordic-Baltic Comparative Research in Mathematics Education” which uses a quantitative questionnaire elaborated by project participants. The questionnaire is divided into eight parts, seven of which are quantitative and entail 77 statements that, with the exception for part A, are evaluated according to a 5 or 4 point Likert scale from ‘fully agree’ to ‘fully disagree’. The questionnaire parts are as follows: A. Basic information; B. Your general satisfaction with your work as a teacher; C. Your beliefs on two approaches to teaching; D. Your beliefs on efficient/good teaching; E. Your beliefs on efficient/good teaching and learning of mathematics; F. How do you use textbooks? G. Your habitual action in class.

Sample

The sampling of mathematics teachers of Forms 7–9 consisted of 390 mathematics teachers from different regions of Latvia; 96 of them work in schools with ethnic minorities, 13 are males and 165 are teachers working in bigger towns, while 225 are teachers who work in rural settlement and small town schools. The sample includes teachers of different ages, education level and teaching experience. The average age of respondents is 47 with range from 25 to 74 years old; the sampling is dominated by the age group from 40 to 49 (more than 43% of respondents). The average duration of teaching experience of respondents is from 26 to 30 years (more than 23% of respondents). The respondents have taught mathematics in Forms 7–9 for 19 years on average, with range from one year to 44 years. The majority of respondents hold a bachelor’s degree. More than 47% of teachers hold a master’s degree (Table 1).

This research sample represents the distribution of mathematics teachers in Forms 7–9 in Latvia. According to the data of the Ministry of Education of Latvia, 94% of mathematics teachers are female, 32% of all teachers work in schools for ethnic minorities and 60% of all teachers work in small towns and rural settlements, with 36% of all teachers working
in Riga and its region, 18% – in Latgale, 16% – in Kurzeme and Zemgale and 14% – in Vidzeme.

Table 1. Socio-demographic indices of teachers’ sample (n=390)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency N (%)</th>
<th>Valid frequency</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region of Latvia</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>Riga and its region</td>
<td>151 (38.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latgale</td>
<td>95 (24.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vidzeme</td>
<td>62 (15.9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kurzeme</td>
<td>48 (12.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zemgale</td>
<td>34 (8.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>Female</td>
<td>377 (96.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>13 (3.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education programme</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>General</td>
<td>294 (75.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnic minorities</td>
<td>96 (24.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urbanization</td>
<td></td>
<td></td>
<td>0.002</td>
</tr>
<tr>
<td>Bigger town</td>
<td>165 (42.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small town or rural</td>
<td>225 (57.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>20–29</td>
<td>11 (2.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30–39</td>
<td>62 (15.9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40–49</td>
<td>171 (43.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50–59</td>
<td>127 (32.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60+</td>
<td>19 (4.9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>Secondary</td>
<td>4 (1%)</td>
<td>4 (1%)</td>
<td></td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>198 (50.2%)</td>
<td>198 (50.9%)</td>
<td></td>
</tr>
<tr>
<td>Master’s degree</td>
<td>186 (47.7%)</td>
<td>186 (47.8%)</td>
<td></td>
</tr>
<tr>
<td>Doctoral degree</td>
<td>1 (0.3%)</td>
<td>1 (0.3%)</td>
<td></td>
</tr>
<tr>
<td>Teaching experience in years</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>0–5</td>
<td>12 (3.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6–10</td>
<td>21 (5.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11–15</td>
<td>43 (11.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16–20</td>
<td>67 (17.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21–25</td>
<td>77 (19.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26–30</td>
<td>92 (23.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30–35</td>
<td>44 (11.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36–40</td>
<td>28 (7.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41+</td>
<td>6 (1.5%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Group differences were assessed with Chi-square tests

Procedure

The data collecting process took place in October – December 2010 at several stages:
1. Informative e-mails were sent to schools all over Latvia inviting mathematics teachers to participate in the polling.
2. Teachers who wished to participate in the polling filled in applications electronically and sent them to a specially appointed e-mail address.
3. The registered participants of the polling were provided a code and they were sent questionnaires with the necessary instructions.
4. Respondents filled in questionnaires and sent them to the appointed e-mail address.
Participation in the polling was voluntary; respondents’ identity and records were kept confidential: the report did not disclose teachers’ personal data (name, school).

Data analysis

The following methods of statistical analysis were used for data processing: Kolmogorov-Smirnov test to assess distribution of data, Descriptive Statistics, Frequencies, Correlation, Cluster Analysis, Mann-Whitney criterion and Kruskall-Wallace criterion, as well as Cronbach Alpha, to assess the reliability of scale. Justification as to the relevance and appropriateness of the statistical techniques are detailed below.

Main results

In accordance with the aim of the article and questions set for the research, only the results of part C of the questionnaire were analysed. This part C was constructed guided by the specific part of the aforementioned USA-based research “TLC-1998 Teaching, Learning, and Computing” (1998): it was translated from English to Latvian and Russian.

In this part of the questionnaire the teachers were offered a description of two teachers with competing approaches in teaching, as described below. One of them poses the teacher as a facilitator of student learning who provides opportunities and resources for students to discover or construct knowledge for themselves; the other describes the teacher’s role as one who explains knowledge in a structured manner (Ravitz, Becker, & Wong, 2000).

Ms Kalniņa was conducting her class in an animated way, asking questions that students could answer quickly based on the reading they had done the day before. After this review, Ms Kalniņa taught the class new material, again using simple questions to keep students attentive and listening to what she had said.

Ms Bērziņa’s class was also having a discussion, but many of the questions came from students themselves. Though Ms Bērziņa would clarify students’ questions and suggest where the students could find relevant information, she didn’t really answer most of the questions herself.

Utilizing a Likert scale, the four questions were posed.

- C1. Which type of class discussion would you be more comfortable having in class?
- C2. Which type of discussion do you think most students prefer to have?
- C3. From which type of class discussion do you think students gain more knowledge?
- C4. From which type of discussion do you think students gain more useful skills?
The questions were posed with the five options of reply: 1) certainly in Ms Kalniņa’s class; 2) more in Ms Kalniņa’s class; 3) cannot say; 4) more in Ms Bērziņa’s class; 5) certainly in Ms Bērziņa’s class.

**Teachers’ orientations towards teaching approaches**

To assess the reliability of the scale, Cronbach Alpha coefficient was calculated with the value 0.688. Thus, it may be concluded that reliability level of part C of the questionnaire is average and part C may be used in the research.

Descriptive statistics shows that all questions have a similar range (R=4), the biggest (Max=5) and the smallest (Min=1) value. Consequently, it evidences that all response options were chosen at least once. The mean of all questions M=3.16, the common standard deviation SD=1.21. Question C4 (Students gain more useful skills) has the highest mean (M=3.68, SD=1.13) while C2 (Teachers think students prefer) – the lowest one (M=2.91, SD=1.17) (Table 2).

Table 2. Descriptive statistics on mathematics teachers supporting either traditional or constructivist approach to teaching

<table>
<thead>
<tr>
<th>Questions</th>
<th>Mean± Std. Deviation</th>
<th>Traditional approach (%)</th>
<th>Middle position (%)</th>
<th>Constructivist approach (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 Teachers would be more comfortable with</td>
<td>2.92±1.27</td>
<td>47.1</td>
<td>11.1</td>
<td>41.7</td>
</tr>
<tr>
<td>C2 Teachers think students prefer</td>
<td>2.91±1.17</td>
<td>42.2</td>
<td>21.6</td>
<td>36.0</td>
</tr>
<tr>
<td>C3 Students gain more knowledge</td>
<td>3.14±1.28</td>
<td>36.9</td>
<td>15.9</td>
<td>46.9</td>
</tr>
<tr>
<td>C4 Students gain more useful skills</td>
<td>3.68±1.14</td>
<td>20.5</td>
<td>11.5</td>
<td>67.7</td>
</tr>
</tbody>
</table>

Further, Table 2 reveals how often teachers choose traditional approach in their replies (options 1+2), how often they choose constructivist approach (options 4+5) and how often they could not answer the question or choose middle position (option 3).

