

LOBIM – a Computer Game Based Training for Inventive Principles

Nick Eckert

Joyson Safety Systems Berlin
Hussitenstr.34, 13555 Berlin, Germany
Nick.Eckert@eu.joysonssafety.com

Abstract. The inventive principles are a very strong TRIZ-tool. They are the source of inspiration to solve the technical contradictions. Used either as a selection with help of contradiction matrix or used as sequential screening of all principles. The author means that it is necessary to understand all principles and to memorize them. This should be done because of a fluently inventive thinking and imagination during the search for solutions. With LOBIM-game based training the player can easily learn to memorize the 45 inventive principles from LOBIM (TRIZ + Bionic). It contains basic game design rules like interaction, scores and ranking. This game improves the acceptance of the inventive principles and brings more fun to the entire problem solving process which other modern invention methods (e.g. Design Thinking) have implemented already. Background, game procedure and first experiences will be presented.

Keywords: LOBIM, inventive principles, Game based training.

1 Introduction into the 45 LOBIM Principles

The inventive principles according LOBIM implement basically the 40 inventive principles of TRIZ and additional principles from bionic according Frederic Vester [1] and Werner Nachtigall [2]. They are categorized with help of the three stage hierarchy from Dietmar Zobel [3].

It is an extraordinary effort what Altschuller found that with these 40 inventive principles of TRIZ you can solve basically all technical problems.

I appreciate the TRIZ principles, enlarged them a little and categorized them into “Universal Level”, “General Level” and “Detail Level”.

The understanding of the 45 LOBIM principles is required for training and memorizing of these principles. At the beginning it is helpful to use the description on www.lobim.de (see Fig. 1) or the LOBIM principle cards (see fig. 2). There are the terms of principles explained in detail with help of concrete examples from nature and technics.



Back to start	16-Intermediary	32-Recycling
Universal Level	17-Self-Service	33-Composite Materials
1-Function Oriented	18-Copying	34-Interaction/Communication
2-Holistic Optimization	19-Parameter Change	35-Learning
3-Efficiency	20-Phase Transition	Detail Level
4-Segmentation	General Level	36-Hydraulics/Pneumatics
5-Taking Out	21-Asymmetry	37-Flexible Membranes/Thin films
6-Local Quality	22-Nested Doll	38-Porous Materials
7-Merging	23-Anti-Weight/Lift	39-Colour Change
8-Multifunction	24-Prevention	40-Homogeneity
9-Reverse Functioning	25-Equipotentiality	41-Thermal Expansion
10-Dynamics	26-Spheroidality	42-Accelerated Oxidation
11-Another Dimension	27-Partial/Excessive Action	43-Inert Medium
12-Continuity	28-Oscillation	44-Redundancy
13-Rushing Through	29-Periodic Action	45-Allometrie
14-Harmful to Useful	30-Short-Living Objects	
15-Feedback	31-Replace Mechanics	

Fig. 1. Subsite “Inventive Principles” on www.lobim.de



Fig. 2. Cards of LOBIM principles with examples from nature and technics

2 Why is it Helpful for the Inventor to Memorize the Inventive Principles?

TRIZ includes very sophisticated tools to analyze problems and to create new ideas. In my opinion it is essential to find out the contradictions before starting the search of solutions. The analyzing process is a convergent thinking process which is narrowing the core problem step by step. Here is used an analytically and scientifically approach. This approach is completely different from creative thinking, where a divergent and broad thinking is necessary. The inventor has to switch from focused to broad thinking. In my opinion the Altschuller contradiction matrix with his couples of parameters gives to much restrictions of the solution field. The 40 inventive principles are a very useful restriction by itself. If the inventor has these principles in mind he can play with these in a kind of interaction with the contradictions in the problem solving process.

This could be done with the experiences of creativity research which will be described in chapter 3.

To that effect there are two requirements necessary:

1. The inventor is focused on the problem with exactly phrased contradictions (contradiction matrix is not mandatory).
2. The inventor has internalized the inventive principles.

