METHODOLOGICAL PRINCIPLES OF SERIOUS GAMES

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***Abstract**: The creation of serious games as an alternative to traditional technologies, forms and means of education, is acquiring the status of a strategic task along the whole chain of the systemic and further education in the post-industrial society of the 21st century.*

In principle, it borrows ideas from Johan Huizinga's fundamental thesis about homo ludens – the playing man. However, in the radically new paradigm of the modern day world, although they have retained their validity, these principles need updating and enriching with new methodological, didactic and emotional-esthetic aspects and dimensions.

The present study offers systematization of a set of requirements and recommendations as attribute of the creative-innovative serious games that are being developed in the age of knowledge and information technologies.

KEYWORDS: SERIOUS GAMES; EDUCATION AND TRAINING WITH CREATIVE-INNOVATIVE SERIOUS GAMES; CREATIVE-INNOVATIVE EDUCATION IN BUSINESS AND MANAGEMENT.

1. Introduction

> *„Man only plays where he is man in the full acceptation of the term, and he is wholly man only where he plays."*
>
> *F. Shiller*

According to David Wortley, Director of the Serious Games Institute, established in 2007 at Coventry University (UK), serious games are electronic games and other technologies for non-entertainment purposes - training and education; i.e. we are talking about games which are enjoyable and fun, however, their main purpose is not to entertain but to train people and help them learn new things.

These games are designed with a serious purpose in mind - learning and simulations. Games are the easiest way for a man to learn something. Therefore their main purpose is educational.

It is expected that in 2012 the 500 largest companies in the world will be applying serious games in conducting their training in corporate management and corporate case studies.

Serious games become a generator and a stimulator of a new flourishing industry which brings more revenues than the film industry.

Universities and university students are not only the target users of serious games but they are also the medium and creators of new generations of serious games for the precious category of young, creative and innovative individuals.

The LUDUS project, popular in the European network for the transfer and dissemination of knowledge and technologies in the innovative field of training through serious games, aims to create serious game libraries to be used by all those concerned with the development, introduction and enhancement of serious games.

It is useful to make some brief generalizations, namely:

1. Serious games that have been developed with a purpose other than to entertain can be: 1) Educational; 2) Military; 3) Diagnostic; 4) Promotional.

2. In fact, serious games copy from all genres: 1) Strategic simulations; 2) Action games; 3) Role plays; 4) Adventure games; 5) Simulation games; 6) Sports games.

3. Practical experience shows that serious games turn out to be particularly appropriate in certain spheres of training especially where practical training in real life situations involves much risk.

1.1. Game Based Learning (GBL)

According to Malinka Ivanova, a researcher in the field of serious games, game based learning (GBL) facilitates personalized training and the acquisition of basic and key skills.

A lot of universities have been included in a study on the introduction of this type of training: Massachusetts Institute of Technology, Pennsylvania State University, Carnegie Mellon, University of Southern California, Stanford University, IT University of Copenhagen, University of Birmingham and some other universities in the UK.

Arguments in favour of game based university training:

1. It increases the skills and knowledge of students within a short period of time.

2. It helps to better understand the importance of the individual's role, knowledge and efficient behavior in a particular situation as well as the consequence of the decisions taken.

3. The captivating power of games engages the learners by motivating them and increasing their active involvement for a long period of time.

4. It provides opportunities for a much more efficient social interaction between learners and lecturers.

Some challenges associated with game based learning:

1. So far game based learning has been widely used in medicine, juridical science, mathematics, physics and chemistry but no claims are made about applicability in the field of vocational training.

2. A large budget is definitely required for effective use of game based learning and of simulations in particular.

According to M. Ivanova, there are projects and systems developed for new recruit in-company training to prove all of the above said:

(1) McKinsey and the "Chief Executive Officer of the future" game.
(2) Philips Electronics and a game called "Simplicity Showdown" to help staff better understand brand strategy.
(3) Johnson & Johnson and a "3DU" virtual reality world to train newly appointed personnel.
(4) IBM and 3D's business simulator to train staff in the field of management.

