

# Playing (with) Educational Games: First and Second Order Gaming

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## Summary

Because games have come into focus for the delivery of educational content, it seems necessary to clarify some of the workings, possibilities and constraints of this medium to be taken into account when creating or using game based learning environments. The approach presented here is based on the assumption that games are expressive and formative medial spaces, and that playing can be seen as an integrated activity of toying, game creation and game play, with liberating virtuality, expressive choice and explorative repeatability as important aspects for educational game design. These claims are supported by theories of play and games, as well as by moderate and radical constructivist theories.

The presented concept of first order gaming is followed by a proposal for an integrated educational game design, which includes the adaptation of the rule system and the narrative elements to the learning objectives, for an adequate and fitting situating of content. In second order gaming, the educational goal is the player's awareness of boundaries, contexts and bias, of the game content as well as of games as medium. To render defining and confining elements of and in games visible, make them accessible and challenge them to be reconfigured, there is a call for a specific mode of design and play, categorised in three different approaches: metagaming, transmediality and unusability.

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## 1. Games and play

### 1.1 Uses in science and education

The idea to utilise the natural appeal of toys and games for educational purposes is no a brainchild of the 20<sup>th</sup> century. For example there are educational creations like the complex 11<sup>th</sup> century strategic board game “Rhythmomachia” teaching harmonic mathematical relations<sup>1</sup>; in the 19<sup>th</sup> century the “Wargame” of Hellwig doing the same for the basics of warfare<sup>2</sup> or the simple, toylike “gifts of play” (“Spielgaben”) of Fröbel for aesthetic explorations<sup>3</sup>. Dedicated games and toys have been used for educational purposes, for the experience of and the experiment with objects and rule systems. The notion of playing as activity well suited for the directed development of physical and cognitive skills may be as old: Erasmus von Rotterdam, Comenius and Locke all agreed that the natural joy of playing could be used to facilitate learning in children<sup>4</sup>.

On the other hand, the rule-based, rational and procedural character of strategic games and the playful, moment-bound creativity of playing lend themselves to be used as supportive metaphors for analysing and explaining anthropological, linguistic, mathematical or socio-economic phenomena. For example Schiller, Wittgenstein, Hilbert or von Neumann<sup>5</sup> have utilised this metaphorical approach for their theories on human behaviour and aspects of ‘reality’.

Although the interest in educational games at the beginning of the 21<sup>st</sup> century is greatly driven by the possibilities and attractiveness of digital media and simulations, it is also grounded in a long tradition of educational and scientific interest in games and playing as an ubiquitous observable phenomenon, didactic method and scientific metaphor<sup>6</sup>.

### 1.2 Obvious advantages and criticism of games as educational tools

What is at first sight turning educational games especially attractive in a socially and educationally stratified performance society are two distinctive traits. First, how game content may be perceived generally, i.e. as challenging, joyful, safe,

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<sup>1</sup> For a description see e.g. <http://en.wikipedia.org/wiki/Rithmomachy> (accessed Oct 2, 2009).

<sup>2</sup> Nohr (2008): “Die Natürlichkeit des Spielens”, p.75.

<sup>3</sup> For an overview and explanation of Fröbel’s „gifts of play“ see <http://www.froebelverein-keilhau.de/0000009bba1161d25/0000009bba125bf63/index.html> (accessed Oct 7, 2009).

<sup>4</sup> Flitner (2002): “Spielen – Lernen”, p.14.

<sup>5</sup> Friedrich Schiller defines playing as inherently human, as necessary mediation between form and sensation; Ludwig Wittgenstein creates the “language-game”, where grammar is the rule system of verbal communication; David Hilbert compares mathematical proofs to making a move in a rule-bound game; and John von Neumann develops his game theory to explain decisions in complex situations with rational behaviour.