3 Experiences from Creativity Research

“I never did a day’s work in my life. It was all fun.”¹

3.1 Creativity and Emotions

All important information, which people receive, would be multiple stored over the complete cerebral cortex. It is stored in a compressed way to prevent overloading our brain with too many details. Because of this wide distributed storage there are many possibilities for overlapping and response. Ideas, intuition and creativity formed of the interplay of this multiple storage of outer and inner perception.

To support this storage it is advantageously to use many different input channels (looking, hearing, touching) and to combine them with positive emotions (fascination, passion, courage). [4]

With today’s brain scanners, scientists found out that emotions extremely influence which brain areas to be switched on or off and therefore to be ready for logical and creative thinking. “Thereby emotions will become an engine for creative thinking. In creative thinking it is important to see the thinks a little bit different than normal. It is

¹ Thomas, Alva Edison

no accident, that many popular artists and genius often have an extraordinary emotional life.” [5]

Meanwhile the creative thinking process it is helpful to accept many emotions. It changes our perception of the problem or task.

3.2 Sub Consciousness and Consciousness

The sub consciousness is a level of our experiences, which we can't explain by words. But most of our knowledge is stored there for a long time. This huge amount of knowledge is fragmented, compressed and mixed with emotions there.

In our consciousness we have only some classified information. The reason is that we need to decide very quickly sometimes with only a few information. Consciousness and sub consciousness are working very close together. Between both is a kind of filter, which is strongly influenced by emotions. In case of negative emotions the input from consciousness to sub consciousness is disturbed. Otherwise with positive emotions like a happy atmosphere much more input information can be stored in sub consciousness. We are more opening minded. [6]

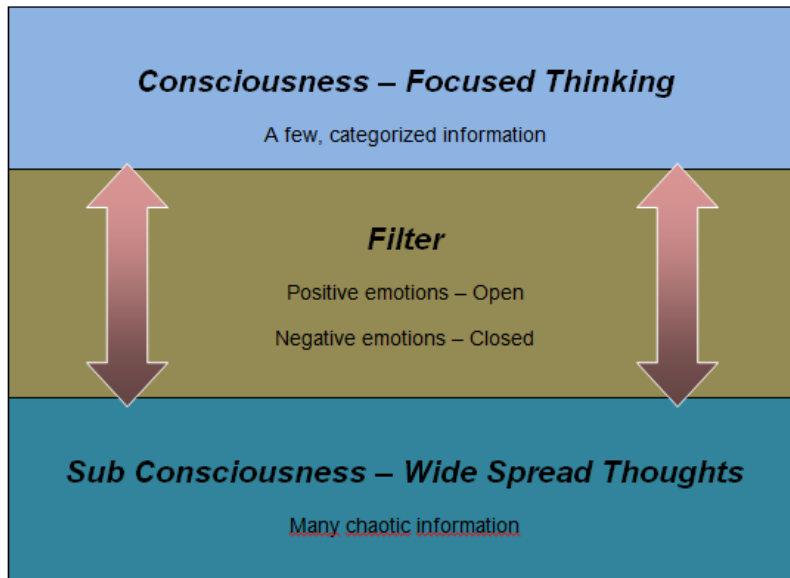


Fig. 3. Model of interaction of sub consciousness and consciousness

3.3 Motivation, Endurance and Flow

Creative people are often interested not only for the result of a work, but they take great interest on working process. Painting - not only the finished picture is important for them. They are happy if they can write, can invent or research – to be creative. They often diving into a flow and forgetting all around them.

The term “flow” was named by Mihaly Csikszentmihalyi, a Hungarian psychologist. He describes with this term the exaltation which creative people often have when they are in a working process. This exaltation develops if there are clear duties in each working step and a direct positive feedback to the own work. The duties and abilities of a person are in balance during a flow. The person in flow is neither over strained nor under strained. Doing and consciousness are unified. Into the flow we are completely focused on what we are doing in this moment. This focused concentration is necessary to keep the balance of abilities and requirements and it is possible because of clear achievements and a direct feedback.

