

SCHOLA LUDUS THEORY OF TEACHING AND LEARNING

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INTRODUCTION

SCHOLA LUDUS theory of teaching and learning (TL) is an original pro-science theory based on 1. Authentic Pedagogy, 2. Thinking Based-Learning, and 3. Cognitive Constructivism [1]. This paper presents brief highlights of the complex SCHOLA LUDUS theory and its comprehensive supports for effective pro-science teaching and learning.

SCHOLA LUDUS TL

SCHOLA LUDUS Teaching accepts three stages of learning: 1. Learning by unawareness (with a matter). 2. Learning by thematization (of the matter). 3. Learning by awareness (over the matter). The meaning of the matter is during the TL process changing. The matter can represent a physical system/process as well as concepts, models or theories.

The process of SCHOLA LUDUS teaching is in agreement with Vygotsky's conception of teacher's scaffolding with respect to learner's zone of proximal development [2] while learning process should result in conceptual changes within the learner's individual pre-scientific conceptions, and in personal development regarding his/her pro-scientific mental and crafts skills.

SCHOLA LUDUS TL THINKING

Any TL process is considered as a thinking process. A significant part of learning is based on imitation of teacher's thinking patterns, and on teacher-learners thinking intrusion that results in a mutually interwoven common thinking frame. Hence the TL process depends significantly on skills of teachers' thinking and thinking is more than teachers' logic or cleverness.

Thinking can be taught and learnt. Effective thinking is supported by specially designed thinking tools and mental exercises. Learners can learn different techniques enabling effective usage of mental tools and acquire useful skills necessary for effective operations with mental tools.

TL frame for pro-scientific thinking includes mental tools and techniques for systematic development of thinking skills based on serious creativity [3] and on complexity as is understood in modern science.

TL SERIOUS CREATIVITY

Serious creativity represents a way of well-disciplined thinking process with respect to the focus and concept of the thinking process, the currently applied mental tool, and the duration stated for respective parts of the thinking process. The goal of serious creativity is to create / discover / solve /

establish etc. something that is 1. novel and 2. useful. At learning process the useful novelty relates to aware progress of learning that is measured by conceptual change and practice.

Creative thinking is the more effective the more we take aim of harmonious development of all types of thinking (resp. all multiple intelligences [4])- verbal, visual, motion, mathematical etc.

A basic assumption for creativity is the lateral thinking [3]. Lateral thinking is an eminent feature of mind and can be systematically developed by specially designed mental tools and techniques. As basic tool for development of lateral thinking is considered humor. To basic mental tools for serious creativity belong provocative operation [3], a tool called OKAMIH and thought experiment [1].

OKAMIH: FOCUS – CONCEPT (– ANALYSIS) – IDEAS (– INFORMATION) – VALUES

OKAMIH is the Slovak acronym for an universal basic mental tool on thought process that consists of a chain of highlights: Focus – Concept (– Analysis) – Ideas (– Information) – Values.

OKAMIH as a SCHOLA LUDUS mental tool is substantial at any thought process, at developing TL materials as well as during realization of any stage of TL cycle (see below). It serves as tool for formal input or output of a thought process and also for assessment of thought development. Highlights in OKAMIH record the way of thinking and the respective progress of the thought process.

The content of OKAMIHs learning at any stage of TL cycle can differ from those for teaching.

Effective usage of OKAMIH means to keep thought discipline, e.g. to consider at once only to one focus via the chosen concept, to create ideas relevant to the respective couple of focus and concept, and afterwards to create from several values a decision towards future.

Hence, for example, formal outputs from several parallel thought processes are values that we can take into consideration in parallel. In addition, by OKAMIH we got genesis of the respective values. This is also why an effective usage of OKAMIH is one of the requirements for serious creativity.

TL COMPLEXITY

Complexity constitutes a comprehensive thinking approach. - Any object in the complexity frame is considered as a model of a complex dynamic system and/or a part of the complex system that is in mutual interaction with other parts of the same system.

For a TL conception of complexity there are obligatory outer features and inner interactions of the

respective object including assumptions under which the model is considered and conditions at which the respective processes occur.

Complexity approach is about non-linearity, and also about probability and uncertainty, and questions of order and chaos. SCHOLA LUDUS intention is to introduce complexity even on lower secondary school level. A necessary assumption to master complexity within TL process at any level is application of parallel method [1].

The parallel method is applied principally in all fields of TL. It takes advantage from lateral thinking, and accelerates individual and collective thinking - stimulate learners to recognize aspects, attributes, functionality, essence and role of a key case.

Any TL process realized in the frame of a TL cycle is established on parallel cases. Also learners' ideas, sketches, models etc. can be used as parallel cases within a TL cycle.

SCHOLA LUDUS TL CYCLE

TLC represents the basic unit of the SCHOLA LUDUS pro-science teaching and learning. Educational conception of a TLC consists of 0+6 stages.

0. Pre-action. First experiences with matter as ordinary reality. Learners don't know the object of teaching. During action they recognize something that is extraordinary.

1. Describing. Simple description of the observed system/process, its features, details, phases of development as they are seen / felt / understood. – Definition of the problem.

2. Mapping. Finding different aspects of respective complex physical system. Classification of features within an aspects. – Definition of the field of the problem.

3. Modeling. Complex study of simplified reality. Building up functional models, realizing real and / or thought experiments. – Definition of potential of the problem with respect to deeper understanding the field.

4. Abstracting. Abstracting physical conditions of the system. Generalization. – Definition of general concepts, laws and conceptions.

5. Embedding. The findings of previous stages are put into the original context and/or learners' scientific pre- and/or mis-conceptions. – Definition of the acquired conceptual change and novelty.

6. Appropriation. Changing current learning into operational knowledge. By solving a top case of TLC learners acquire awareness that possession of the respective knowledge has a personal potential for him/her. Commonly, the top case does not relate to the key case.

The key case, the respective parallel cases and the top case are indivisible parts of a TLC design. The role of the key case is to attract and motivate, the role of parallel cases is to stimulate, the role of the top case is to open horizons. The attractive key case is applied systematically at each level of the TLC as a reference case of parallel cases. The top case can be treated also as a key case of another teaching-learning cycle.

SCHOLA LUDUS TL THEORY IN PRACTICE

Any TLC should be supported by a TL frame - a table containing sketches of the respective key case, sets of parallel cases and the top case / cases of the TLC. The TL frame is considered as a strong tool for both, teachers and learners. It represents a TL synopsis. It helps to keep focus and time disciplines. It can be used as a base for tests. On the base of TL frame a teacher can decide for appropriate TL methods. By help of TL frame can learners formulate OKAMIHS etc.

To apply SCHOLA LUDUS theory in schools, teachers can decide between three main strategies of SCHOLA LUDUS authentic learning by play: spontaneous, directed and great creation and of variety of mostly non-formal procedures, let mention a very specific form of creative discovery workshop [1].

CONCLUSIONS

The SCHOLA LUDUS pro-science theory of TL is suitable for any TL subject, is applied at any current SCHOLA LUDUS programs for schools, teachers and public [5-8]. The challenges are - new programs and education. As the theory rises from eminent features of reality and applies creative-complexity thinking it seems to become also a tool for change of cliché: "We need Mathematics in order to develop thinking ..." to "We need physics with pro-science TL to understand the world."

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