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Research Scope and Perspective

With 89 Figures, Including 1 in Color

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23. Effective Learning Through Gaming Simulation Design

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Introduction

In order to survive, people, groups, organizations, and societies need to adapt continuously to the change of inner and outer conditions. Therefore, human beings and social systems must be able to learn. Learning on the individual level implies acquiring knowledge, skills, and competencies in order to cope successfully with different circumstances. Learners need to change their inner conditions. Through cognitive (re)construction of mental models, learners change their perception and interpretation patterns of reality. Simultaneously, individuals must deal with the environment in which they live. Learning at the level of social systems signifies the change of systems cultures and structures. Organizational learning affects the (re)construction of social representations and norms of groups and the development of social systems' processes in order to create sustainable and humane societies.

With the use of gaming simulation, a general competence in dealing with change processes can be developed. Simulation games can also be used for supporting the acquisition of knowledge and competencies in a domain-specific context for the training of specific skills. Gaming simulation and the design of simulations with debriefing can be used as methods of training to foster individual learning processes. Simultaneously, the use and design of simulation games effects learning at the organizational level. New sensibilities and awareness, new team skills, competencies and cognitive capacities, new action rules, attitudes, and values that are formed in the run and design process of simulation games give direction, and are implemented to produce new organizational approaches, structures, and corporate cultures (Kriz 1998, 2001). Gaming simulation enhances a shift of existing organizational cultures and structures and in this way contributes to the change process of social systems. This leads to a preferred (re)construc-

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tion of real situations through the constitution of new action patterns, norms and roles, and the change of the physical and social environment itself. In this way, organizational learning, individual learning in organizations (e.g., in school, university, company, etc.), and the cultural change of organizations form the basis and offer fundamental social contributions to maintain healthy and peaceful societies.

A Training Course with Gaming Simulation Design

In the process of experiential learning, the playing of simulations games, their design, and debriefing are all important aspects of the learning cycle. We developed a 560-h gaming simulation-based training course on systems competence (the program takes 1.5 years). During the course, participants not only play simulation games and experience different forms of debriefing, they also learn how to facilitate and debrief simulation games ("train the trainer"). In addition, they design simulation games as well as debriefing sessions ("train the designer"). See Table 1.

The main contents and objectives of the program are: fostering of systems thinking (especially skills for analysis and sustainable development of complex system dynamics), fostering of teamwork skills (especially training of competencies for better problem solving, decision making, communication, and exchange of mental models in groups), and learning about methods of gaming simulation. Within the program, simulation games are designed that should contribute to the sustainable development and cultural change of selected social systems.

During Seminar 1, students participate in different simulation games in order to gain basic skills in systems competence and to learn about methods of gaming simulation (e.g., policy exercises, role play, pure games and experiential learning activities, simulation games and played simulations, computer simulations). In this seminar, trainers lecture on theory (lecture and discussion), present various techniques (e.g., tools for building models and systems analysis, brainstorming techniques, decision-making techniques, debriefing methods, etc.), and run illustrative simulation games.

During Seminar 2, the participants gather information and knowledge, and prepare methods, techniques, and simulation games in small project teams (with coaching by the trainers). The participants are the ones that lead the activities of the second seminar: facilitate and debrief simulation games, train methods and techniques (similar to Seminar 1). In addition, optional workshops are offered: a special course in outdoor training methods (e.g., with low and high ropes course elements and special combinations of outdoor exercises and gaming simulation), a seminar about computer simulation, and use of system modeling software and a workshop on large-group simulation games. Special problems and effects of large group games are not only discussed in theory, participants of the workshop also prepare and facilitate a large group game with more than 100 participants.