The person is completely lost in thought. There is no fear to fail and a loss of time feeling, diversion is eliminated by consciousness. The activity is so called “autotelic” and the feeling is concentrated but easy and relaxed. [7]

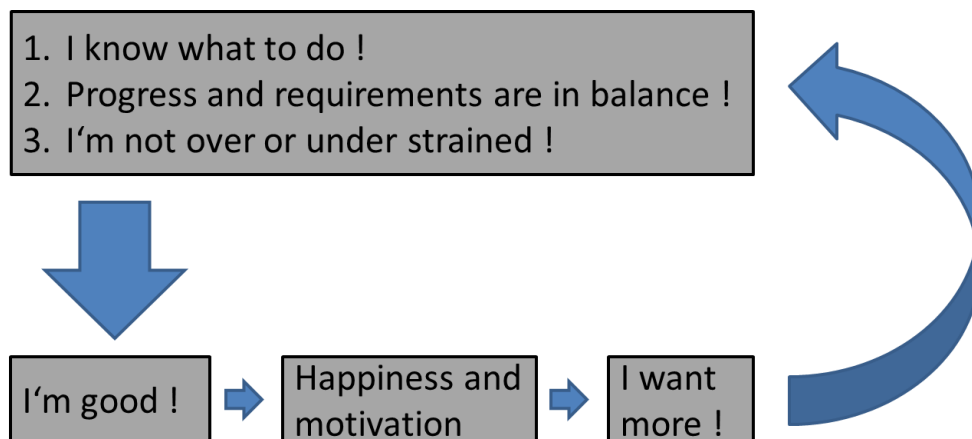


Fig. 4. Model of the flow circle

4 How does a Good Computer Game Work?

Computer and video games satisfy basically human wishes. The virtual life spends a high amount of gratification, more than in a real life. They teach, inspire and give motivation.

Essential features of a game:

- a. **Voluntary participation** is the baseline for positive emotions at the beginning.
- b. **Clear targets** for the player gives signification to the game.
- c. **Regulations** restrict the player to meet the targets.
- d. The **feedback system** informs the player how far away he is from the target. It is important for the motivation.

The essential difference between digital and conventional games is the direct and immediate feedback. The player feels how sensitive the game reacts to his abilities. It's getting harder only if he's getting better. It is a perfect balance between challenge and abilities of the player. Games can produce flow in a very short time. The player is constantly on his own maximum performance limit. When he fails he always can start again. There are no serious negative consequences for him. Players want to explore, learn and getting better. If they are getting better they will feel proud. This feeling causes from a self-motivation which is lasting longer than any material rewards. [8]

5 How does LOBIM Game Based Training Work?

In this training game the player learns to memorize the LOBIM inventive principles. Terms of the 45 inventive principles are placed on the right side of the display in an unsorted column of five. On the left side of the display are showing the inventive principles as example pictures one after another (1-45) with a short description (see fig. 5). The players target is to relate the inventive principle term, on the right to the example picture on the left by mouse push or finger smudge (see fig. 6). If this relation is correct, the player gets points, cheer is audible, funny cartoon appears and flies away. In addition the right term is spoken by speaker before the next example picture appears. The term on the right side will be replaced by the next in row. If the relation is wrong, an error alarm is listening and the term flips back to the original position.

The player has 3 minutes of time (180 seconds) to relate all 45 principle terms to the correct pictures. After 5 correct relations the player achieves the next higher level. Now the backstage changes and new funny cartoons are visible after every right choice. If the time is over sounds a trumpet air horn and the player will be awarded with a title like following: If the score is highest (45) then the player is promoted to Professional. The following titles ranking down are Master, Bachelor, Senior, Junior, and Beginner".