In response to question C1 (Teachers would be more comfortable with), there was the smallest number of teachers who could not determine their position and the largest number (41.7%) of those who supported the traditional approach. In response to question C4 (Students gain more useful skills), the largest number of teachers supported the constructivist approach (67.7%). As both indices differ for more than 20%, this suggests that teachers who first selected the traditional approach providing answer to question C1 changed over to constructivist approach providing answer to question C4. Most teachers could not determine their position (21.6%) in answers to question C2 (Teachers think students prefer). At the same time, the smallest number of teachers supported a constructivist approach, namely, in C2 question.
Spearman’s correlation was used for correlation analysis as the data do not have a normal distribution. It shows that all questions have a statistically significant correlation. The closest relation exists between questions C1 and C3 ($r=0.61$, $p<0.01$), C3 and C4 ($r=0.52$, $p<0.01$), and C1 and C4 ($r=0.50$, $p<0.01$). Less close correlation exists between question C2 and other questions (refer to Table 3).

Table 3. Intercorrelations of the teachers’ feelings of comfort, students’ priorities and discussions in knowledge acquisition and developing useful skills ($n=390$)

<table>
<thead>
<tr>
<th>Questions</th>
<th>C1 Teachers would be more comfortable with</th>
<th>C2 Teachers think students prefer</th>
<th>C3 Students gain more knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2</td>
<td>0.205**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>0.612**</td>
<td>0.115*</td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>0.503**</td>
<td>0.166**</td>
<td>0.515**</td>
</tr>
</tbody>
</table>

"p<0.01; *p<0.05

**Latvian and US teachers: Traditional or constructivist approach**

Tables of frequency provide an opportunity to compare the results of Latvian case with those of the analogous US research (Ravitz, Becker, & Wong, 2000) (Tables 4, 5, 6 and 7). Apart from teachers’ beliefs about what students prefer (Table 4), it is obvious that teachers of the presented sample in Latvia are more tended to constructivist approach than teachers of the similar study in the USA.

Table 4. Replies of US and Latvian teachers about what they would be more comfortable with in teaching

<table>
<thead>
<tr>
<th>Country</th>
<th>Traditional approach</th>
<th>Middle position</th>
<th>Constructivist approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>64%</td>
<td>7%</td>
<td>28%</td>
</tr>
<tr>
<td>Latvia</td>
<td>47%</td>
<td>11%</td>
<td>42%</td>
</tr>
</tbody>
</table>

The least differences in replies of US and Latvian teachers about the approach to learning that most develops learners’ knowledge were observed (Table 5).

Table 5. Replies of US and Latvian teachers about the teaching approach they suppose students prefer

<table>
<thead>
<tr>
<th>Country</th>
<th>Traditional approach</th>
<th>Middle position</th>
<th>Constructivist approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>53%</td>
<td>10%</td>
<td>37%</td>
</tr>
<tr>
<td>Latvia</td>
<td>42%</td>
<td>24%</td>
<td>34%</td>
</tr>
</tbody>
</table>

Analysing the replies of US and Latvian teachers about the approach to learning that most develops learners’ skills, it is possible to state that the majority of teachers in both groups support constructivist approach (Table 6).
Constructivist beliefs of Latvian mathematics teachers: Looking into future

Table 6. Replies of US and Latvian teachers about the approach to learning that most develops learners’ knowledge

<table>
<thead>
<tr>
<th>Country</th>
<th>Traditional approach</th>
<th>Middle position</th>
<th>Constructivist approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>44%</td>
<td>14%</td>
<td>42%</td>
</tr>
<tr>
<td>Latvia</td>
<td>37%</td>
<td>16%</td>
<td>47%</td>
</tr>
</tbody>
</table>

Table 7. Replies of US and Latvian teachers about the approach to learning that most develops learners’ skills

<table>
<thead>
<tr>
<th>Country</th>
<th>Traditional approach</th>
<th>Middle position</th>
<th>Constructivist approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>29%</td>
<td>14%</td>
<td>57%</td>
</tr>
<tr>
<td>Latvia</td>
<td>20.5%</td>
<td>11.5%</td>
<td>68%</td>
</tr>
</tbody>
</table>

Apart from teachers’ beliefs about what students prefer, it is obvious that the teachers of the presented sample in Latvia are more tended to constructivist approach than the teachers of a similar study in the USA.

Mathematics teachers’ beliefs on teaching approaches: Socio-demographic differences

According to Kolmogorov-Smirnov criterion, in all questions, it was revealed that there are significant differences with normal distribution, therefore the analysis of differences between socio-demographic groups was produced by using non-parametric criterion. To make out whether there exist statistically significant differences in the beliefs of teachers representing diverse socio-demographical groups concerning teaching approaches, and if they do, in what groups they exist, each question (C1, C2, C3, C4) was cross-tabulated considering all socio-demographical characteristics. The following statistically significant results were gained.

Question C1 (Teachers would be more comfortable) brings out essential differences (p=0.030) among the replies of teachers from diverse regions of Latvia. Trend towards constructivism is slightly more expressed in Riga’s region and in Latgale. There exist statistically significant differences (p=0.000) among teachers of general education and ethnic minorities programmes, teachers who work in rural settlements and bigger towns (p=0.007) and among groups of education (p=0.000): absolute frequency exceeds the expected frequency for traditional approach to teaching for teachers who work in schools with the general basic education programme, in rural settlements or small towns and teachers holding a bachelor’s degree. However, absolute frequency exceeds the expected frequency in constructivist approach to teaching for teachers working in ethnic minority schools, bigger towns and those holding a master’s degree. Very high (p=0.001) and maximally high (p=0.000) statistical differences are observed according to age group and teaching experience subgroups: with growing of age and teaching experience there occurs a growth in positive attitude towards constructivist approach to teaching in class.
In question C2 (Teachers think students prefer) no statistically significant differences among socio-demographical groups are observed.

Question C3 (Students gain more knowledge) reveals maximal significant differences (p=0.000) depending on the education programme and very significant differences depending on teachers’ place of residence (p=0.034). Teachers working in ethnic minority schools and bigger towns show more distinctly constructivist beliefs. Besides there are statistically significant differences also in regions of Latvia (p=0.017): teachers in Vidzeme express more traditional beliefs, while teachers in Latgale – constructivist. Statistically significant differences (p=0.030) with orientation to constructivist approach are observed in teaching experience groups from 16 to 20 and from 31 to 35 years. In question C4 (Students gain more useful approach), there exist statistically significant differences (p=0.000) between teachers of general and ethnic minority education programmes in question C1 and groups of education (p=0.004). The same as with question C1 (Teachers would be more comfortable) constructivist approach is more popular with teachers working in ethnic minority schools and those holding a master’s degree.

To determine differences in teachers’ approaches on teaching mathematics depending on education programme, urbanization and mathematics as a major subject, Mann-Whitney criterion was used. Statistically significant differences were revealed among groups of teachers in diverse education programmes (items C1, C3 and C4, p=0.000) and depending on their place of residence (item C1, p=0.007). To clarify the character of the above mentioned differences, the mean values of these questions were compared in the corresponding groups (Tables 8 and 9).