TABLE 1. Structure and contents of the training program for systems-competence with gaming simulation

Activities in the whole group of participants	Individual tasks (I) and teamwork in project teams (T)	Training hours
Seminar 1: Introduction		2 h
Seminar 1: Basic course		50 h
	I: Writing learning diary	7 h
	I: Design a modification/variation of a simulation game presented in Seminar 1	6 h
	I: Paper about theoretical contents	15 h
Sum step 1		80 h
Seminar 2: Introduction		2 h
	T: Prepare the facilitation of exercises, presentations, and simulation games	40 h
Seminar 2: Train the trainer, conduct games and debriefing		60 h
	I: Writing learning diary	7 h
	I: Design a modification/variation of a simulation game presented in Seminar 2	6 h
	I: Paper about theoretical contents	15 h
Sum step 2		130 h
Seminar 2a (option)—outdoor training		20 h
Seminar 2b (option)—large group game	T: Prepare and conduct a simulation game for 100 participants or more	40 h
Seminar 2c (option)—computer simulation and modeling software		40 h
Sum step options		100 h
Seminar 3: Introduction		8 h
	T: Design of simulation game, prepare the facilitation of self-designed prototype game	80 h
Seminar 3: Train the designer, conduct of designed games with debriefing		60 h
	I: Writing learning diary	7 h
	T: Writing game-manuals (facilitator and participants manual)	15 h
Sum step 3		170 h
Seminar 3a (option)—projects	T: Work as co-trainer and/or co-designer in real gaming and simulation projects (in small teams) for customers (possible to write thesis)	40 h
Seminar 3b (option) attending guest lectures of gaming and simulation experts		10 h
Sum step 3 options		50 h
Seminar 4: Excellence in gaming simulation	Seminar at Venice International University	30 h
Total sum with all options		560 h

During Seminar 3, the participants again have the opportunity to form teams, in which they are to design simulation games. There again the trainers play a supervisory role. Self-created prototype games are presented, conducted, and tested. The trainers facilitate a continued meta-debriefing within the whole design process. Again, additional optional activities are offered at this stage of the training program: guest lectures with experts and participation in real projects. Students can also choose to write their thesis on a topic related to gaming simulation (e.g., evaluation of self-designed games, empirical studies about the effects of training programs, etc.).

Seminar 4 focuses on gaming simulation for intercultural communication (with participants and lecturers from different countries) and on "excellence in gaming simulation." There again simulation games are designed in teams, although in a very short period of time. Topics of the designed games are intercultural communication and additional specific themes linked with current design projects of the lecturers.

Empirical evaluation studies of this training course, based on measurements both before and after, show significant improvements in knowledge and competencies, and a clear effect of knowledge transfer via training, as compared with control groups without such training. Studies highlight especially the combination of education team skills and in systems thinking through gaming simulation, which leads to a more sustainable systems management. As a result, the students' systems competence especially increases during the phase of designing their own games (Kriz and Brandstaetter 2003).

The design of games and simulations is used as a training method in order to improve students' acquisition of knowledge and skills, and to aid in the formation of shared mental models within groups. Among the group of participating students, the design of simulation games creates a virtual reality that leads to a change in their social representations of reality. The construction of models and the design of corresponding simulation games tends to be more effective than simply participating in rigid-rule simulation games (even if they are properly designed by simulation and gaming experts; Kriz 2003). The translation of experiences gained from the design of a simulation game and from the playing of the self-designed games to the real life system lead to a deeper understanding of that system's structure. This understanding may lead to intervention in the system in order to improve its functioning. The design of simulations and games by stakeholders can be defined as a type of "free form game." Participants have the opportunity to settle their own learning goals, construct models of reality, and define game rules. The design process as a self-organizing learning environment helps reveal the communication modes of the group as well as the individual mental models and systems representations of the participating designers. Common values, goals and rules, social representations of reality, and common strategies for complex systems management can be mutually shaped. In this way people are more committed to their own ideas and visions of change. Therefore, the probability of an effective change process within the reference system of the designed game increases.

The participating students are educated in the training course to become designers themselves. In this way, participants, as designers of gaming simulation, should also become change agents to develop and implement appropriate learning environments in educational organizations. The process of game design as a part of the curriculum at the University of Munich enhanced the preferred change of the institution itself. The learning process and the learning culture at the university is effecting change in the direction of a new and preferred culture that provides students with more opportunities for self-organized learning, team learning, and experiential learning.

Participants of the training courses are students of the educational sciences (future educators) and they design games that they intend to use later on in their own classrooms. Some of these education students and recent graduates have gone on to design games with their own pupils. More than 25 teams designed games in the last 5 years with a large spectrum of different gaming simulation methods, different contents, and varied learning objectives (Kriz and Reichert 2001). The learning aims of these games range from the development of personal and social skills to domain-specific and methodical competencies.