1.2. Game Based Learning in real business practice.

A review of the experience worldwide yields the following generalizations:

1. Serious computer games addressing mainly business and politics issues are oriented towards and win the attention of specific groups of people, including university students, on topics that have to do with specialization, organization, hierarchy and formalization, e.g. IT management or accounting.

2. Serious games appear to be very suitable for business practices such as corporate training as they encourage strategic and economic reasoning, including planning skills.

3. The company staff being trained can experiment with real situations without risk for the company to suffer losses.

4. The gamers among the young specialists prove better than their non-playing colleagues in the course of the training.

5. Serious games turn out to be a simple and reliable way to reach people as well as to recruit young talents.

6. Reducing the invested cost and time for corporate training.

40% of US firms use serious games in their corporate training programs which comes to confirm all of the above points.

Experts recommend that games should be designed to train through the "trial and error" method and predispose the learner much more to experience an insight, and respectively demonstrate fantasy and imagination, but they do not suggest any particular principles, approaches, techniques or strategies.

1.3. Risk factors for the gamer in the age of the Internet.

1. The playing individual remains the only valid category in the global virtual reality created by the computer technologies.

2. The Internet itself is some special analog of a meta-game but in some instances quite a few of its aspects turn it into a pathological game, into some kind of a "techno-drug".

Besides, new types of communications, interpersonal relations, identities and communities are formed on the Internet.

3. Homo ludens (playing man) of the IT and the Internet age represents a new stage in the evolutionary development, with no precursors or analogs from previous epochs.

2. Prerequisites and ways to solve the problem

Whatever new methodology and concept one tries to formulate or develop about serious games, it is logical to start with the principles defined by J. Huizinga:

1. Playing is inherent in animals and humans regardless of their functions and how old they are - it goes on from childhood to old age. And therefore, with his social nature and belonging man is obliged to play almost continuously in his daily activities throughout his life; one is self-doomed if he/she refuses to do so.

2. Playing is a voluntary act but it has its own reality and a spontaneously imagined world with actions that happen accoring to rules. The game generates different emotional and behavioural states.

3. Playing stimulates but it also generates tension.

It is a celebration – a predisposition rooted deep into the collective unconscious – the traditions of antiquity.

4. The play has specific functions to unite and bring people closer in a team.

5. Through the game one develops as a personality and forms mental models, universal rules and models of behavior.

The game forms the mind.

6. A man plays only when the meaning of the word "play" is embodied in the act. A man is entirely there and entirely a person only where he plays. Then he is blissful and enjoys life.

7. A game is a main culture-formation factor. In it one finds the phenomena of spirituality and of the material culture.

The playing turns each culture into a game.

8. Play is a sole performer of different human activities, such as language, law, war, knowledge, poetry, philosophy, art and the civilization as a whole in the passion (or impulse) for playing.

Conceptual framework of the creative-innovative serious game (CISG)

Creating serious games, that exercise the creative-innovative ability, provides an opportunity to improve the quality of university training in a wide range of degree courses where creative thinking and innovativity are a priority.

The conceptual framework of a serious game of this type does not fit into the traditional formats and scenarios because it is very complex, nonlinear and multilayered, i.e. it is an open, nonlinear structure, which is very much like what the neural network, the brain and the thinking process actually are.

The following can be defined as the main principles of the conceptual framework of a creative-innovative serious game:

1. **It is largely oriented towards today's personality, especially the "Generation Y"** (aged up to 20-25 years old), who find themselves, not by their own will, in a very delicate situation - they neither wish to follow the mental models of the previous generations nor possess or are able to develop basically new and effective mental models adequate for the present day times.

Modern civilization must solve this problem so as not to cripple the future of the next generations, and its own future respectively.