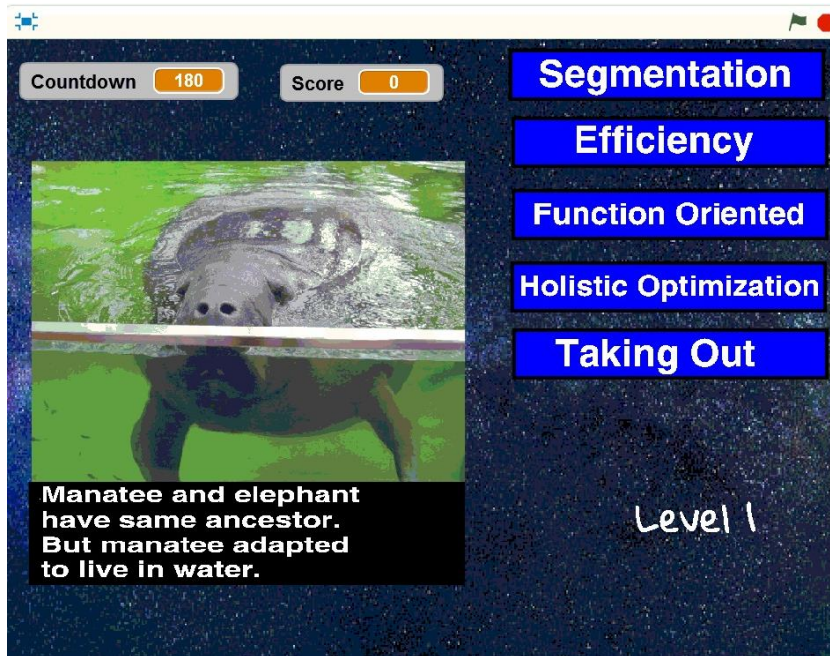


Fig. 5. Training game display at the beginning at level 1 (180 seconds left)

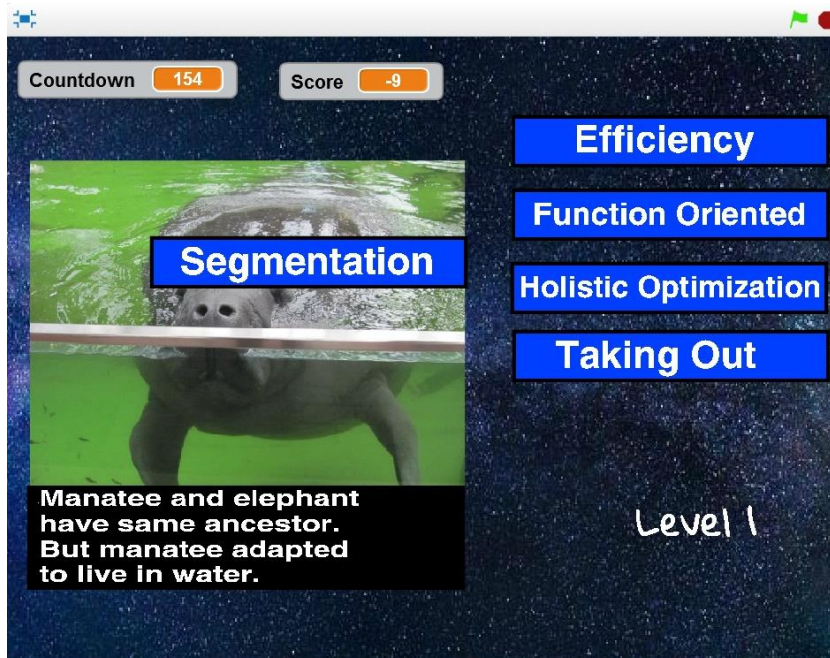


Fig. 6. Training game display with a selection (154 seconds left, 9 wrong selections)

6 Summary and First Experiences?

The LOBIM training game brings learning and emotions together. It meets all criteria's of a good computer game like voluntary participation, clear targets, regulations and feedback system. The target is to collect as much points you can get in a restricted time. The player gets direct feedback of score and remaining time. In the different levels he will awarded with exiting backgrounds, funny cartoons and audible jingles. These visible and audible awards give the player a lot of positive feedback. These permanent positive feedbacks can induce a flow feeling, which is best precondition to store the inventive principles into the player's brain for a long time.

A further option to use this game is to click the pictures step by step. In this option the player won't be awarded with points, but he can imagine his own picture story of the inventive principles. If he remembers this story again and again, he will memorize the principles very easily.

So the 45 inventive principles of LOBIM are always retrievable and applicable in the problem solving process.

The LOBIM training game is available for Windows computers and tablets. At the end of 2018 hopefully it will be available for Android and iOS smartphones.

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