<table>
<thead>
<tr>
<th>Education programme</th>
<th>C1 Teachers would be more comfortable Mean± Std. Deviation</th>
<th>C3 Students gain more knowledge Mean± Std. Deviation</th>
<th>C4 Students gain more useful approach Mean± Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>General education programme</td>
<td>2.64±1.20</td>
<td>2.89±1.24</td>
<td>3.54±1.12</td>
</tr>
<tr>
<td>Ethnic minorities education programme</td>
<td>3.76±1.08</td>
<td>3.90±1.11</td>
<td>4.09±1.09</td>
</tr>
</tbody>
</table>

Table 9. Comparison of teachers’ mean values in the group “Urbanization” (question C1)

<table>
<thead>
<tr>
<th>Teachers’ place of residence</th>
<th>Mean± Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural settlements and small towns</td>
<td>2.77±1.23</td>
</tr>
<tr>
<td>Riga and bigger towns</td>
<td>3.12±1.28</td>
</tr>
<tr>
<td>Total</td>
<td>2.92±1.27</td>
</tr>
</tbody>
</table>

Similar results gained by means of factor analysis also verify the validity of data. Kruskall-Wallace criterion was used to locate differences between teachers’ two approaches to teaching mathematics depending on the region of Latvia, teachers’ education, age and teaching experience. It was revealed that there exist statistically significant differences depending on
Constructivist beliefs of Latvian mathematics teachers: Looking into future

the region (items C3, p=0.008 and C1, p<0.05), teachers’ age and teaching experience (C1, p<0.01) and education (C1, p=0.000 and C4 p<0.05). Like in the case of using cross-tables, constructivist approach in the above mentioned questions is more popular with teachers from Latgale and Riga, those with greater teaching experience and age as well as teachers holding a master’s degree.

Cluster analysis with k-means cluster analysis method and 4 cluster limitation made it possible to divide all respondents in 4 groups/clusters (Table 10).

Table 10. Mean values of questions C1, C2, C3, C4 in 4 clusters according to the teachers’ beliefs on two teaching approaches

<table>
<thead>
<tr>
<th></th>
<th>Cluster 1 (n=97)</th>
<th>Cluster 2 (n=103)</th>
<th>Cluster 3 (n=80)</th>
<th>Cluster 4 (n=108)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 Teachers would be more comfortable</td>
<td>4.2</td>
<td>3.4</td>
<td>1.6</td>
<td>2.2</td>
</tr>
<tr>
<td>C2 Teachers think students prefer</td>
<td>4.0</td>
<td>1.9</td>
<td>1.9</td>
<td>3.6</td>
</tr>
<tr>
<td>C3 Students gain more knowledge</td>
<td>4.2</td>
<td>4.0</td>
<td>2.0</td>
<td>2.3</td>
</tr>
<tr>
<td>C4 Students gain more useful skills</td>
<td>4.2</td>
<td>4.3</td>
<td>2.2</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Table 2 shows that group 1 includes the teachers who are oriented towards constructivism. Group 2 holds the teachers who are basically oriented towards constructivism; they consider that their learners would not like a constructivist approach in lessons. Group 3 holds the teachers who are oriented towards conventional methods and approaches. Group 4 holds basically traditionally oriented teachers who still consider that their learners would prefer and find more useful teaching of the new, constructivist kind.

Discussion

The initial results show that the beliefs of Latvian teachers of mathematics on efficient teaching are more inclined towards a constructivist approach. This is proved first of all by the mean of all questions. However, it must be noted that, though the majority of teachers realize that a new kind of teaching provides learners with more knowledge and useful skills, the teachers do not feel comfortable when conducting classes with the new approach.

Both the results of using cross-tables and Mann-Whitney criterion make it possible with a high degree of probability to state statistically significant differences in the group of ethnic minority/general education programme: teachers of mathematics in ethnic minority schools tend more toward the constructionist approach as compared to their colleagues in general education schools. This fact is ascertained by the results of cluster analysis (p=0.000) in which 33.3% of ethnic minority school teachers belong to the cluster of constructivist oriented teachers and just 9.4% of ethnic minority school teachers prefer traditional teaching approach. In comparison to teachers who work in schools of general education, the respective percentage is 22.3% and 24.3%.
Concerning other groups, irrespective of the fact that in different analyses statistically significant results were gained, no concrete conclusions may be made yet and additional tests are needed. First, it is related to the fact that in other groups there were no statistically significant results in cluster groups, second, because Cronbach Alpha value does not reach 0.7, though in tests of attitudes and personality it may usually be lower.

Finally, the distribution of Latvian sample according to socio-demographical groups is not homogeneous: e.g., 87.5% of ethnic minority schools are located in Riga region and Latgale, 76% of ethnic minority schools are in Riga and bigger towns, 78.1% of ethnic minority school teachers hold a master’s degree. This further education of the teacher may be one of the main reasons why ethnic minority school teachers have a greater inclination towards constructivism. In urban environment with more versatile culture and economic environment greater innovations are possible in education as well.

Except for the question that students gain more useful skills, values of all other questions slightly differ shifting to one or another side from the mean value 3. This may signify that teachers in many cases take a third position that differs both from the traditional and constructivist approach, e.g. they prefer the formal approach. This hypothesis may be proved by analyzing parts D, F, and G of the questionnaire.

The present research is first of all oriented at espoused beliefs study, though it must be noted that the author of the research further intends to produce beliefs-in-action analysis and its comparison to espoused beliefs. The nature of the relationship between espoused beliefs and beliefs-in-action is important in deciding if it is better to concentrate upon the behaviour, the beliefs, or both in order to improve behaviour.

One more direction for a further research is to study why, with growing of age and teaching experience, a growth in positive attitude towards constructivist approach to teaching in class occurs, also why, in different regions of Latvia, there are different professional development opportunities. In order to achieve this, it is planned to use qualitative research methods, for instance, semi-structured interviews with educational politicians, teachers and higher education establishment staff and environment.

As mentioned above, the teachers of the presented sample in Latvia are more tended to constructivist approach than the teachers of the similar study in the USA. It means that exposed beliefs of Latvian teachers better match with reforms in mathematics education. In further studies there will be an opportunity to compare the obtained results on exposed beliefs of Latvian mathematics teachers with the exposed beliefs of teachers in Baltic and Nordic countries within NorBa project. Research on teachers’ beliefs in different countries will allow identifying both, known and so far unknown, aspects.

Conclusions

The initial results show that Latvian mathematics teachers’ beliefs on efficient teaching are tended towards the new/constructivist approach. There exist statistically significant differences among teachers representing different socio-demographical groups in their constructivist beliefs on teaching approaches: ethnic minority school teachers have a greater inclination towards constructivism. Teachers of Latvia are more tended towards constructivist
approach than US teachers (according to 1998 national polling “TLC-1998 Teaching, Learning, and Computing”). The information gained in the course of the research provides an opportunity to develop the education of young teachers, teacher further education courses, to improve academic programmes as well as secures the sustainability of the process of education.

References:


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RELATIONSHIP BETWEEN RAPID NAMING SPEED AND READING SPEED AS A MARKER OF READING DIFFICULTIES OF ESTONIAN CHILDREN FROM 6 TO 8 YEARS

Kadi Lukanenok
Tallinn University, Estonia

Abstract

Reading is one of the fundamental skills for successful performance in modern society. Reading acquisition is one of the most important tasks in primary level of education. The early identification of reading difficulties (RD) enables educators to apply the treatment as early as possible. Rapid naming (RN) is one of the reliable methods used to identify RD and risk for RD. The relationship between RN skills, especially RN speed and reading decoding speed, is investigated as a good tool for predicting reading at decoding level and well-documented in languages using non-transparent orthography. Few researches are carried out on RN skills in transparent orthographies. The current research is the first attempt to investigate RN skills of children speaking Estonian, highly transparent Finno-Ugric language. The aim of this study is to examine longitudinally RN speed and decoding skills of children at the age 6, 7 and 8 years to detect the relationship between RN speed in pre-reading age and reading age after starting formal reading instruction.