2. **Entertainment and study should not exclude but complement each other organically.**

a) Gratification of both the instinctive inclination to having fun, obtaining information and communicating, and also the need for advice, knowledge, commitment, self-assertion and a personal mission.

b) Receiving instructions and directions but also sharing, trusting and spontaneous and emotional approval of the format, content and implementation.

3. **In order to train effectively, the game must meet a number of requirements:**

(1) To develop creative thinking, linear and non-linear thinking respectively, on the basis of formal logic and intuition, in other words – imagination and fantasy.
(2) To develop innovativity, including the ability to find problems and come up with novative solutions, both renovative and innovative (horizontal/lateral and vertical).
(3) To satisfy the exceptional necessity of the human brain to learn and to know.
(4) To offer, find and create knowledge and information, including recommendations for their creative-innovative application and practical implementation.
(5) To develop an investigator's approach.
(6) To encourage and stimulate entrepreneurship, effective reactions to challenges and opportunities, competitiveness, self-confidence and a fighting spirit.

4. Motivating missions, unreservedly shared visions and inspiring high/bold aims as sources for cultivating emotional responses and emotional commitment to significant, enticing, charismatic and uniting principles, goals and decisions.

5. Defining tasks which provoke a person's interest and desire for self-identification as one with a vocation and mission to realize them in a creative-innovative way and also as an author.

6. The creative-innovative game, which the inventive mind dreams for, must be fractal – as is the creative-innovative thinking process itself.

It is self-evident that interactivity is a valid requirement. In this case it is related to synergy, fractality and self-organization of an open non-linear system and such, indeed, is the brain, the neural network, and the very thinking process.

Fractality, as a feature of "organized" chaos, denotes:

a) The synergy principles for self-organization.

b) The catching of "attractor-structures" which pull the open non-linear system towards structuring, sustainability, vitality and the future.

c) Mental models of the creative-innovative personality based on his/her being self-organized and self-disciplined.

Besides, in order to be holistic (complete, global) the creative-innovative serious game must be designed as a captivating multimedia with fractal interactivity and causing irresistible desire in the learner's personality to follow a fractal generated by his/her **Personal Self-management Algorithm (PSA)** – as a firework of individual intentions, steps and experiences in a fantastic multidimensional intellectual space (whose dimension is a fraction number!); as a gigantic multilayer and multi-fragment Mobius strip with spontaneously occurring points of exacerbation and turning points.

3. Solving the scientific problem.

Being a medium for generating and synthesis of creative-innovative ideas and solutions, one can model a co-evolutionary intellectual sub-landscape with the help of the fractal interactivity, as shown in the illustration in Fig. 1:

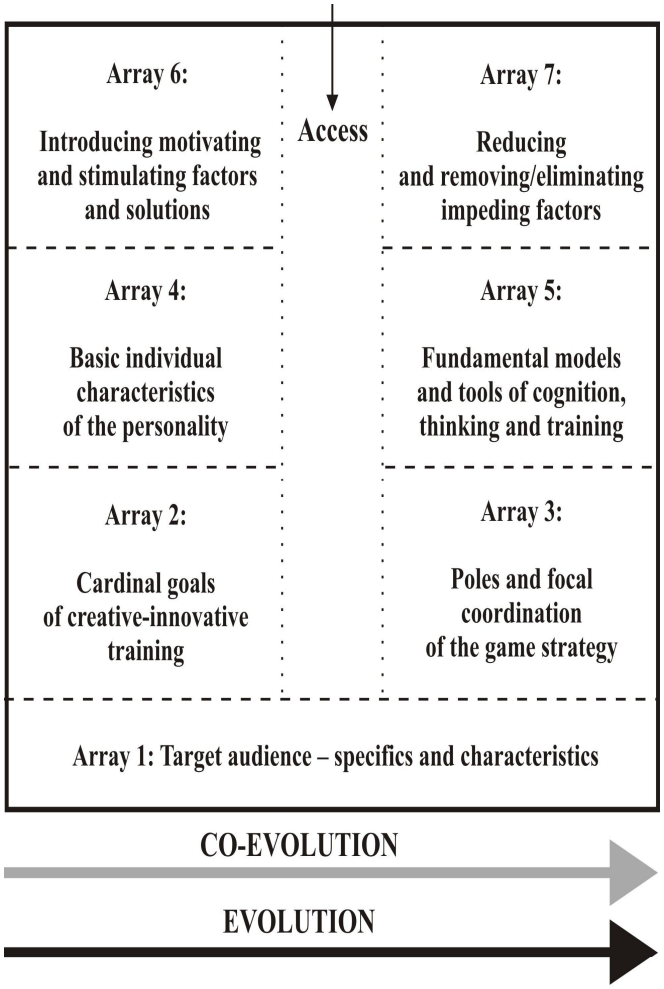

Fig.1. Co-evolutionary intellectual sub-landscape
A principle model of a creative-innovative serious game (CISG) as an open non-linear system with blurred knowledge arrays for fractal interactive navigation
- **Evolution** in the objective material world
- **Co-evolution** in a world invented/created by man

In general it is an open nonlinear system dominated by chaos, uncertainty and unpredictability with arrays (seven in this case) of blurred structures flowing from one into another, at several arbitrary vertical levels and content like the following:

1. **Target audience – specifics and characteristics**:

* **Generation Y** – according to K. Anderson and T. Erickson: aged up to 20-25 years old.

* **Generation X** ("no logo") – according to N. Klein: from 20-25 to 40-45 year-olds.

Quite different compared to the older generations of **pragmatics** (from 40-45 to 60-65 years old) and **traditionalists** (over 60-65 years old), they come with striking differences regarding: Education and competence; Intellectual and moral heterogeneity; Knowledge, values and semantics; Personal and social experience; Goals and aspirations; Creative innovative predisposition.

2. **Cardinal goals of creative-innovative training**:

(1) Formation and perfection of the personal creative-innovative level, including creative thinking, linear and nonlinear thinking.
(2) Acquiring the principles of holism and synergy, including those of being self-organized and self-disciplined.
(3) Acquiring, developing and transferring knowledge and information, including the generating and capitalizing on intellectual property.
(4) Self-identification and self-updating of one's strong sides (talent+knowledge+skills), the mental models and the role models and functions of the individual.
(5) Preparation in PREentrepreneurship as a basis and prerequisite for effective market realization regardless of the type of marketing and the individual's motivation level.

3. **Poles and focal coordination of the game strategy:**

(1) The homo ludens principles, defined by J. Huizinga, including the ones systematized in the present study.
(2) Separate and combined application of:
- Human psychological archetypes – according to Carl Gustav Yung.
- The meta-model of Neuro-linguistic programming (NLP).
- The model of Milton Ericson.

(3) An array of the personality's major characteristics necessary for an effective and creative thinking process.
(4) The personality's self-programming algorithm (PSA) and its arrays.
(5) Well defined **subject matter** of the creative-innovative game (the "cake" of the creative-innovative cognition) and the **objects** (the separate pieces of the "cake") of the serious game.
(6) Highly professional and personality oriented communications and presentations.

4. **Basic individual characteristics of the personality:**

(1) Domination of the brain hemispheres: Analytical, artistic and adequate types.
(2) The ratio: Mentality-Emotions-Senses. For example 70% : 20% : 10%
(3) Psychological type of the personality: Choleric; Sanguine; Melancholic; Phlegmatic.
(4) Main stimuli of egonomics: 1) To possess; 2) To communicate; 3) To know; 4) To defend.
(5) The six main types of mental activities: 1) Verbal; 2) Perceptual; 3) Mechanical; 4) Spatial; 5) Numerical; 6) Analytical.
(6) Intelligence type, including emotional intelligence and multiple intelligences – according to H. Gardner.
(7) The strong sides of the personality – the 34 models based on M Buckingham and D. Clifton's model.
(8) Major role functions in a team – according to M. Belbin.

