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CREATIVE E-COURSE MODEL IN ENGLISH FOR ENGINEERING STUDENTS

Summary

Introduction

A topical task is to research the methodology of designing an online course in English for Specific Purposes (ESP) to foster students' communicative and creative thinking skills in their integrity.

Aim of the Study

To design a creative online course model in ESP for engineering students.

Materials and Methods

Ministry of Education and Science of Latvia, and Riga Technical University project "Development of Online Course Design and Delivery Approach in Creative Learning of ESP".

Results

The set of criteria developed in designing a creative online ESP course may be also applied in other languages, and includes specific course content, creative process support and corresponding course administration.

Conclusions

The suggested model is integrated and complex, and enables development of students' professional, communicative and thinking skills.

Key words: ESP, online course design, activity theory, creative problem solving.

Introduction

One of the key challenges facing the higher education system is to change the prevailing culture so that greater value is placed on students' creative development alongside with more traditional forms of academic development (Jackson, 2006; Lantolf, 2006; Laurillard, 2002; etc.). "Although, students are expected to be creative, creativity is rarely an explicit objective of the learning and assessment process (except for a small number of disciplines in the performing and graphic arts" (Jackson, 2006). To be successful, Sternberg and Lubart point out the following three abilities: *analytical abilities* – to analyse, evaluate, judge, compare and contrast; *practical abilities* – to apply, utilise, implement and activate; and *creative abilities* – to imagine, explore, synthesize, connect, discover, invent and adapt (Sternberg, Lubart in Jackson, 2006). D. Laurillard specifies that "adaptive learning" must be joined by "generative learning" - learning that enhances our capacity to create (Laurillard, 2004). These goals can be largely attained by a wider introduction of e-learning (Benfield, Francis, 2005; Porter, 2006). Besides the generally recognized benefits such as content individualisation, increased autonomy, multisensory delivery of information, flexibility in time, place and tempo of learning, e-learning can offer a creative medium for self-expression of individuality and fruitful collaboration.

With "shared knowledge building" and "discovery-based learning" gaining ground, the

curricula of schools and universities are becoming increasingly student-centered. The author acknowledges that everyone has the potential to be creative, and that individual creativity depends greatly on the social, cultural, family, pedagogical, and even the virtual (as in the case of e-learning) environments (Rumpite, 1998, 2000). Therefore, the research project supported by the Ministry of Education and Science, Latvia, and Riga Technical University (RTU), Latvia, pursued the goal of integrating creative learning methodology with e-learning in the online course of English for Specific Purposes (ESP) for engineering students.

Aim of the Study

1. to analyze the main methodological approaches and tools in developing creativity and explore the integration of ICT facilities with creative learning methodology of ESP
2. to develop an online course design and delivery approach in creative learning of ESP for engineering students
3. to design the online course contents (texts, tasks, creative problem solving situations, tasks and activities, creative thinking techniques)
4. to integrate development of students' language skills with purposeful fostering of their creative thinking skills
5. to test and implement the online course delivery; to analyze the project results

Materials and Methods

Adopted goals and targets determine the scope, content, quality, development complexity and, eventually, the accessibility of the specific e-learning project. The goals of the Ministry of Education and Science, Latvia, and RTU, Latvia, project "*Development of Online Course Design and Delivery Approach in Creative Learning of ESP*" were drafted in the context of the "Strategic Development Plan of Latvia", development of the Virtual University in Latvia, and the widely recognized notion that creative thinking skills may have a crucial impact on student performance in academic and professional tasks. These goals implied the purposeful development of students' professional and communicative skills through the use of creative thinking tools and techniques, both in virtual and face-to-face classes.

Creative e-learning is defined as the integration of creative learning methodology with e-learning facilities to promote the creative abilities of our target audience (Rumpite, Zuga, Ritins, 2007). A creative activity in e-learning would largely depend on specific learning content and process design, which should also recognize the differences in personalities of its end users. Learners should have four key qualities:

1) the ability to identify new problems, rather than depend on others to define them;

2) the ability to transfer knowledge gained in one context to another in order to solve a problem;

3) a belief in learning as an incremental process, in which repeated attempts will eventually lead to success;

4) the capacity to focus attention in the pursuit of a goal, or set of goals (Craft, 2001*)*.