Key words: education for sustainable development, reading, naming, rapid naming speed, reading, reading difficulties

Theoretical overview

Introduction

The concept of education for sustainable development (ESD) includes the wide range lifelong learning and participatory learning experiences to ensure the benefit from quality education that can be sustained. Among the personal and professional competences stressed are educational-cognitive strategies, mastery of planning, analysis and reflection, methods of problem solving, informational processing and communicative competences. These abilities enable to search, analyse, select and process the necessary information independently, communicate and proceed professional activity as sustainability guaranteed competences (Makarevičs, 2008; Scanavis & Sakellari, 2009).
Contemporary Estonian Republic regulations in educational field (Estonian Teachers’ 5th Professional Standard, 2005; National Law of Basic School and Gymnasium, 2010) point out the importance of inclusive education and especially highly valued domains in the teachers’ professionalism: developing learning environment, motivation, guiding learning and analysing and assessing learners’ development and study process. Consequently, the teachers’ professional competence plays a major role in the sustainability of society (Kukk & Talts, 2007).

According to the aforementioned research, there is an increased demand in education based on reading ability and reading skills. Reading, reading acquisition and the educators’ competences to identify and manage possible reading difficulties and diversities in the educational process had become one of the crucial issues in education.

Reading is one of the fundamental skills for successful performance in modern society. Reading skills are the basis for gaining an occupation and acquiring further professional development. Reading ability ensures an individual’s performance in society and guarantees personal sustainable development. Great attention is needed to support achievement of reading skills in the primary school.

Specific reading difficulties (SRD) and dyslexia are caused by biological, psychological and cognitive factors despite of support for students in the social and pedagogical environments. Much research has been done in the areas of cognitive and linguistic processes, and some verbal skills in the pre-reading period may be related to later performance in reading. The level of pre-reading and reading skills, i.e. naming, rapid naming, phonological processing and awareness have especially great value in the context of reading prediction both by scientific and practical perspectives (Denckla & Rudel, 1974; Pastarus, 1999; Wolf, 1999; Wolf & Bowers, 1999; Goswami, 2000; Holopainen, Ahonen, & Lyytinen, 2001; Van der Leij, Lyytinen, & Zwarts, 2001; Nation, 2005; Shaywitz, 2003; Wolf & Denckla, 2005).

The reading difficulties discovered at an early age are likely to be mitigated or overcome by using effective intervention strategies and methods. The efficiency of intervention is directly related to detection of the difficulties as soon as possible (Boscardin, Muthén, David, & Baker, 2008; Nation, 2005).

Research on Estonian students’ reading skills indicate that students with low achievements in reading skills in Form 1 have low general educational success in Form 3 as well (Pandis, 2002).

**Naming and rapid naming**

The naming process involves the sub-processes of storing, finding and retrieving word sounds in memory and rapid and adequate speech production. It is considered as attribution and utilization of the linguistic equivalent (symbol) to the objects, characteristics and actions (Luria, 1962).

Naming ability is based on a number of cognitive processes: visual perception, auditory perception, linguistic processes and memory (storing, preservation and retrieval). Integration of the auditory and visual memory, memory processes, motor and executive
processes with language processes, particularly word identification and automaticity, are of crucial importance (Wolf, 1991, 1999; Wolfe & Nevills, 2004; Heikkilä, 2005; Stackhouse, 2006; Arnell, Joanisse, Klein, Busseri, & Tannock, 2009).

Rapid naming is considered to be the ability to name the presented stimulus and move ahead to the next stimulus as fast as possible. Research has shown that the speed of rapid naming has more diagnostic value than correctness of rapid naming in evaluation of risk for SRD especially in the languages of transparent orthography (one to one phoneme-grapheme correspondence), for instance, Finnish, Greek, Spanish (Wolf, 1986; Wolf & Bowers, 1999; Aro, 2004; Holopainen et al., 2001; Salmi, 2008).


In recent times, numerous tests of rapid naming have been constructed. Rapid naming tests consist of sequences of various stimuli which the examinee has to name as fast and correctly as possible. The task of the examinee is to identify the stimuli, find and produce the correct name and move to the next stimuli as fast as possible. The most relevant criteria to measure RN are considered naming speed and accuracy (Wolf & Denckla, 2005; Wolfe & Nevills, 2004).

Researchers have asserted that RN and reading performances are connected, and RN could predict reading performance. RN speed has been identified as an especially strong predictor for SRD in regular orthographies (Wolf, 1986; Wolf & Bowers, 1999; Holopainen et al., 2001; Aro, 2004; Salmi, 2008).

Correlation between rapid naming and reading

Naming is related to reading by neurogenetic and cognitive factors. A number of researches (Grigorenko, 2004; Samuelsson, Byrne, Quain, Wadsworth, Corley, DeFries, Willcutt, & Olson, 2005) have evaluated the relation between RN and heredity and have found it to be medium or strong (r~.60)

The relevant functional regions of the brain that underpin naming and RN processes allow reading process to be performed in the same way. The development of naming skills is considered as a function of age and cognitive ability (Luria, 1962; Laine, 1995; Karlep, 2003; Messer & Dockrell, 2006). The researches (Denckla & Rudel, 1976a; Wolf, 1991, 1999; Goswami, 2000) stress the common cognitive, perceptual and linguistic sub-processes characteristics for both naming and reading processes. Naming skills are considered important in reading acquisition especially in alphabetic-phonetic orthographies. Naming speed is directly connected to word identification, word reading effectiveness and comprehension by temporal processes common to linguistic and motor functions.

Incorrectness and slow naming speed refer to SRD and are characteristics for both SRD and general learning difficulties (Denckla & Cutting, 1999; Wolf, 1999; Waber, Wolff, Forbes, & Weiler, 2000; Misra, Katzir, Wolf, & Poldrack, 2004; Messer & Dockrell, 2006; Heikkilä, Närhi, Aro, & Ahonen, 2008).
Research suggests a connection between RN and reading/decoding. The level of RN is considered one of the strongest indicators of reading performance. RN speed is related to later reading speed, text reading fluency and reading comprehension.

RN and reading have several common cognitive processes (Geschwind, 1965; Denckla & Rudel, 1976a, 1976b; Wolf, 1991, 1999). At the input level, RN assumes direction of attention to both the presented stimuli and modality perception. At the processing level, RN requires evaluation, classification and activation in working memory and retrieving and integrating information with lexical (phonological and semantic) information stored in memory. At the output level, the RN process is related to motor activity which leads to variations of articulation and pauses.

So far, the precise mechanism of the aforementioned connection is not fully clear, but many different associations have been found. Several researchers have indicated that people with RN difficulties have more reading difficulties than those whose word RN does not cause any problems or errors. Poor readers differ from regular readers by the RN speed and/or amount of mistakes in naming tasks. Consequently, the level of RN predicts RD both in regular and irregular orthographies (Denckla & Rudel, 1974; Wolf, 1986; Korhonen, 1995; Salmi, 2008). RN speed has more diagnostic value than correctness in regular orthographies (Wolf, 1986; Wolf & Bowers, 1999; Holopainen et al., 2001; Aro, 2004; Misra et al., 2004).

Compton (2003), Lehtonen (1993), Savage and Fredricson (2005), Savage, Pillay and Melidona (2007) have demonstrated that RN numbers and letters (alpha-numerical stimuli) predict decoding ability and the speed and accuracy of text reading more than the rest of stimulus (non-alphanumeric). RN-pictures do not have a significant predictive value (Savage & Fredricson, 2005; Albuquerque & Simoes, 2010). Some researchers have shown that picture naming requires access to semantic information that is not required in letter and number naming which becomes automatic at a certain age (Savage & Fredricson, 2005; Albuquerque & Simoes, 2010). RN methodology enables psychological, pedagogical and special pedagogical scientific research.