5. Fundamental models and tools of cognition, thinking and training:

(1) Traditional and untraditional techniques and technologies of training.
(2) Accounting for the factors: Concentration, fatigue, relaxation; Autogenic training; Positive emotions and psychological states and dispositions.
(3) The creative thinking process. Neural network.
(4) Main thinking operations: Logical; Intuitive; Heuristic.
(5) Principles of creating images (visual and verbal), which remain in the mind. Place and role of metaphors and associations.
(6) Semantic information techniques:
- Semantic circle.
- Dialogue and presentation levels: "Author-Audience".
- Semantic information "Languages".

(7) Levels of creative solutions.
(8) The serious game in its two basic forms of existence:
- Logical labyrinth.
- Fractal narration.

(9) Principles of self-study and the learning organization – according to Peter Senge:
- System thinking.
- Personal mastery.
- Mental models.
- Building shared vision.
- Team learning.

6. Introducing motivating and stimulating factors and solutions:

(1) Systematically declaring, following and pressing for the Mission-Vision-Goal-Message sequence.
(2) Generating engaging and inspiring ideas, effects and solutions:
   - **"Both – And"** thinking; connecting the material and the spiritual.
   - Establishing an emotional bond.
   - Co-creation of values and experiences.
(3) Adequateness and parity of the "Author-Audience" dialogue, taking into account their individual goals, motivation and preferences.
(4) Impressive speech techniques and author's style including:
   - Winning attention and gaining credibility.
   - Organizing the thinking of the personality/audience.
(5) Combining what is useful with what is pleasant and satisfying by bringing in spots or brief interludes dedicated to:
   - Wisdom. Laughter and humour.
   - Cognition. Hypotheses. Scientific theories. Innovations. Innovative, challenging and untraditional ideas and solutions.
   - Successful personalities, who traced the way.
   - References to Google, Wikipedia, etc.
   - Unique multimedia – containing knowledge and spiritual values.
   - Creative-innovative films; fractal films.
   - Issues of personal interest.
   - etc.

7. Reducing and removing/eliminating impeding factors, such as:

(1) The common confusion between "understanding" and "knowledge" or accepting them as synonymous.
(2) Psychological viewpoints and obsessions.
(3) Barriers of mental, cognitive, terminological and other types.
(4) Conservatism and lack of imagination. Pessimism and frustration.
(5) Inadequate mental/thinking models.
(6) Illegitimate concepts, hypothesizes, theories and schools of thought.
(7) Negative sides of the present time: Nihilism and bias.
(8) Negative sides of the individual: Self-conceitedness. Becoming profane, turning wild.

4. Results and discussion

For the realization of the suggested model of a creative-innovative serious game, one needs specialized training to comply with the above mentioned arrays and to acquire data (information), knowledge, skills and habits adequate for the innovation.

In parallel with the target training, the creative-innovative personality learns to acquire and permanently apply the principles and technologies of self-study and further education for the purpose of achieving an adequate author's level of synthesis of new products, services, objects, systems and intellectual solutions as well as finding effective, creative, managerial and business solutions.

In the course of the last three or four decades all components of the discussed arrays have been developed and continuously updated and improved at the University of Ruse in the framework of the specialized training in methods of creative and targeted scientific research, with the practical realization of an **Ego-centered** hexagonal model of effective creative thinking.

The conceptual and practical realization of the idea for a creative-innovative serious game (CISG) is as timely and necessary as it is realistic.

5. Conclusion

In the academic environment there is a real need and place for didactic products and solutions without which the idea to train in creative thinking and produce creative-innovative personalities will remain a voice (or a cry) in the wilderness and another reminder of the warning: "If you find education expensive, try ignorance."

6. Reference literature

1. Huizinga, J. Homo Ludens: A study of the play element in culture. Translated from Dutch. Sofia, "Nauka i izkustvo" Publishing house, 1982, 248 p.