Edward de Bono, the originator of lateral thinking and an acknowledged international authority in the field of creative thinking writes that "creativity need no longer be a mystery or a special gift – it is a skill that can be learned and applied" (Bono, 1996). He has always stressed the importance of escaping from ingrained patterns and stereotypical thinking and urged the need for a fresh approach to problem solving. It could help to formulate patterns in an innovative and exciting way, and lead to unordinary, theoretically and practically efficient solutions.

According to Torrance (1983), creativity is not a special, but a common ability, which is based on the constellation of the general intellect, personal features and abilities to think productively. He

considered that any creative process consists of several steps – *perceiving the problem, looking for a solution, generating and formulating hypotheses, verification of the hypotheses, their modification and finding a solution or a result.* It is essential to make students realize that "all the knowledge of the world we live is tentative and open to movement …" (Wells, 2002). When the aim is to foster creativity, there might be two recommendations. One is problem-solving activities, the second is to help students of greater promise find ways of accelerated intellectual development in the domain of their choice.

Knowledge building can take a variety of forms, but all are essentially social and interactional in nature (Wells, 2002). Therefore, one of the major developmental factors is the assimilation of social experience while interacting, in our case - in the computer-mediated collaborative environment. Csikszentmihalyi points out that while creativity originates in the minds, actions and interactions of individuals, it is fundamentally a social-cultural concept (Csikszentmihalyi, 1997).

Methodological Approach

The research was centered on the theoretical and empirical methodologies in defining and developing creativity in pedagogy, psychology and language teaching practice (Bono, 1996; Csikszentmihalyi, 1997; Lantolf, 2006; Lindquist, 2003; Runco, Pritzker, 1999; Sternberg, Lubart, 1999; Torrance, 1983, etc.). Several tendencies became apparent with focus basically either on the result – which should be innovative and socially meaningful (something new and useful), or a significant personality feature or a process. Still most of the contemporary researchers consider a creative personality, process and product in their entirety.

Vygotsky, the founder of *the cultural-historical theory (*Vygotsky, 1978; 1999*)*, viewed the creative process as "interaction, tension, transformation, and synthesis over the parallel timescales of the creative act, the creative life, and historical cultural development" (Moran, John-Steiner, 2003). He underlined that creativity exists not only where it creates great historical works, but also everywhere human imagination combines, changes, and creates something new. He came to a far-reaching conclusion that "*creativity creates the self as well as external artifacts*" (Vygotsky in Moran, John-Steiner, 2003). In a Vygotskyan framework, we speak of a lifelong "zone of proximal development" as "past acts, current experiences, and future plans expand and mobilize the resources of creative individuals" (*Ibid.*). "Creativity forms lifelong zone of proximal development that contributes to the sustained development of creative personality" (*Ibid.*:78). Vygotsky considered that imagination is the mechanism of creativity. In adolescence, creative imagination is characterized by the collaboration of imagination and thinking in concepts, which matures in artistic and scientific creativity of adulthood. Therefore, it is significant to develop both imagination and abstract thinking. According to Vygotsky, we have to understand creativity in terms of collaboration and interaction. He stressed the social processes in creative endeavors.

His approach was further embodied in *the activity theory* (Леонтьев, 1977; Davydov, 1999; Гальперин, 2000; Engestrom, 1999; Lompscher, 1999, etc.); it noted that any kind of activity has its own definite content, structure, needs, motives, tasks and actions (operations). The activity to be developed is structurally analysed according to the hierarchy of the underlying actions in order to estimate the gradual controlled process of skill development.

Accordingly, to secure adequate selection of the online course material, the project developers analyzed the existing and future trends in the field of Power Engineering. The materials for the online course were selected on the basis of (1) the dynamic changes that are taking place in the students' field; (2) the needs analysis of the students; (3) students' functions as future engineers, focusing on their skill to create knowledge rather than to reproduce it; (4) the students' curriculum

in majoring disciplines. The analysis of the field and the experts views on the findings indicated that one of the most essential issues that modern power engineering has to deal with is not only the application of modern technologies to optimize the use of the traditional energy sources, but also the steadily increasing role of renewable energy sources in the world. The content and organization of the online course reflected these findings. It resulted in a smaller number of texts and learning tasks; they had become more purposeful, corresponding to the generalized and most essential ('core') concepts and situations. The course content was also largely determined by the goals of the Erasmus project on the "*Consumer Citizenship Education*" (CCE) (http://www.hihm.no/concit), dealing with sustainable development of the environment and the role of a human in preserving it. Another feature to foster students' creativity was to develop *their ability to see the whole earlier than its separate parts* (Davydov, 1999; Давыдов, 1996, Гальперин, 2000, Lompscher, 1999, etc.); it was implemented in both the online and face-to-face learning.   The criteria for designing and delivery of a creative online course in teaching languages are seen in Table 1 (see Table 1).