**Rapid naming difficulties, connection to reading and reading difficulties**

Rapid naming difficulties (RND) are referred to as slow or incorrect word retrieving process and production of familiar words (Denckla & Rudel, 1974).

RND can be taken into consideration in case that the slower responses and more mistakes than average occur in naming tests. Children with RND are considered to be at risk for failure in their reading acquisition. Naming deficits are detectable at pre-school age before the start of formal schooling and reading instruction (Wolf, 1986; Constable, 2001; Ahonen et al., 2003; Shaywitz, 2003; Heikkilä, 2005; Nation, 2005; Stackhouse, 2006; German & Newman, 2007; Puolakanaho, Ahonen, Aro, Eklund, Leppänen, Poikkeus, Tolvanen, Torppa, & Lyytinen, 2008).

The genesis of naming deficits has several explanations and researchers lack consensus concerning the basis of RND. Researchers claim that these difficulties may have several etiologies based on phonological or motor difficulties. Some authors support the viewpoint
that RND appears to be the part of phonological processing difficulties and argue that naming deficits, particularly slow naming, are related to slowness of phonological processes (Wagner & Torgesen, 1987). Other authors suggest RND as a general speed processing deficit of cognitive processes which involve both naming and phonological components (Wolf, 1991, 1999; Korhonen, 1995; Wolf & Bowers, 1999; Messer & Dockrell, 2006).

There are several possible explanations regarding how naming speed can be an impediment for many readers. Wolf (1999) and Wolf, O’Rourke, Gidney, Lovett, Cirino and Morris (2002) have offered two possible hypotheses to explain the effects of deficits in naming speed on reading difficulties, based on behavioral and neuropsychological evidence. One hypothesis claims that children with SRD perform visual processing of spatial components more slowly. According to the second hypothesis, the reduced naming speed refers to the dysfunction of general speed and timing problems which affect reading skills in many ways. Wolf (1999) suggests that the source of speed and timing problem is a central time-keeping mechanism. Naming speed can be defined as the central point of a speed and timing cascade which influences perception, lexical and motor processes. This general impairment of processing speed influences, in turn, both phonological and orthographical inputs. Readers with double deficits (naming speed and phonological difficulties) have identified constant reading difficulties (Wolf, 1999; Wolf et al., 2002).

Longitudinal studies have demonstrated that RND discovered at the pre-reading or early reading age (6–9 years) had not disappeared, and RN tasks were passed more slowly based on the number of mistakes by adolescence (Korhonen, 1995; Wolf 1999). The study of Korhonen (1995) is in line with other studies which have found that adults diagnosed with SRD differ from their naming speed from the control group.

Recent investigations have focused on the transparency of orthography of the language of children learning to read. The researchers have found out that transparency of orthography impacts on reading acquisition, predictors of reading progress. Children learning to read in transparent orthography tend to show less severe disorder, making fewer mistakes in the beginning phase of learning than children in deep orthography. RN is figured out to be an especially powerful predictor for SRD in consistent orthographies. RND tends to manifest at first in slow reading speed and after that in reading inaccuracy (Holopainen et al., 2001; Goswami, 2002; Aro, 2004; Seymour, Aro, & Erskine, 2004; Guron & Lundberg, 2004; Georgiou, Parrila, & Papadopoulos, 2008; Serrano & Defior, 2008).

Much research has been carried out to determine what the SRD predictors are in terms of RN skills and different orthographies. RN skills are investigated in Finnish (Lehtonen, 1993; Korhonen, 1995; Ahonen, Leppänen, & Tuovinen, 2003; Aro, 2004; Heikkilä, 2005), Dutch (Van der Leij, Lytinen, & Zwarts, 2001), Spanish (Serrano & Defior, 2008) and Portuguese (Albuquerque & Simoes, 2010) and compared with the results in English (Wolf, 1999).

Although there is no consensus regarding some aspects of RN, further theoretical investigations are needed. RN tests are considered reliable tools in practical assessment of SRD.

The aim of this longitudinal study – to investigate the developmental course of RN speed and the correlation between RN speed and reading. Two tests were conducted by the author: RN test and reading/decoding tests. RN test comprised six subtests: colours, num-
bers, letters, objects, letters and numbers, colours, letters, numbers; reading/decoding test consisted tree subtests: words, sentences, non-words.

Methodology

Sample

The random sample consisted of 250 Estonian speaking children. Children’s ages and testing periods ranged as follows: the first period of testing was from 6 years 0 months to 6 years11 months (hereafter 6 years), the second period of testing – from 7 years 0 months to 7 years 11 months (hereafter 7 years) and the third period of testing – from 8 years 0 months to 8 years 11 months (hereafter 8 years).

All children attended regular kindergartens in the beginning of investigation. Diagnosed general cognitive, motor or speech and language difficulties were not observed. The data was collected from different cities and regions in Estonia.

Experimental tasks and procedure

Each child was required to complete six RN tasks and three reading tasks.

RN test. The aim of the tasks was to assess a child’s RN skills in terms of mistakes, self-correction of mistakes and time consumed for passing the subtest. Six subtests were utilized to assess RN skills of colours, numbers, letters, objects, letters and numbers, colours, letters and numbers. RN tasks were measured using “Nopean Sarjallisen Nimeämisen Testi” (Ahonen et al., 2003, adopted into Estonian by the author of this paper). The task was to name all randomly presented symbols on the A4 sheet and move quickly to the next item. In the case of mistakes, the child might have corrected him/herself. All performances were recorded on the individual score list. Some tasks were allowed for naming the colours, numbers, letters and objects sub-tests.

Reading/decoding test. The aim of the reading tasks was to assess the child’s decoding skills in terms of time consumed for passing the subtests (in seconds). The experimental test battery consisted of three subtests compiled for this study.

1. Word reading/decoding subtest included 20 words matched to pictures.
2. Sentence reading/decoding subtest included 10 sentences matched to pictures.
3. Non-word reading/decoding subtest included ten non-words in basic phonological and syllabical structures commonly used in the Estonian language. Five non-words decoding practice was allowed prior to the testing performance.

All reading/decoding performances recorded on the individual score list included the time consumed for passing the subtest.

The tests were administered to each child individually once per academic session from October to January. The testing process was approved using the standard process for children in kindergarten and schools by permission of parents. Testing sessions lasted approx-
imately 30 minutes. Tasks were administered in the same order within the testing session for each participant.

Descriptive statistics, t-test and correlations were analysed statistically.

Results

The developmental course used for naming speed at the ages of 6, 7 and 8 is shown in Table 1 (Appendix). A t-test was applied to detect statistical significance in age differences in RN speed.

Naming speed decreased at the ages of 6, 7 and 8. The most extensive growth (approximately 50%) is notable in naming of the alphanumerical stimuli: N, L, NL, NLC.

The ranges of naming speed decreased within the explored period. Ranges and particularly maximum of naming speed of alphanumerical stimuli are decreased especially significantly.

The naming speed of all stimuli shows the tendency to decrease by age and growth of formal schooling as expected. The most rapid development is observed in decreasing naming speed and ranges of naming speed of alphanumerical stimuli between the ages of 6 and 7. These results affirm rapid growth in naming speed of alphanumerical stimuli and decrease of intra-group differences in the beginning of formal reading instruction.

Learning alphanumerical symbols and attaining the automaticity in reading process is considered to be in the main focus of the first periods of formal schooling. Progress in literacy study process is visible in decrease of rapid naming speed, especially in naming of alphanumerical stimuli. Colours and pictures as symbols are more familiar to children at the age of 6 already and therefore the development of naming speed of these stimuli is not so markable within an observed period.

