

SCHOLA LUDUS virtual science centre

Building e-framework for new paradigm of teaching and learning

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Abstract - In this contribution the background, the present state and the visions of the project of the SCHOLA LUDUS Virtual Science Centre (SLVSC) is presented including the educational approach and front-end dynamic structure of the SLVSC system.

The goal of the SLVSC project is to set up an open, but controlled platform for permanent science popularization and enhancement of general science culture via active non-formal learning that will be both, attractive at present and meet the learning needs of tomorrow. The system will be filled by tricky educational entities with indirect learning scaffold, supporting not consumption of knowledge but knowledge creation, with emphasis on balanced understanding between real, thought and virtual matter.

Key words: learning content management system, new learning models and applications, e-learning, e-portfolios, authentic heuristic learning, real world experience

THE SLVSC BACKGROUND AND CHALLENGE

Twenty years ago we had a vision of building a stone science centre for all full of exhibits. The goal was to build up a new scientific-cultural institution that will popularize science and support shift of thinking paradigma from linear critical one towards complexity and creativity. By time this vision turned into "science centre in the mind" [1] realized with real objects but "only" in the way of travelling exhibitions, educational modules etc. Indeed the big amount and variety of visitors allowed developing original learning formats and thinking tools marked together as 'SCHOLA LUDUS pro-science theory of teaching and learning' [2]. Having the theory, a new question arose: How to disseminate the functioning methodology? Successively, the vision of "science centre in the mind" turned into the design of the SCHOLA LUDUS Virtual Science Centre.

Strict requirement on development of the the SLVSC were based on the theory: To provide authentic pro-science learning, to keep the spirit of complexity and serious creativity, to challenge life-long non-formal and self-imposed learning.

Building SLVSC is a challenge itself. There are many science popularising IT portals and e-learning portals of different content based on presentations of facts, information, explanation, ideas for activities etc., often illustrated by

beautiful demonstrations, simulations etc., but we did not find any science popularizing or educational portal that provides learners by that what is called Vygotsky's Scaffolding in pedagogy, supporting systematic development of learners' knowledge, and scientific approach. Likewise we did not find any science popularising or e-learning portal that supports systematic development of both, individual and co-operative cognition, giving rise of chaordic co-operation skills [3], considered as a way of new organisational culture of society and of Science.

AUTHENTIC PRO-SCIENCE LEARNING

Very first requirement on the SLVSC was that learning should be realized via learner's individual step-by-step discoveries whereby experiences gained by playing with real objects are imperative. The requirement is resolved by "big portion" of visualization of any SLVSC case, and - by hints addressed to users to create own hypotheses, and to provide own experiments apart of the SLVSC. The experiments, real or thought, are as prerequisites to go on by abstractions, systematizations, feedback to the key case etc. and towards new cases inside the SLVSC case.

From point of view of creation of e-learning entities, the universal parallel method, cognitive constructivism, and strategies for authentic learning are essential. For example, application of parallel method means that there are used parallel cases supporting understanding of the key case and the cases are mutually referred.

SPIRIT OF COMPLEXITY AND SERIOUS CREATIVITY

The Complexity is considered in scientific meaning, i.e. viewing objects as dynamic systems whereby three main features of the complex system are distinguished:

1. The outer dynamics of the macroscopic, collective phenomena.
2. The dynamic structure of the system (parts of the system and their interactions),
3. The dynamic boundary of the system (provides contact between the system and its surrounding (realization of outer forces on the system).

Serious creativity requires novelty plus usefulness of the novel matter, and can be achieved only by serious discipline work.

Awareness of both, Complexity and Serious Creativity, means also the way of thinking. While SLVSC user is expected to find the Focus and the Concept for her/his Thinking Process, to keep them with discipline during Thinking process, and to Value own Ideas with respect to that Focus via that Concept, creators of e-learning entities are expected to build up intellectual space enabling development of such processes.

There are many thinking tools supporting complexity-creative thinking. The aim of the SLVSC is to apply them in such a way that they become habits of users' minds.

