Simulation game-based virtual learning

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Abstract: - The paper describes the development of virtual simulation-game-based learning environment. Presented is a simulation-game tailored on the basis of constructivist theory for diversified student groups in graduate courses and employees in the tourism sector, aiming at giving them competences for international and global business management. The paper presents European project designing a VIRBUS simulation-game and virtual community for assisting collaboration among users: entrepreneurs, students, teachers and trainers. Focus groups were used in a design process and needs assessment was performed at the beginning of the project.

Key-Words: - Virtual simulation game-based learning, Hephaistos simulation software, Business simulation, Constructivism, Virtual community, Lifelong learning

1 Introduction

Organisational structure of traditional universities means large classes, diversified classes in terms of student prior knowledge, ability and motivation, and differing conceptions of students and teachers as to teaching and learning. The study process is mainly designed for an average student and, as such, it is insufficient for better students and for those with poorer prior knowledge.

Considering cognition as intrinsic in the cognitive constructivist learning theory, individuals build their new knowledge in the process of relating new information to their existing knowledge structure – teaching approach needs to support students' meaningful incorporation of new concepts, principles and theories. Sociocultural constructivist theories emphasize that human mental functioning is inherently situated in social interaction and cultural context [20, 25]. Learning is understood as an interactive activity, taking place in social interaction [23]. The quality of learning process strongly depends on the type and intensity of teacher-student and student-student interaction.

2 Constructivist conditions for simulation game-based learning

2.1 Framework

Simulation-game working environments are frequently designed and based on constructivist theory, though the interpretation frameworks may differ.

VIRBUS was designed and based on constructivist theory, in the collaboration of university and enterprises. In defining quality teaching, the constructivist theory emphasises those teaching approaches, which are not in a transmissive function. but rather in the function of encouraging students to build their knowledge by means of their own activity. Glasersfeld maintains that 'Concepts cannot simply be transmitted from teachers to students – they have to be conceived' [11: 5].

A teacher's role is supportive - he or she does not transmit his or her own ways of understanding (knowledge constructions) to students. His or her role is rather to provide guidance needed by learners in order to bridge the gap between their current and desired knowledge level. The student-centred approach is required. The teacher's role at such an approach changes, the focus is shifted to the constructive role of the learner, which differentiates it from the teacher-centred model in which knowledge is transmitted from teacher to learner. The following learning conditions should be fulfilled: 1. Provide complex learning environments that incorporate authentic activity. 2. Provide for social negotiation as an integral part of learning. 3. Juxtapose instructional content and include access to multiple modes of representation. 4. Nurture reflexivity. 5 Emphasise student-centred instruction [9: 365].

Ideas and conceptions that students bring when entering the university are different from scientific view. Those ideas are strong and complex and resist change. The process of aligning students' conceptions with domain knowledge is a central problem of teaching and learning. Many researchers focus their work on this problem [1, 15, 16, 19].

Productive learning occurs when teachers pursue teaching approaches based on students' current understanding of scientific concepts. Students in the process of learning don't memorize facts but construct their knowledge. Crucial determinant is prior knowledge

[1], which is related to students' approaches to learning and their achievement [19].

Increasing educational potential is noticed in games which include the element of simulation and in simulations that are intended to be "played with" by users [6]. Overlap of game and simulation pedagogy is applied in VIRBUS virtual simulation-game. Main characteristics of educational game can be summarised as: player engages in a game on his/her own or in a group of players to construct his/her own knowledge, using various approaches: learning by doing, learning from mistakes, goal-oriented learning, role play, and constructivist learning [18]. Characteristics of game, as educational goals, rules, competition, chance and pleasure, are applied, adding educational simulation as a model of reality defined as a system, a dynamic model, a simplified model, and a model that has fidelity, accuracy and validity [22:251].

2.2 Research design

Focus groups were used to support the development of VIRBUS pedagogy, with specific emphasis on the partnership of all the stakeholders. Qualitative research approach was selected for entering a very complex field of investigation [7]. It has been stated that a method is appropriate only if studying norms, group meanings and group processes [5]. As such, focus groups are valuable in investigating professional practices and professional development activities. In the study, the main aims of the focus groups were assisting the validity [10, 13] of simulation-game, and identifying best approaches to design and appropriate teaching and learning methods for diverse users among students, and for entrepreneurs in their professional development activities. Focus groups were implemented with groups of teachers, students, entrepreneurs and experts. Special focus was on pedagogical and ICT-experts, applying in particular the game-based and simulation-based learning. Focus groups stimulate lively debates [14], where views are developed and modified. When investigating group dynamic, and professional identity development processes in a professional community, the method is most valuable. Participants in group discussions were focusing on topics which they had previously not paid attention to.