These results, which are shown in Table 1 (Appendix), are consistent with the previous investigations highlighting the impact of formal schooling and starting to learn alphanumerical symbols in the context of growth of rapid naming speed (Wolf, 1986, 1999; Compton, 2003).

The correlation between rapid naming speed and decoding speed of words, sentences and non-words could be estimated as moderate and strong, correlation index .24 … .78. Stronger links are visible between decoding speed and naming speed of alphanumeric (and mixed stimuli) than naming speed of non-alphanumeric stimuli. The strongest links appear between naming speed in age 6 and reading speed in age 8, from .27 (L) to .78 (NL). Naming speed at the age of 7 presents stronger links to decoding speed than naming speed at the age of 6 and 8. Different reading tasks exhibit similar correlation indexes. Any considerable differences are not visible within words, sentences and non-word reading tasks (Appendix, Tables 2 to 7).
Discussion and conclusions

The results confirm two previously presented views about the developmental course of rapid naming and significant correlation between RN and reading/decoding performances in languages with high level of orthographic transparency.

The obtained results are congruent with previous studies in several aspects of RN skills already investigated: a performance improvement by age (Denckla & Rudel 1974; Ahonen et al., 2003; Wolf & Denckla, 2005), the greatest increase in rapid naming time is noticed in the beginning of formal reading instructions (Denckla & Rudel 1974; Ahonen et al., 2003), the noticeably faster diminished alphanumerical (numbers, letters) stimulus naming (Ahonen et al., 2003).

Current findings are also in harmony with previous investigations and stress the results about the relationship between RN tasks and reading, especially in languages using regular or semi-regular orthographies. RN speed and reading speed is found to be moderately or strongly correlated in Dutch, Finnish, German, Italian, Spanish and Portuguese studies (Wolf, 1986; Wagner & Torgesen, 1987; Korhonen, 1995; Wolf & Bowers, 1999; Holopainen et al., 2001; Aro, 2004; Seymour et al., 2004; Serrano & Defior, 2008; Albuquerque & Simones, 2010).

This investigation confirms the results according to Compton (2003), Lehtonen (1993), Savage and Fredricson (2005), Savage et al. (2007). The strongest association is between numbers naming speed and reading speed. According to findings by Denckla and Rudel (1974) and Wolf (1991), this research confirms mixed stimulus tests (RAS) naming speed to be more strongly associated with reading speed than simple stimulus (RN) tests. These findings support Albuquerque and Simoes (2010) conclusions to differentiate RN and RAS tests.

The current study was the first investigation in RN speed in highly regular Estonian language context. RN speed was investigated from the point of view of developmental course and correlation with reading speed. The research findings will guide how to use RN tests in early literacy assessment process in order to predict reading abilities and reading difficulties. The results obtained confirm that rapid naming skills are beneficial to investigate in order to predict reading/decoding skills, and rapid naming tests are relevant tools. Further statistical analyses are needed to elaborate what standards are age appropriate for rapid naming test used in this study.

Acknowledgement:

This work has been supported by the Estonian Doctoral School of Educational Sciences. Agreement No. 1.2.0401.09-0070.
References:


**Appendix**

Table 1. Naming speed in age 6–8, p < 0.01, n=250

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** Correlation is significant at the 0.01 level (2-tailed).

Table 3. Relationship between naming speed of numbers (N) and decoding speed

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** Correlation is significant at the 0.01 level (2-tailed).
Table 4. Relationship between naming speed of letters (L) and decoding speed

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** Correlation is significant at the 0.01 level (2-tailed).

Table 5. Relationship between naming speed of picture (P) and decoding speed

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** Correlation is significant at the 0.01 level (2-tailed).
Table 6. Relationship between naming speed of numbers and letters (NL) and decoding speed

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** Correlation is significant at the 0.01 level (2-tailed).

Table 7. Relationship between naming speed of numbers, letters and colours (NLC) and growth in decoding speed

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<td>NLC speed 7y</td>
<td></td>
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<tr>
<td>NLC speed 8y</td>
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</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed).
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INTEGRATION OF COMPETENCIES IN AN ONTOLOGY-BASED FRAMEWORK SUPPORTING TEACHERS TO CONSTRUCT LEARNING DESIGNS IN THE DOMAIN OF SUSTAINABLE ENERGY EDUCATION

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Abstract

In previous work, a framework based on three ontologies (content, learning design and sustainable energy domain models) was introduced in order to support teachers to construct learning designs in the field of sustainable energy education. This paper is focusing on the integration of a competency model in the structure of this framework. This model actually interconnects the other three models by establishing connections between learning objects, learners, activities, learning objectives/competencies and knowledge in the sustainable energy domain. It enriches the description of learning resources enabling their search and retrieval via queries based on competency parameters and can also support competency-based reasoning in order for the competency gaps to be filled. The competency model came as an answer to a literature review triggered by some results of a Wizard of Oz experiment along with the aim to integrate into the framework sets of questions supporting learning in sustainable energy domain.

Key words: ontology, learning design, competency, sustainable energy, learning object, semantic web applications

Introduction and background

The growing amount of educational material in the domain of sustainable energy education coming from various resources in various languages and forms claims a substantial effort for its collection, evaluation, adaptation and distribution.

As a contribution to such an effort in terms of facilitating teachers to discover and reuse relevant Learning Objects (LOs) in order to construct learning designs in this knowledge area, a framework was introduced (Karetsos, Haralambopoulos, & Kotis, 2011). This framework was based on three ontologies (namely content, learning design and sustainable energy domain models). The content model was based on the Institute of Electrical and Electronics Engineers Learning Object Metadata (IEEE LOM) standard (IEEE Learning
Technology Standards Committee, 2002). In the conceptualization of the learning design model, a toolkit approach was followed based on the concept of mediating artefacts (Console, 2008) with the aim to provide teachers with a variety of supports ranging from informal solutions, as patterns, up to more constrained structures such as the formal representation inspired by IMS Learning Design (LD) specification (IMS Global Learning Consortium, 2003). As far as the domain model is concerned, the basic concepts of sustainable energy development and their interrelations were specified relying on the Driving force, Pressure, State, Impact, Response action (DPSIR) indicator-based framework (European Environment Agency [EEA], 2002).

In the relevant literature, there are sets of questions (for instance, EEA, 2002; McKeown, 2002) that are or could be mapped to concepts/classes of the DPSIR based sustainable energy domain ontology. These sets can support the organization of knowledge and the construction of learning designs in this knowledge area. In previous work (Karetsos et al., 2011), the authors specified such an ability, at a macro-level approach, organizing these sets as predefined templates that could facilitate the construction of learning designs. This paper offers a more detailed view of the conceptualization of ontologies attempting to encapsulate such questions in the structure of the existent ontology-based framework. This attempt is interlaced with the development of a competency model which was triggered by the results of an evaluation experiment conducted by the authors.

Briefly, the paper is structured as follows: at first, the context and some results of the evaluation experiment mentioned above are presented. Afterwards, the requirements of a competency model in the context of the specific framework for learning design in sustainable energy education are specified, related work is mentioned and an ontology-based competency model is proposed. Finally, possible uses and two indicative substantiations of our proposal are demonstrated along with some concluding remarks and recommendations for future work.

**Context and results of an evaluation experiment**

In an evaluation experiment conducted, based on the Wizard of Oz technique (Kelley, 1984), the participants were asked to put forward one to three questions in a digital repository in order to search for LOs related to sustainable energy domain. This repository was supported by the ontology-based framework that the authors developed. This technique was applied in order to assess, among others, the capabilities of our framework in terms of facilitating teachers to search and select LOs for their educational setting. In this technique, an individual plays the role of Wizard in order to allow users to interact with a system missing some functionality. This way the authors were able to simulate a search facility supported by the ontology and investigate teachers’ expectations of such an approach.