SELF-IMPOSED LEARNING

The work at SLVSC must be on voluntary base (even, if it is considered for school)! Hence, motivation and appropriate outer stimulation are necessary, but not sufficient. The task of creators of the e-learning entities is to build up such a provoking space that s/he wants to play within:

- can find the mental conflicts
- can define the open problems and wants to solve them
- has tools to solve the problem in her/his way
- get satisfaction of solving the problem.

SLVSC STRUCTURE AND FORMATS

The system of SLVSC is created as a series of dynamically linked Entities controlled by the Learning Content Management System (Fig. 1-3).

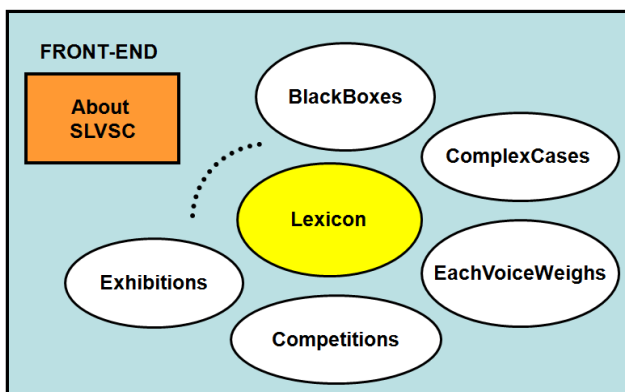


Figure 1. Sketch of the Front-End of the SLVSC

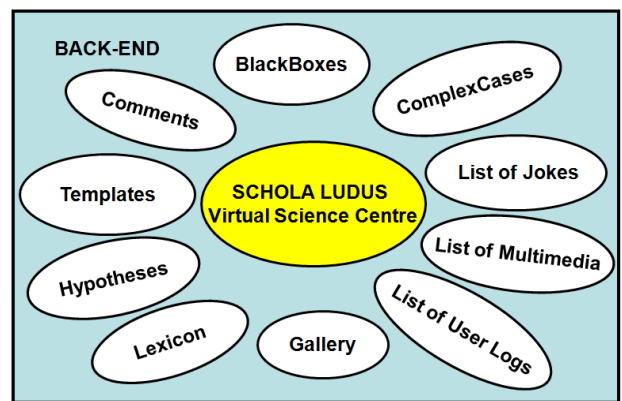


Figure 2. Sketch of the Back-End of the SLVSC

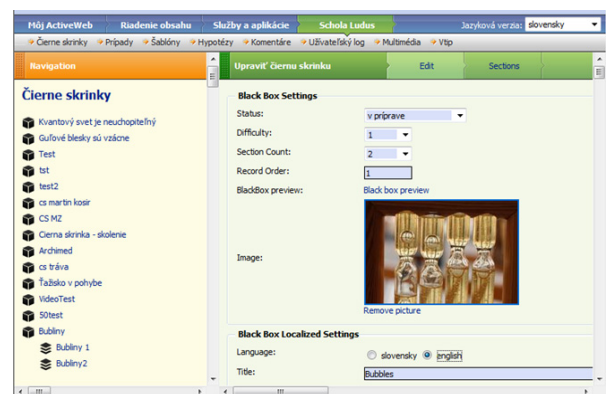


Figure 3. A part of the BlackBox setting

The respective Entities represent non-traditional e-learning materials. The e-learning Entities are divided according to their formats into SLVSC Sections. The content of each SLVSC Entity is highly interactive, divided into Stages and Phases, addressed for users' cognition.

There are developed formats for BlackBoxes, ComplexCases, Exhibitions [4], Competitions, and there are planned further formats, for example the face-to-face and Internet co-operative format EachVoiceWeights; and the format of Serious Games [5], both real and virtual.

The particular Formats are constructed for different goals, each one with its unique system of interactions and feedback, galleries, and multimedial content given for problem-solving.

SLVSC SPECIAL TOOLS AND FUNCTIONS

The user work with e-learning Entities solicits effective interactivity. At disposal are several functions designed with respect to effective cognition process.