<sup>6</sup> A “scientific metaphor” may sound like a contradiction, but according to Charles S. Peirce’s “abductive reasoning” or Jeromes Bruner’s “narrative mode” this may be the only way to create new paradigms, rather than just differentiating existing ones. These approaches show similarities to radical constructivist views as well as to creative, assimilative playing. For an explication of abduction see Fischer (2000): “Rationalität zwischen logischem und paralogischem Denken”; see also Fischer’s similar online-text at <http://www.hrudifisch.de/html/paralogisches/index.html> (accessed Oct 3, 2009). Narrative and paradigmatic modes are described in Bruner (1986): “Actual Minds, Possible Worlds”.

manageable, closed, and non-evaluative. Second, how the actual 'serious' content may be delivered, i.e. in a simplified, interactive, experience-based, constructive and emotionally appealing form. Thus common positive conclusions for the use of game based learning approaches are:

- Adolescents from lower social strata who usually shun educational initiatives may be reached by educational games<sup>7</sup>.
- "Digital natives", i.e. those who have grown up in a culture already permeated by computers and internet, may be addressed better by focusing on their specific modes of information handling – e.g. a handling that is instantly rewarding, interactive, playful fun, fast, and nonlinear<sup>8</sup>.
- The effectiveness and sustainability of gained knowledge may be raised by the shift from passive consumption to holistic, interactive experience, and the inclusion of attitudinal and emotional involvement of the learner<sup>9</sup>.
- Algorithm-driven adaptability of the game to the growing skills or behaviour changes of the individual learner/ player may incorporate and advance aspects of the cognitivist intelligent/ adaptive tutoring system approach<sup>10</sup>.
- Technical and social networking of games and gamers may facilitate long lasting and creative communities of interest and practice, resulting in a self-sustaining culture of teaching and learning within a culture of playing<sup>11</sup>.

A recent development rendering games also interesting for media education is the congruency of games and digital media. We can find similar characteristics of emergent polymorphy, interactivity and procedurality in both of them: Both appropriate, reinterpret, reformat and integrate existing media; both are dependent on a state-changing interplay of user and medium; and both are higher-level content organisers, because they not just deliver information, but describe, exemplify and support the generation, communication and application of it. These characteristics may turn an in-depth understanding of the workings of games as medium into an asset for the understanding of interactive networked digital media.

On the other hand, educational games may also be seen as – yet another – utopian didactic concept<sup>12</sup>, an update of the "Nuremberg Funnel", but extended for learner-autonomy and enjoyment. It promises sustaining, applicable knowledge

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<sup>7</sup> Merschmann (2007): "Aus Ernst muss Spaß werden". Reversing the view, the JIM-survey 2005, one consistently carried out survey on the usage of media by children and adolescents in Germany, found out that "with a higher level of education [...] the interest in [...] computer games [...] diminishes." MPFS (2005): "JIM-Studie."

<sup>8</sup> Prensky (1997): "Reaching Younger Workers Who Think Differently".

<sup>9</sup> Squire (2005): "Game-Based Learning".

<sup>10</sup> Bopp (2003): "Teach the Player". The adaptability of programs to the skill level of players is well known to game designers as "rubberbanding", a ludic relative to Vygotskys "Zone of proximal development", and a mainstay of the software-based cognitivist Adaptive/Intelligent Tutoring Systems approach. See e.g. Gradl (2001): "Organisation und Unterstützung des Selbstlernens durch Adaptive Tutorielle Systeme".

<sup>11</sup> If popular gaming is seen as spawning subcultures of interest and practice, e.g. with MMORPGs like "World of Warcraft" or Tactical Multiplayer FPSs like "America's Army", the works of Brown, Lave and Wenger on learning as cultural initiation, participation and integration may apply. See Brown et al. (1989): "Situated Cognition and the Culture of Learning"; Wenger (1999): "Communities of Practice".

<sup>12</sup> Tan (2007): "eLearning als utopische Praxis?"

without conscious effort, and even being fun for the 'recipient' during acquisition<sup>13</sup>.

The nature of skills and attitudes to be gained in most learning games is – one can say as a systemic precondition of being didactic content – (an) objective: The goal is a defined change of the learner from a given to a wanted state, with this state edited and encoded into a closed medial form by its creators. These "first order" educational games, because they not only target the acquisition of certain knowledge and skills but also of attitude and context, may be criticised to be exploitable for commercial, ideological or propagandistic use as well. Squire's observation can thus be seen with a grain of salt:

"Organizations – from Microsoft to the United States Army – need workers not just to perform competently but also to adopt the values and perspectives of the parent organization and think creatively with them in solving problems. And getting people to adopt new roles – to think creatively within new perspectives – is one thing that game designers know how to do."<sup>14</sup>

While educational game designers may point to studies documenting the effectiveness of game based learning<sup>15</sup>, the same studies may be read as evidence for the claim that games are generally more dangerous than books, pictures or TV and require censorship or controlled use – *because* of their unique properties in teaching skills and changing behaviour. What is possible to be used for "good" intentions, e.g. to train future US-soldiers or Microsoft-workers in the spirit of their employers, is also open for "bad" ones, e.g. to prepare insurgents or school shooters<sup>16</sup>.