The participants numbered fourteen (14) teachers of primary and secondary Greek education. Eight of them were experienced in environmental education while the others were interested in infusing topics of sustainable energy development into their teaching practice.
The descriptors included in the questions posed by the teachers for the repository of LOs are presented in Table 1.

Table 1. Quantitative results of a survey for identification of the descriptors teachers use for searching LOs in the field of sustainable energy education in comparison with the descriptors included as properties/slots in the content model

<table>
<thead>
<tr>
<th>Descriptors of LOs</th>
<th>Descriptors used by teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number</strong></td>
<td><strong>Title</strong></td>
</tr>
<tr>
<td>9.1</td>
<td>Related domain concept*</td>
</tr>
<tr>
<td>5.2</td>
<td>Learning resource type*</td>
</tr>
<tr>
<td>5.5</td>
<td>Intended end user Role*</td>
</tr>
<tr>
<td>1.3</td>
<td>Language*</td>
</tr>
<tr>
<td>5.7</td>
<td>Typical age range*</td>
</tr>
<tr>
<td>5.6</td>
<td>Context*</td>
</tr>
<tr>
<td>9.1</td>
<td>Discipline*</td>
</tr>
<tr>
<td>5.8</td>
<td>Difficulty</td>
</tr>
<tr>
<td>1.2</td>
<td>Title*</td>
</tr>
<tr>
<td>1.8</td>
<td>Aggregation level*</td>
</tr>
<tr>
<td>2.3.1</td>
<td>Author*</td>
</tr>
<tr>
<td>2.3.3</td>
<td>Date*</td>
</tr>
<tr>
<td>4.1</td>
<td>Format*</td>
</tr>
<tr>
<td>4.2</td>
<td>Size*</td>
</tr>
<tr>
<td>5.3</td>
<td>Interactivity level*</td>
</tr>
<tr>
<td>6.1</td>
<td>Cost*</td>
</tr>
<tr>
<td>6.2</td>
<td>Rights/restrictions*</td>
</tr>
<tr>
<td>9.1</td>
<td>Related learning objective*</td>
</tr>
</tbody>
</table>

* Included in the content model  
** Expresses the classification of IEEE LOM standard

It could be mentioned here that none of the teachers described the learning material in terms of the learning objectives this material should serve. However teachers ranked related learning objectives as the eighth most important among thirty descriptors for searching LOs, while 71.4% of the teachers considered this criterion as Required, 21.4% as Nice to have and only 7.1% as Unimportant for the selection of a LO.

This may be attributed to the inherent difficulty in locating a LO through the use of learning objectives that are not described in a structured way and lack a commonly accepted typical form. This difficulty adds value to cases where, as opposed to the previous one, communities of practice use learning objectives described by an agreed classification scheme and a controlled vocabulary for cataloguing and locating learning resources. From this point of view, the authors considered it reasonable to extend their vision and investigate the possibility of expressing learning objectives in a structured way taking the form of a competency model.
Setting the requirements of a competency model

In order to set clearly the purpose of such an investigation, some requirements that this model should fulfil were specified.

*Description of learning objectives in an explicit and structured way being also understandable and processable by machines.* Description of learning objectives aims to enhance learning resource’s semantic annotation, localization and reusability. With regard to the issue of a learning resource’s reuse, the explicit definition of an educational objective is particularly critical irrespectively of its granularity or whether learning outcomes are going to be formally assessed or not, even though assessment provides further the opportunity to record learner’s competency (IMS GLC, 2002). In addition, Paquette (2007) states that a structural model for a competency is needed. According to Sicilia (2005), the competency description can be used to retrieve relevant LOs, while the prerequisite relations can be used to trigger the search of more LOs which may be eventually required for specific learners.

*Alignment with the existing ontology-based framework for learning design in the field of sustainable energy education.* This actually implies that the model should have an ontology-based structure and, in general, be in compliance with the conceptual model of IMS LD specification (IMS GLC, 2003). An ontology-based structure is even proposed to express subtle details in competency schemas, especially in cases where competencies are to be associated with learning materials and activities (Sicilia, 2005). As for the compliance with IMS LD (IMS GLC, 2003), Paquette (2007) states that “the only way to describe the knowledge involved in a learning design is to assign optional educational objectives and prerequisites to the Unit of learning as a whole and/or some of the learning activities” (p. 9). Paquette (2007) also stresses that the association among documents, tools, actors, activities within a Unit of learning and the knowledge and competencies they possess, contain or process is a key concept for semantic web applications.

*Exploitation of the existent work in the area of learning design.* This expresses the general direction of the proposed framework in relying on the concept of mediating artefacts. According to that, work which has been done so far by educational experts and could mediate and ease the learning design process.

*Addressing the need for integration of existing frameworks/sets of questions that could support analysing of sustainability themes.* This integration could enhance the organization of knowledge and facilitate the construction of learning designs in the domain of sustainable energy development.

*Ability to detect and express competency gaps.* According to Schmidt (2004), calculation of competency gaps during the learning process is needed for the recommendation of suitable learning activities for a learner, thus allowing the personalization of learning.

*Allowing for competencies’ and questions’ subsumption.* This would help the structuring of learning paths in accordance with the competencies needed to be possessed by learners. Competency subsumption is considered as an important aspect of competency modelling (Schmidt, 2004).
Existing relevant approaches

Existing relevant approaches are distinguished in standardization efforts and in ontology-based competency models proposals. Standardization efforts aiming to meet the need for common understanding, unique referencing and cataloguing of competencies, as IMS Reusable Definition of Competency or Educational Objective [RDCEO] specification (IMS GLC, 2002) or the HR-XML standard (HR-XML Consortium, 2001), have, however, a high level of abstraction, and they do not address the issue of competencies’ classification. Even though the IMS LD specification states that competency models as IMS RCDEO can be used for the description of learning objectives, such models lack computational semantics (Sicilia, 2005). Their core information is an unstructured textual definition of the competency which may be refined using a user-defined model of the structure of a competency. The aggregation of smaller competencies into larger ones is not addressed and the issue of how competencies are to be assessed or used as part of a learning design process is not specified (IMS RDCEO, 2002). According to Sitthisak (2009), HR-XML and IMS RDCEO “are not able to accommodate complicated competencies, to link competencies adequately, to support comparisons of competency data between different communities, or to support tracking of the knowledge-state of the learner” (p. 42).

With regard to ontology-based proposals for competency modelling, a number of them are mentioned here. LUISA framework (Grandbastien, 2009) uses ontology-based competencies modelling to annotate, search and retrieve learning resources. It consists of two ontologies, one based on IEEE LOM for the description of learning resources and the other based on Human Resources competencies for the description of the existing and targeted competencies of learners and resources. Paquete’s (2007) approach has many similarities with the one currently proposed, however, he uses a generic skills sub-ontology instead of the Bloom’s taxonomy (Bloom & Krathwohl, 1956), and he does not explicitly refer to an assessment entity.

Sitthisak (2009) also proposed a competency model accompanied by a system for automatically generating questions based on templates. This approach involves an ontological database representing the intended learning outcome to be assessed across a number of dimensions, including level of cognitive ability and subject matter based on educational taxonomies.

Askar & Altun (2009) proposed a method to separate educational expectations by deconstructing them for concepts and skills, via development of the two corresponding ontologies. They refer generally to cognitive skills without separating domains of educational objectives. They mention also the concept of assessment entities (the term assessment objects is used), but without analyzing further relations.

Finally, an attempt to integrate ontologies, competency management and e-learning was undertaken by Draganidis & Mentzas (2007).
Competency model proposed

Taking into consideration the high abstraction level of existing standardization efforts that claim a user-defined structural model and responding to the relevant recent approaches of the scientific community, the authors introduce an ontology-based competency model. The aim of this model is to establish connections between LOs, learners, activities, learning objectives/competencies and knowledge in the sustainable energy domain, and address in general the previously specified requirements. The model’s basic concepts are depicted in Figure 1.