Five short examples that have already been successfully evaluated within the context of diploma thesis and which were also implemented in the school curriculum are:

- A simulation game about environmental education and teamwork in the classroom; target group are pupils of 3–4th grade primary school (age: 8–9 years); dealing especially with eco-farming and cooperative farming;
- A simulation game for mathematics education, team building and team development in the classroom; target are pupils of 8th grade high school (age: 13–14 years); fostering mathematical abilities (linear relations, proportionality, fraction terms) and social communication skills;
- A role-play game about creating a positive climate and good relationships in the classroom and about integration of outsiders and handicapped in the class; target group are pupils of 3–4th grade primary school (age: 8–9 years);
- A simulation game for intercultural communication, conflict resolution, and consensus building within value conflicts, building awareness for implicit social norms; target group are pupils of 10–12th high school, university and vocational training (age: 16 years and older);
- A frame game for learning how to learn and to develop better learning strategies; target are pupils of 5–10th grade high school (age: 10–15 years).

The next section shows a large group game, which was designed within the course.

Cruz del Sur—A Large Group Game

The game was designed as a highlight for a 1-week Boy Scout camp with nearly 1000 participants with ages ranging from 7 to 25 years. The learning goals for the whole week were: cross-cultural learning, improvement in communication, and

strengthening of the solidarity between the participants. The organizers divided the scouts into five age groups and each was settled on its own "planet" (camp group).

The configuration of the game was five planets, five different cultures, and five completely different ways of thinking and living. However, only together can they save the galaxy from apocalypse. Only if all of them act together can they avert the danger. This is the task of the 1-day large group game Cruz del Sur (Fig. 1).

Every planet has its own culture, its own history, and its own rules. The five planets together with several uninhabited planets are part of a galaxy named Cruz del Sur. (The star constellation Cruz del Sur, the Cross of the South, actually exists. It can be seen in the sky of the southern hemisphere.)

The first planet is Acrux. The Acruxianer are travelers and merchants. They trade with everything available and buy all goods, objects, food, new games, information, etc. Most important is that they are the only species that can transport goods through the galaxy, because they have the necessary freighters. This is their asset for the realization of the common goal.

The second planet is Becrux. The Becruxianer are a high-tech society focusing on technical solutions and statistics. The contribution of the Becruxianer to the common goal is the design of a symbol. Toward the end of the game, they have to arrange all players in the pattern displayed by the symbol.

FIG. 1. The participants form a "human" Cruz del Sur

Third is Gacrux. It is a cold, barren, and inhospitable planet without resources. Therefore, the Gacruxianer have to trade to get everything they need to survive. The task of the Gacruxianer is to learn as much information as possible about the other planets and to document everything with photos. Because of their studies, the Gacruxianer will gather information about the apocalypse.

The inhabitants of Decrux, the fourth planet of the galaxy, spend most of their time designing and making jewelry and other beautiful items. They also like to play and have religious ceremonies. Through the ritual the Decruxianer get their food and will also find out about the apocalypse. So their assignment is to send groups to the other cultures and inform them about the dangerous threat which can destroy the whole galaxy. Later on they are also told how and where the apocalypse can be prevented.

The fifth and last planet is called Ecrux. The population of Ecrux is a very conservative, reactionary macho-culture. Men like to drink tea and to play games, while women have to make tea and design games. Because Ecrux is the only planet where yellow exists, this makes the planet very important for building the symbol at the end of the game, because many people from other cultures need something yellow in the end.

At the beginning of the game the participants have to adapt to their own culture and to master the challenges inherent to living on their planet. Then they have to contact the other cultures, trade with the other planets, and learn more about them. Furthermore they have to follow a number of rules:

General Rules:

- Communication between the cultures is only allowed on the planets and not while traveling from one planet to another.
- The population of a planet is divided into groups of 10–20 people by lot. The groups have to stay together for the rest of the game. Every activity has to be done by the whole group.