What may be easily overlooked in the search for an effective educational medium is the Janus-like nature of games. On the one hand, their nature demands submission under and compliance to the rules and goals of the game to play and win. On the other hand, this very nature defines games as something anarchically set apart from real life, where rules, goals and narratives are very obviously created artefacts – and are thus open to change if the players do not like the game and/or crave a different one.

Before turning to the design of first and second order educational games, some terms have to be clarified: What defines a game and a toy, gaming and playing, and what renders them unique for educational use?

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<sup>13</sup> Papert remarks a bit cynically that educational games in most of the cases do not inherit the best but the worst attributes of education and games. See Papert (1988): "Does easy do it?", also Squire (2005): "Game-based Learning", p.36.

<sup>14</sup> Squire (2005): "Game-Based Learning", p.7.

<sup>15</sup> Meta studies on empirical research such as Randel et al. (1992), Wolfe (1997) or Hays (2005), hint on the importance of setting, fitting topics and approach, but give, except Randel, a generally positive review on the effect of game based learning. Studies on senso-motoric effects, e.g. by Green and Bavelier (2003) or Rosser et al. (2007), see game-trained dexterity, spatial orientation and hand-eye-coordination as significantly successful.

<sup>16</sup> See e.g. Hackensberger (2005): "Virtuelle west-östliche Kreuzzüge" or the controversy started by Danny Ledonne's game (2005): "Super Columbine Highschool Massacre RPG".

### 1.3 Break, make and take 'reality': Playing as three modes of action

Definitions of play and games are abundant, ranging from pragmatic approaches of game designers<sup>17</sup> to socio-cultural or philosophical definitions<sup>18</sup>, from structural to functional views; sometimes even as example for a phenomenon hard to describe<sup>19</sup>.

One of the most quoted definitions of play may be from Huizinga's 1939 "Homo Ludens":

"[...] a free activity standing quite consciously outside 'ordinary' life as being 'not serious' but at the same time absorbing the player intensely and utterly. It is an activity connected with no material interest, and no profit can be gained by it. It proceeds within its own proper boundaries of time and space according to fixed rules and in an orderly manner. It promotes the formation of social groupings that tend to surround themselves with secrecy and to stress the difference from the common world by disguise or other means."<sup>20</sup>

This definition, due to its comprehensiveness, may be difficult to apply to some modern digital-age phenomena of play, where the boundaries between players and participants may be blurred, or where the familiar definition of play is open to be played with itself: a second order gaming perspective has to include acts of game creation and the redefinition of the medial boundaries of games as an integral part of playing.

Costykian's minimalist definition of "game" stresses artificiality and aesthetics, choice, symbolic action and direction, and may be in principle open to define the game's rules as resource, too:

"A game is a form of art in which participants, termed players, make decisions in order to manage resources through game tokens in the pursuit of a goal."<sup>21</sup>

Piaget delivers a complementary and for second order gaming very useful aspect of play in "Nachahmung, Spiel und Traum". Accommodation is described as the process of adapting one's cognitive structures to given external stimuli, while assimilation lets one interpret given stimuli to one's own cognitive structures – these latter ones may include prejudices, hallucinations or fantasy. The player's choice of what is possible is not confined to given regulative boundaries, because

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<sup>17</sup> See e.g. Costikyan (1994): "I have no words and I must design"; Crawford (1982): "The Art of Computer Game Design"; Salen and Zimmerman (2004): "Game Design Fundamentals".

<sup>18</sup> Salen and Zimmerman (2004) deliver a contextualised overview on the more common definitions as does, slightly more concise, Juul (2002) in "Half-Real", p.29 ff. English and French authors have the advantage that game and play are already separate linguistic entities, while the German language with "spielen" does not differentiate between verbs for free playing and rule bound gaming.