Figure 1. The ontology developed via the use of the relevant tool Protégé 3.4 beta and the visualization captured via the use of Ontoviz, a plug-in embedded to the specific ontology editor

Competency was defined in terms of a generic competency type, a knowledge entity and a proficiency scale, combined and expressed via a statement. It should be noted that the term “competency”, keeping with IMS RDCEO specification (IMS GLC, 2002), includes learning objectives (those things that are sought) as well as competencies (those things that are achieved). As can be seen in Figure 1, competency can be expressed as prerequisite, actual
competency or target competency-learning objective via object properties which annotate roles (for instance, learners, teachers), learning activities and LOs.

The definition of the generic competency type and the mastery levels for the knowledge in the sustainable energy domain were based on the three domains classification of Bloom’s taxonomy of learning objectives (Bloom & Krathwohl, 1956). This taxonomy constitutes a tested and widespread artefact, which favours interoperability and implies the possibility for exploitation of the work that has been capitalized on this so far by educational experts. This exploitation refers mostly to potential mappings among taxonomy’s levels and artefacts, like behaviour verbs, types of questions or types of assessment that could be integrated in this ontology based competency model. For instance, mappings between levels of cognitive complexity with question types or products/assessment types, integrated in the ontology, can provide hints via inference functions about the selection of appropriate assessment types for a learning situation, as long as competencies have been defined.

The three domains of Bloom’s classification of educational objectives (Bloom & Krathwohl, 1956), namely cognitive, affective and psychomotor domains, are based on the revised Bloom’s taxonomy (Krathwohl, Bloom, & Masia, 1964; Dave, 1970; Anderson & Krathwohl, 2001). The knowledge dimension of the revised Bloom’s taxonomy is initially separated by the cognitive one and is combined with the related domain concept in order to represent a knowledge entity prior to be used as part of the competency statement. A proficiency scale was also defined as expert, superior, average and marginal possession of competencies, expressed also in a scale from 1–10 (Draganidis & Mentzas, 2007).

Competency questions and products/assessment types are subclasses of the assessment entity which represents the evidence of competency. According to Sicilia (2005), further work is needed, among others, on the assessment of competencies and the composition of learning activities that would fulfil complex competency requirements.

Competency questions are questions that a knowledge base, based on the ontology, should be able to answer (Gruninger & Fox, 1995). This term is extended in order to define questions that evaluate the possession of a competency by a learner as well.

Possible uses – example cases

The model’s structure enables a refined domain concept-based search for learning resources (for instance, addition of a competency parameter), since any competency definition is linked to one or more domain concepts. It further provides the ability to store and retrieve questions related with a domain concept and assessing the possession of a competency and/or to recommend questions, or question types relevant to a learning situation. Such an ability is highly attractive as these questions constitute a tangible starting point in order to organize a learning scenario. These questions could be mere single questions assigned by experts to any concept of sustainable energy domain ontology or could be combined in a set and act as a framework for the investigation, either of a simple issue or of a whole part of the domain. Relations among questions can be specified via object properties as HasPart and IsPartOf.
One case that concerns the substantiation of the competency question class is a framework proposed by McKeown and Dendinger (McKeown, 2002) for analysing and teaching environmental issues. This framework can be mapped to the DPSIR framework (EEA, 2002) (Table 2). Since the ontology of sustainable energy domain (corresponds substantially to the “domain concept”) developed by the authors is based on DPSIR framework, this mapping can be easily integrated with the competency ontology.

Another case concerns a set of six questions for assessing progress of sustainable energy development in a society. These questions are mapped to concrete sustainable energy indicators organized in the context of DPSIR framework in a report of EEA (2002).

Table 2. Mapping between McKeown & Dendinger’s and DPSIR frameworks

<table>
<thead>
<tr>
<th>Questions of McKeown &amp; Dendinger’s framework</th>
<th>Corresponding element of DPSIR framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the main historical and current causes of the issue?</td>
<td>D</td>
</tr>
<tr>
<td>What is the geographic scale, the spatial distribution and the longevity of the issue?</td>
<td>Link between D &amp; P, distribution patterns</td>
</tr>
<tr>
<td>What are the major risks and consequences to the natural environment?</td>
<td>I</td>
</tr>
<tr>
<td>What are the major risks and consequences to human systems?</td>
<td>I</td>
</tr>
<tr>
<td>What are the economic implications?</td>
<td>I</td>
</tr>
<tr>
<td>What are the major currently implemented or proposed solutions?</td>
<td>R</td>
</tr>
<tr>
<td>What are the obstacles to these solutions?</td>
<td>Link between R &amp; D</td>
</tr>
<tr>
<td>What major social values are involved in or infringed upon by these solutions?</td>
<td>Link between R &amp; S</td>
</tr>
<tr>
<td>What group(s) of people would be adversely impacted by or bear the costs of these solutions?</td>
<td>Link between R &amp; I</td>
</tr>
<tr>
<td>What is the status of the problem and solutions?</td>
<td>Link between R &amp; I</td>
</tr>
<tr>
<td>How does this issue relate to other environmental issues?</td>
<td>I</td>
</tr>
</tbody>
</table>

As an example, a number of pressure indicators/classes of sustainable energy domain ontology, such as “greenhouse gas emission”, “air pollutant emission”, “contaminant discharges”, “generation of radioactive wastes”, “land area taken by energy facilities” and “poorest income to energy prices”, are related with the question: Is the use of energy having less impact on the environment, the economy and the society?

Any of these questions could, in advance, be associated and analysed for competencies that annotate learners, LOs and learning activities in order to form actually a semi finished predefined template for the framing of learning activities.

Any learner could be also annotated with the level of cognitive complexity and proficiency level on entering a learning process and the expected target levels in combination with a knowledge entity. In this way, competencies’ gap analysis and personalization of learning could be supported by the model, thus increasing the level of competencies possessed by the learners. The efficiency of this function, however, depends on the precise mapping between the competency level and the appropriate LOs.
Conclusion and implications for further research

The results of an evaluation experiment, conducted by the authors regarding the descriptors that teachers use in order to search for LOs in a digital repository, indicated that an ontology-based framework developed to support learning design in sustainable energy domain is in accordance with teachers practice and supports, in general, the semantic annotation and retrieval of LOs.

However, the need for a structured definition of learning objectives also emerged. Concerning this need, the role of competencies/learning objectives as a central unifying element for the mapping between the different components of a learning design situation is underlined. Moreover, in this direction, the authors argue about the need for an ontology-based competency model and proceed to the proposal of such a model.

The proposed model is integrated in the structure of the existent ontology-based framework and actually interconnects the other three ontology-models (namely content, learning design and sustainable energy domain models). It enables the description, search and retrieval of learning resources based on competency parameters and can support competency based reasoning in order for competency gaps to be filled.

As far as the evaluation of the competency model is concerned, this is comprised of verification, supported via Protégé, and of validation, which is carried out with the help of domain experts. Moreover, in order to detect if the model provides the adequate expressiveness and functionality to support teachers in constructing learning designs suited to their specific educational context as to their learners’ current knowledge and cognitive state, evaluation experiments with the participation of teachers are needed.

Sustainable Energy Education (SEED) Wiki (Karetsos & Haralambopoulos, 2010), a semantic Wiki built on the top of Semantic MediaWiki platform (Krötzsch, Vrandecic, & Völk, 2006) and based on the enriched, by the integration of the competency model, framework can be used for such evaluation experiments in future.

References:


Integration of competencies in an ontology-based framework supporting teachers to...


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