Focus groups were formed in order to link the needs of university initial education with the continuous professional development in the field. In order to provide suitable pedagogical design of simulation-game-based virtual environment, the main aims of focus groups were identified:

- getting the agreement of general simulation-game-based virtual learning environment for the diverse user groups;
- conceptual and construction design;
- preserving the authenticity of simulation-game and its maintenance, where all the stakeholders can be actively involved;

Pedagogical design therefore needs to focus on the design of simulation-game for diverse audiences in order to provide authentic tasks, dealing with real-life data. Community of users can provide for the constant maintaining of simulation-game.

2.3 VIRBUS

VIRBUS simulation-game-based virtual environment is designed by MediaWiki [27].

VIRBUS simulation-game-based virtual environment consists of:

- Business Planning Tool in Microsoft Excel format;
- country-specific data from Finland, Slovenia, Germany and Estonia;
- theories are selected from among three main topics of business management - Planning, Analyzing and Evaluation tools;
- Hephaistos simulation module;
- glossary of concepts;
- VIRBUS community, which is a setting, where teachers, students and other users of VIRBUS simulation-game are able to develop their professional understanding and expertise in the field. VIRBUS community is to provide opportunities for reflection, evaluation and exploration of new ideas.
- VIRBUS evaluation instruments of questionnaires, for teachers and students.

Theoretic topics are structured as follows:

Planning Tools
- Business Plan
- How to organise a company
- Human Resource Management
- Market Positioning
- Pricing Management
- Strategic Management

Analysing Tools
- Balance Scorecard
- Porter's Five Forces Analysis
- SWOT Analysis

Evaluation Tools
- Key Performance Indicators
- Financial Statement Analysis
- Service Quality Management

Figure 1: Virtual simulation game-based learning environment structure

The competition as a significant characteristic of game has in VIRBUS three major patterns: in the first phase player competes against virtual or dummy players, in the second phase player competes with other players in the virtual classroom and in the third phase player competes with players ho are distributed globally in competing tourism destinations.

Figure 2: Real life data for Finland, Slovenia, Germany and Estonia

The calculation model underlying the simulation-game reflects the assumptions and biases of the designers of the game, in terms of how they choose, relate and weight the various inputs [17:3].

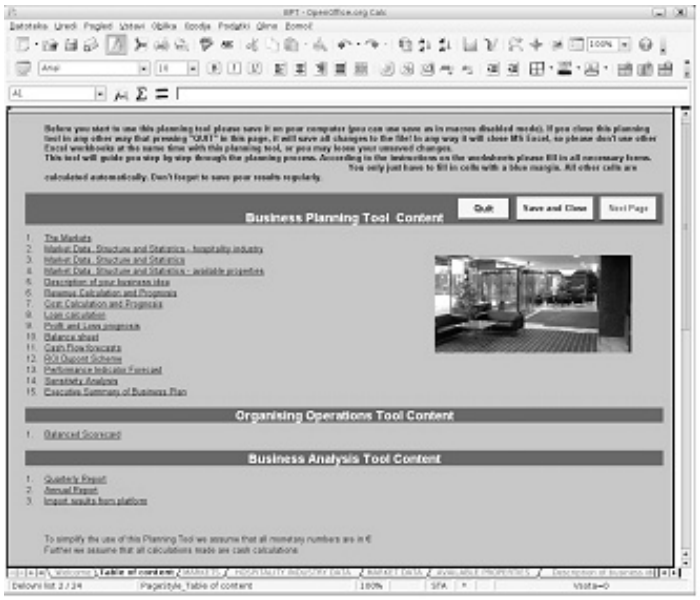

Figure 3: Business planning, organizing operations, and business analysis tools

In VIRBUS, the Hephaistos – Java-based generic simulation application, version 1.5, was used for developing the simulation module. All the information regarding business simulation market data parameters is received through XML-files, which define the simulation-game scenario. Parameters may be manipulated by teachers or trainers (Figure 4).