The registered users are divided into categories (students, teachers, etc.) giving different access to SLVSC materials. Each user has an e-portfolio with all of his/her cases. The e-learning item turns into individual user case after certain interaction.

Each kind of the e-learning format has an Operational Board. The Operational Board is changed from Stage to Stage.

It contents Buttons for access to other respective Stages of the same Entity and or to the Solutions of those Stages. The user can open s/he Solution or the SCHOLA LUDUS Solution. The second is generally available only at the end of User's Solution of the particular Stage. By opening any Stage of the e-learning Entity, the respective functions for user's work in the frame of the Opened Stage are available.

At disposal is a function for Creation of a Set of Ideas. – The user is asked,

1. to entry her/his own ideas;
2. to create a joint list as a mixture of given and user's ideas, at synonyms accepting the given ideas whereby the given list can content "right" and "false" ideas;
3. to make the choice. After this the set of chosen ideas is automatically checked with respect to pre-defined "right" ideas.
If the set does not content all of them the user is asked to consider a new choice.
If the set contents all "right" ideas and also false ideas, the user is asked to revise the set.
4. to confirm the created set.

The automatic assistance of the system is provided by Help functions. At each Stage of the particular Entity there can be activated Direct Helps and Indirect Helps. The Direct Help Message appears automatically, immediately after interaction. The Indirect Help turn users' attention to conflicts of his entries with the content within the Stage and is applied usually to the end of the Stage.

The usual dilemma of creators of educational materials that arise between needs of open-ended heuristic tasks on the one hand, and needs of clear opinions and explanations on the other hand, is solved by Simulated Peer Ideas that are at disposal in parallel with users entries.

The whole system of e-learning Entities is re-bounded by system of Key Words derived from the content of the single Entities. The Key Words are summarized as Concepts that are defined in the SLVSC Lexicon. The concepts from Lexicon provide cognitive links between particular items

The Lexicon contains only Concepts derived from the SLVSC e-learning items. After opening a Concept the user sees the SCHOLA LUDUS definition of the concept and the references to the Entities that s/he has already worked out.

User can play with Concepts Maps using Tag Clouds. The Concept Maps should be used also in the frame of users evaluation of cognitive progress.

For users who are registered there is at disposal also an interactive system for Commentaries to respective Entities.

Only chosen users have access to complete lists of Entities, Statistics and linked data related Users' Solutions, Evaluations etc.

One measure of quality of the e-learning item is the deepness of users' immersion into the e-learning item. The deepness relates to cognitive Stages of particular e-learning Entity (an Entity for children and for university students can

have the same kind of Stages – describing, mapping, modeling etc.).

SLVSC CHAORDIC ORGANIZATION

The SLVSC system is open for new formats, functionalities, collaborations. Two kinds of collaborations are wanted - regarding the SLVSC system operation and regarding the content of SLVSC Entities.

The vision of the SLVSC organization is that, besides provider of the SLVSC, there will work Editorial Units, Live Units, Research Units, all with specialists on SCHOLA LUDUS education with narrow mutual collaboration and co-operation, open for ideas from outside. - Inputs of others and their weights are a must!

Scientists, researches etc. will offer topics, motives, problems that will be elaborated by the editors – specialists for the e-learning Entities.

Before the e-learning Entities will be published on SLVSC portal there will be pilot live realizations and pilot virtual realizations related the content of the e-learning Entities. The aim is to collect relevant peer ideas for Peer Ideas Simulation in the frame of the single e-learning Entities, plus to ensure cognitive effectiveness of each single e-learning Entity.

The pilot live educational programs with big samples of addresses will be carried by mediators – specialists for live science communication and should be open for general public.

The pilot runs of e-learning Entities will be followed by researchers concerned to learning, thinking, and working tasks and processes. Besides feedback of single e-learning Entities and or the whole Sections of the SLVSC, they can use the system of Key Words to follow users' activities on SLVSC in arbitrary thematic field.

The SLVSC Editorial Units are expected to collaborate with Universities, Technology centurms etc., the Live Units are expected to collaborate with schools and local public, while the SLVSC will be open for all.

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