Table 1. *Criteria for the design and delivery of a creative online course in foreign languages (Rumpite, Zuga, Ritins, 2007).*

Criteria	Practical implementation and delivery
1. Course content	
1.1 Learning material and visuals	• Modelling authentic communicative situations in the students' professional area, e.g. Power Engineering • Challenging content developed with student motivation and interests in mind • Learning material containing a problem or a contradiction • Sufficient material for thought, transformations and combinations (5-8 page illustrated texts) • Adequate language for linguistic analysis, discussion, elaboration, dialogic inquiry, roleplays, etc. • Multifunctional material to develop various communicative skills – reading, writing, speaking, listening • Multimodal way of presenting the material (texts, colourful pictures, diagrams and other visuals) • Linguistic difficulty corresponding to the upper-intermediate level
2. Creative process support	
2.1 Creative thinking tools, techniques and software	• Learning by teamwork – sharing knowledge and collaborating • Brainstorming • Synectics (metaphors, analogies) • De Bono lateral thinking techniques (de Bono, 1993) • ThinkTank™ software for generation of ideas and further elaboration to find creative solutions
3. Course administration	
3.1 Selection of the learning content	• Consulting experts to choose the basic concepts and core knowledge to be acquired with significant value in further studies, e.g. "Energy Sources", "Fossil Fuels", "Renewable Energy"
3.2 User support	• "Word assistant" tool to show translations, explanations, illustrations, and provide links for further reading – discretely and on demand • Guides, instructions and manuals • Face-to-face consulting during classes
3.3 Software environment	• Blackboard™ software to organize the course materials produced in HTML and to provide basic assessment
3.4 Assessment techniques	• Individual and collaborative problem solving tasks and achievement tests to assess student creativity and acquaintance with the course material

The unconventional part of the "Creative learning of ESP" course was delivered with two distinct software solutions. The Blackboard (Blackboard Inc.) software environment was used for the delivery of learning material, basic performance assessment, user support, task information,

and task feedback among other things, while ThinkTank™ (Groupsystems company) was used primarily for problem solving tasks which required creative collaboration. A total of 43 first-year students of the Faculty of Electrical and Power Engineering, RTU, took part in the course.
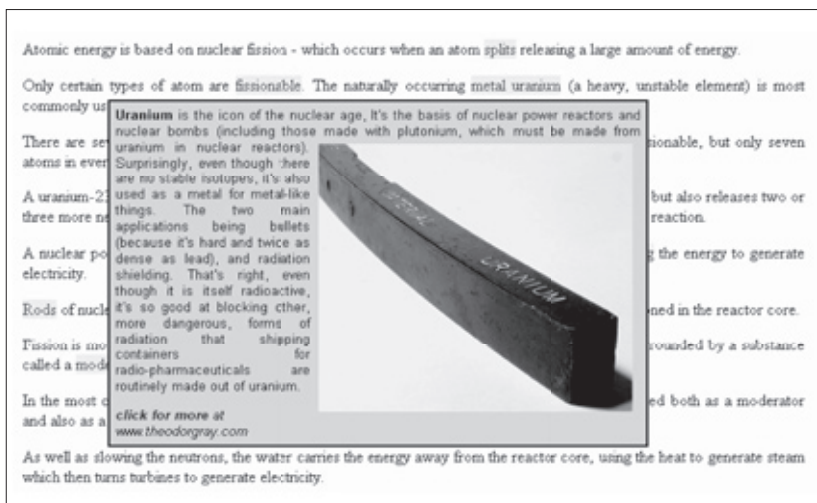
During the 1st term the online texts were focusing on the basic tendencies in the application of renewable energy sources, highlighting also the duties and functions of a modern engineer (see Figure 1).

Figure 1. *The template of the ESP course on the recent trends in the use of energy sources.*

The course developers paid particular attention to the selection and adequate, professional explanation of the terminology by implementing the *Word Assistant tool* (see Figure 2). The terminology was selected on the frequency principle which would allow the students to move further independently when starting their professional careers.