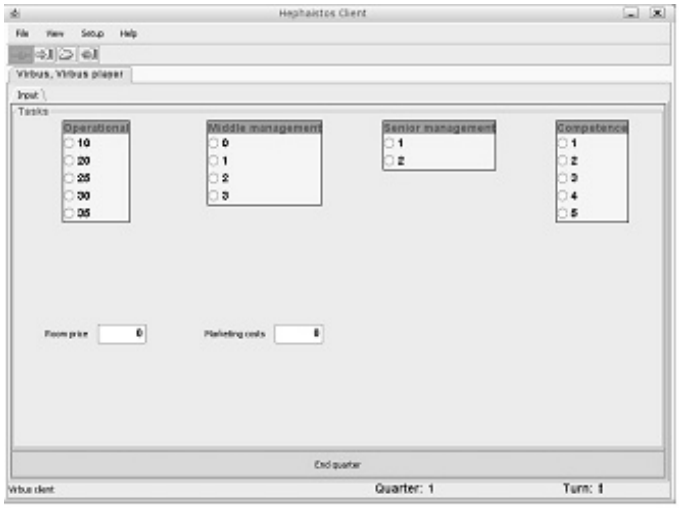

Figure 4: VIRBUS Hephaistos client

3 Virtual community: construct – share - exchange

Software development is starting process continuing in maintenance phase which is becoming major investment in terms of manpower and finances. According to Brooks 90% of cost of a typical system is maintenance

phase [4]. VIRBUS virtual community has been designed as a strategy for improvement and assistance of change process in implementing VIRBUS in the mainstream curricula of tertiary education and lifelong learning. Anticipated changes will be implemented in maintenance phase. It has been designed to assist learners and professionals in the field: individuals, small and medium size development teams which are globally distributed. VIRBUS will connect body of knowledge of users to be shared by teachers, students and enterprisers.

Professional community facilitates learning to the participants in an appropriate sociocultural context, by the appropriate means for learning and collaboration with experts in a particular field. Professional communities of practice are more and more important in developing the web-environments for professional development [8, 2]. A community of practice is defined, according to Lave and Wenger [12: 98], as a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice. It is an intrinsic condition for the existence of knowledge, not least because it provides the interpretative support necessary for making sense of the heritage. Thus, participation in the cultural practice, in which any knowledge exists, is an epistemological principle of learning.

Wenger proposes three dimensions of the community of practice, defining the community members as "evolving forms of mutual engagement; understanding and tuning their (joint) enterprise; and developing their repertoire, style and discourse" [24: 95].

Characteristic of a community of practice is, according to Barab and Duffy [3:37], a common cultural and historical heritage, where a community is composed of individuals, who are interdependent and interconnected within the community context, which is part of a larger community; a community has an ongoing 'reproduction cycle', with new members entering, cooperating with other members of the community, and becoming its core members.

Characteristics of professional community, which are to be promoted in a VIRBUS community, include the shared mission, vision and values; collective inquiry, collaborative teams, action for continuous improvement;

Ross, Smith and Roberts [21] describe a collective inquiry process, which enables members to actively participate in a community. The "team learning wheel" consists of:

- public reflection, in which participants exchange and share their assumptions and beliefs.
- shared meaning of the community members, when they achieve common ground and shared insight.
- joint planning of action steps and initiatives in a process of developing shared insight.
- coordinated action of the team, which can be carried out independently by community members.

We refer to VIRBUS community as a professional community, promoting vision and values of a learning community. It is a setting, where teachers, students and other users are able to develop their professional understanding and expertise in the field. Key aim of VIRBUS community is to provide opportunities for reflection, evaluation and exploration of new ideas.

Quality teaching and learning, aiming at studying objectives within the hospitality business management and destination management operations, focusing on international business management skills and competences, will be provided within the international groups of students. The aim of VIRBUS community is therefore to stimulate and assist international teams of teachers so as to collaborate in teaching international groups of students, using VIRBUS. Teachers may exchange good practices and critical reflections, participate in international teams of teachers for teaching international groups of students with VIRBUS, and actively participate in the further developing of VIRBUS. International collaboration is the main aim of Bologna reform and Copenhagen process within the university and vocational education. Transparency of university curricula across the EU supports the implementation of VIRBUS in the mainstream courses. Students are able to find peers in the community, and to engage in the collaboration with students, experts and entrepreneurs nationally and internationally.

4 Conclusion

In the paper presented the strategy for integration of authentic working environments in order to support practical application of theoretical knowledge within teaching and learning approaches in graduate courses and lifelong learning. Creative engagements in a design process of learning resources are required, and therefore, the collaboration of experts in enterprises with university experts was provided. VIRBUS virtual simulation-game for university education and work-based learning assists the learning by doing, learning on live experiences, learning in safety and offer space for establishing partnership in a design process and maintain it through virtual communities.

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