Rules for Traveling:

- About half of the population should always stay on the planet to welcome visitors. This is necessary so that visitors can be received at any time and get a comprehensive impression of the planetary life and culture. The game leaders can decree laws of exception for any planet upon request of that planet's regional government.
- Only predetermined groups are allowed to travel. Two group members at most are allowed to be absent while traveling.
- While traveling, only personal property can be taken, e.g., one's own lunchbox. For transporting goods, special freighters (labeled backpacks) are required.
- Galactic turbulences aggravate traveling in the star system. Every inhabited planet is surrounded by a critical zone, which travelers have to get through in order to reach the planet.
- A small number of high-tech, one-man spaceships can pass through those critical zones without being affected.

Regional Governments:

- At the beginning of the game, each group elects one representative for the regional government of its planet. Each regional government has one president which is elected by the representatives.

At first glance, one could be under the impression that the planets are not necessarily dependent on each other. As the game proceeds the situation changes. In the course of their research, the Acruxianer find out that a black hole closes in on the galaxy at a very high speed and threatens to destroy the entire galaxy. If they fail to swiftly inform the other cultures and develop a solution together with all of the other races, then all of the planets are doomed.

What can be done to save them? To prevent the apocalypse the inhabitants of all five planets have to work together. Many things are needed and important parts of the solution only exist on each one of the planets. Every culture plays an important role, but they need one another to survive. During the game, the cultures have to find out what they can do to prevent the catastrophe and what the role of each culture is. In the end they have to create a symbol, which shows the star constellation Cruz del Sur, made of blue and yellow plates. This symbol has to be built on one of the uninhabitated planets of the galaxy.

If all the cultures work together and manage to construct a "human" Cruz del Sur they will save the galaxy from the catastrophe and win the game (Fig. 2).

FIG. 2. The catastrophe has been prevented

After the game, a debriefing took place in the same small groups that already existed during the game. Its major goal was to find out whether the following learning objectives had been achieved:

- Cross-cultural communication
- Tolerance toward other cultures
- Solving of problems and challenges
- Interaction and group dynamics

Because of the large number of participants, the debriefing was done in written form. Also, problems and questions were addressed in order to promote reflection of what had been learned and to transfer new insights won during the game to everyday life as a scout. It was important to show what the simulation had to do with reality. The participants played in the same age groups which normally exist for pioneers. These groups have many problems in everyday life and so the organizers tried to solve these problems by playing a game.

Closing Remarks

Recent education graduates and participants of the training course have also started to use gaming simulation in processes of organizational development of school administrations. Increasingly, more appropriate learning environments are constructed in the educational system, with a great potential to create effective learning processes and to advance educational social systems. In addition, the designed games of the training programs phase III deal with different social issues and in this way contribute to the development and preferred change of social systems and society itself.

To push this forward Cruz del Sur, for example, is now adapted for use in schools. In summer 2004, it will be played in two high schools with 850–900 pupils per school to develop the pupils' skills in teamwork and social competence and to contribute to a better climate of confidence and mutual assistance in the school system as a whole.

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24. For the Knowledge Society: How to Involve Human Resources in Gaming

Arata Ichikawa[1] and Mieko Nakamura[2]

Introduction

The most important resource in the knowledge society will definitely be organized human beings. The assumptions, opinions, and objectives of people and their organizations will be primary facts for future gaming research.

Peter F. Drucker (1985) pointed out that "scientific" is not synonymous with quantification. He teaches that "scientific" presupposes a rational definition of the universe of science as well as the formulation of basic assumptions that are appropriate, consistent, and comprehensive. He insisted that the first task for management science is to define the specific nature of its subject matter. To gaming researchers, what he wanted to emphasize seems to be that this should include, as a basic definition, the insight that the business enterprise is made up of human beings.

Drucker's thoughts on management science, as mentioned above, have had an influence on not only our business game research, but also our gaming research in general. As gaming simulation should be understood to be human or human–computer simulation of social processes, our approach to gaming research focuses on communication, information sharing, knowledge creation, and decision making for teamwork in a small group.

Although our gaming research is still in its embryonic stage, this chapter presents a series of dialogues and actions in a game without using built-in computer simulations in observing the conversational learning process of a gaming team. This empirical presentation shows the current state of teamwork activity of players in a Japanese management style.

In the following sections, we address management and business gaming in order to define what gaming is universally in line with Drucker's thoughts on management.

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