Figure 2. *The use of Word Assistant tool in mastering terminology online.*

All the update of the tasks was available on the online course Discussion Board (see Figure 3), but the creative problem tasks done - in the online students' portfolio (see Figure 4).
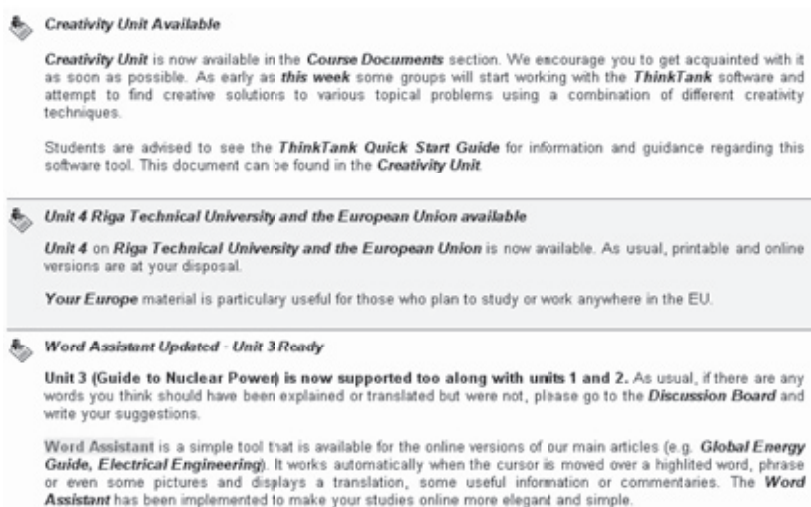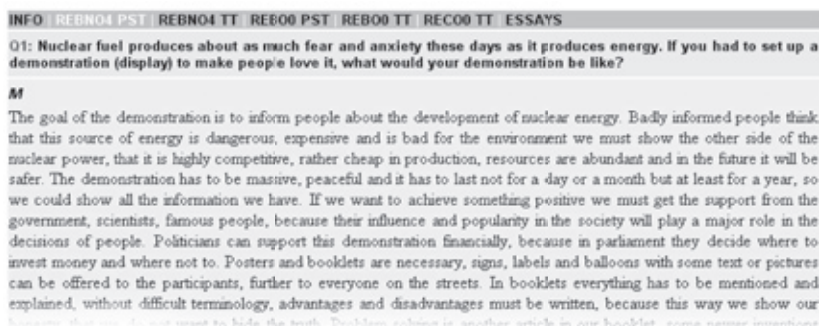
Figure 3. Online Discussion Board.

Figure 4. Portfolio with creative problem solving tasks.

Creative collaboration using the ThinkTank™ software

Four distinct open-ended problem solving tasks were developed for use with the *ThinkTank™* software. These sessions were held to one group and no more than 22 students at a time. Each session was limited to 80 minutes with groups working synchronously. A moderator oversaw the process assisting students where necessary.

The tasks focused on different social and economic challenges:

1) purely entrepreneurial – "New Business Challenge"
2) purely public opinion – "Public Opinion Challenge"
3) entrepreneur dependant on public opinion – "Market Sentiment Challenge"
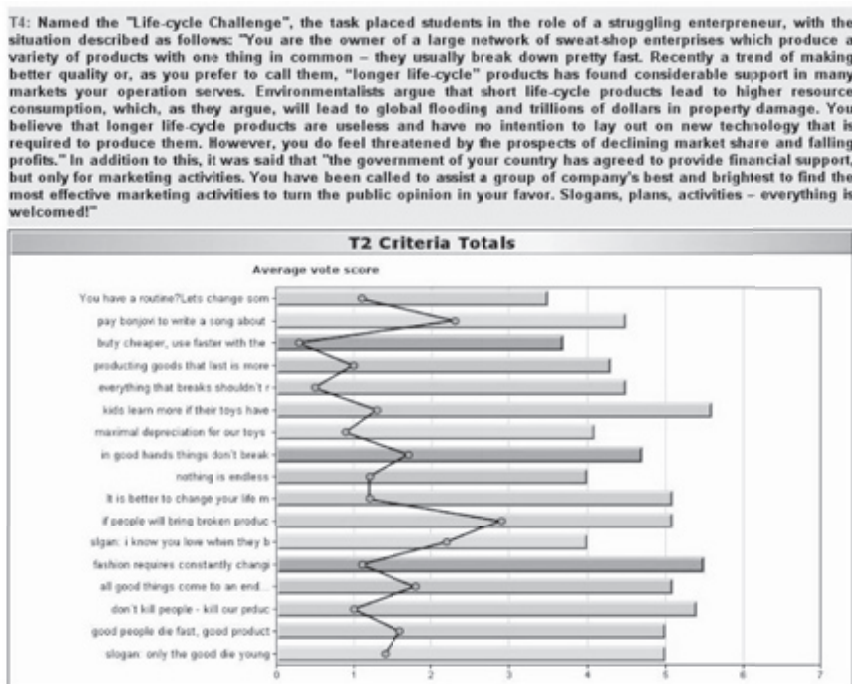4) social behaviour – "Lifestyle Challenge".

The problem solving process was anonymous and consisted of four stages for every task:

1) brainstorming – producing ideas
2) categorizing – isolating a particular group of ideas

3) voting on various criteria – finding where the consensus or disagreement lies
4) evaluating the results – done at the end of each session and the results were published in the Blackboard™ environment as part of the student portfolio.

   Students began with the "New Business Challenge" featuring a vivid language with similes to encourage creativity. They took the role of a businessman operating a small hydroelectric power plant dependant on government subsidies which had stopped and electricity production could no longer remain profitable. Another task – 'Lifestyle Challenge", focused on social responsibility and encouraged students to explore the dilemma of conspicuous consumption. The arguments speaking against it such as consequential environmental pollution and wasting of precious resources were presented, while, at the same time, recognizing that it has always been human nature to display one's wealth and social status by acquiring expensive commodities. The task was to think of activities motivating people to display their wealth and status by more socially conscious activities such as environmental protection, devotion to social issues, etc. Some of the solutions offered, their divergence and the consensus reached are depicted in Figure 5.

Figure 5. The criteria totals and the average divergence in solving the task 'Lifestyle Challenge' in the ThinkTank collaborative session.

   Creativity of the solutions was later analyzed considering the criteria of fluency, flexibility, originality, and elaboration (Torrance, 1974; Туник, 2002). *Fluency* implies the ability to produce a large amount of ideas, *flexibility* – to produce a broad variety of ideas, to use a variety of strategies, or shift from one approach to another, *originality* is the ability to produce ideas away from the obvious, commonplace, banal or established, *elaboration* characterizes the ability to develop, carry out or otherwise elaborate on ideas.

Results

One of the assignments was completed both without group collaboration software and later with it which makes a direct comparison of the software and non-software approaches possible for a small number of students who did not take part in the prior task. Compared to the average results of the non-software approach by the rest of the participants, these students were more creative which could be attributed to use of sophisticated group collaboration software. A poll was also conducted and showed that students who participated in the group collaboration tasks thought that they had more motivation throughout the course than they would have had without these activities.

While the results are encouraging, it is important to note that a period of only three months may not be enough to observe immediate changes in creative abilities of the students. The author believes, however, that the specific creative and collaborative activities illustrated above and used in the course of "Creative Learning of ESP" could be integrated into other e-learning efforts to improve learners' self organization, foster creativity and decrease course dropout rates.

Conclusions

The author concludes that there are many reasons to undertake a deliberate effort to foster learners' creativity in e-learning courses. In this respect the research project supported by the Ministry of Education and Science, Latvia, and Riga Technical University, turned out to be most valuable (project developers: Diana Rumpite (supervisor), Bruno Zuga, Gunars Ritins, Liga Mangusa – RTU; Irina Surkova, University of Latvia). The results of the research showed that by applying the methodological principles of activity theory in structuring the course content and providing a student-centered pedagogical environment stimulated student creative thinking skills, as well as their English language proficiency.

During the development of the online course it became apparent that many commercial products were marketed as supporting a collaborative workflow, only few of which, however, were suitable to be used for sophisticated creative activities. Special tasks had to be developed and creative collaboration activities added significantly to the cost of the e-learning course. If comparable software is used, larger projects are bound to suffer from excessive costs of user support and course administration. Nevertheless, the author concludes that the approach of integrating commercially available group collaboration software with an e-learning course is feasible for smaller projects.

The author believes that e-learning will play a key role in delivering educational services in the near future and in recognizing the individual's creative potential and the importance of human creativity in any e-learning initiative.

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