<sup>19</sup> Wittgenstein (1997): "Philosophical Investigations", §3 ff.

<sup>20</sup> Huizinga (2001): "Homo Ludens", p.22, translation of the quote taken from Wikipedia article on "Play" (accessed Oct 10, 2009).

<sup>21</sup> Costikyan (1994): "I have no words & I must design".

an overriding choice can be made to appropriate reality and create new boundaries to play in. Whenever a child decides to turn a stick into a sword, herself into the dangerous black knight, and the sorry brushwood behind the house into an enchanted forest, this happens:

“Play can be recognized by the more or less large-scale change in the relation of equilibrium between the reality relation and the ego. One could thus say: if adaptive activity and thought produce an equilibrium between assimilation and accommodation, then play begins at the point at which assimilation begins to dominate accommodation [...] Play is thus practically pure assimilation.”<sup>22</sup>

Bateson describes play as a complex act, even a paradox act of and for communication. His definitional frame starts with the aforementioned new, assimilated boundaries, and with the player searching for someone else to share it with, i.e. someone to play with. The communicative challenge is this:

“ “This is play” looks something like this: “These actions in which we now engage do not denote what those actions *for which they stand* would denote.” ”<sup>23</sup>

These actions are ‘real’ and readily interpretable as play, but their in-game meaning is purely virtual. Playing is a complex sequence of anarchistic toying, innovative game creation and rule-complying gaming, of turning aspects of reality into virtuality.

#### 1.4 Virtuality: Choices in a self-chosen framework

Playing is about choices and the communication of these choices: *What* I choose to do within a game – and *that* I choose to be in a game in the first place.

Whether I play a game of chess, soccer or Counter-Strike: I decide on certain moves and realise my decisions in a symbolic manner, e.g. by manipulating a playing piece, myself as a player, or as an avatar. This happens compliant to a set of meta-communicated rules, so my co-player(s) may interpret my choices as in-game and react accordingly. This is the definitional frame of play in classic rule-based games, including most card games, board games, team games, computer games, etc.

Furthermore, this feature of choice and communication sets games apart from classic media like text, image or film, where the balance of choice is usually tipped in favour of the content’s creator<sup>24</sup>, and the interpretation of this choice is confined to the mind of the reader or viewer.

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<sup>22</sup> Piaget (1975): “Nachahmung, Spiel und Traum”, translation in Pias (2003): “Action, Adventure, Desire”. See also Sutton-Smith (1978): “Die Dialektik des Spiels”, p.53.

<sup>23</sup> Bateson (2000): “A Theory of Play and Fantasy”, p.180, italics by the author.

<sup>24</sup> Crawford (1982): “The Art of Computer Game Design”, p.13.



### 1.4.1 Play: Creating virtuality

Playing is, as Bateson states<sup>25</sup>, about getting rid of choice defining limitations in an assimilative act, and about the refitting and communicating of new ones. This relates to the higher-level choice “This is play, not reality”, but also to specific in-game choices like “This stick isn’t a real sword, but I’ll treat it like one”. This feature of playing sets toys apart from any object, process or system, where the defining limitations are a socio-culturally encountered given and have to be accepted and adopted, i.e. accommodated – e.g. for an elongate piece of wood to be just that; or similarly for a book to be read, for learning to be the counterpart of teaching, or for a market driven society being part of a given socio-cultural environment.

Thus the verb ‘playing’ usually describes for starters a distinct mode of perception and activity: The explorative stripping of given contexts and meanings of objects, followed by the assimilative and re-interpretative handling, respective creation of a toy. So, how does this happen in concrete?

Abstract regulative elements – rules – give a game jurisdiction, direction and manageability of its use, while concrete narrative elements – e.g. basic game metaphors, background stories, visual design – give a game context, continuity and signification. A toy is an object, which is in certain aspects regulatively and narratively not yet defined, though it may suggest certain interpretations of its use as part of a potential game. Every object, process or system may be turned into a toy – it can be toyed with – before it can be recreated as a game, or part of a game – where rule-bound gameplay is possible.

A ball, a doll, a stick for example, pass as archetypical toys<sup>26</sup>, but “Kick it as far as you can”, “Play house with it” or “Use it like a sword” define them as part of a game, with a set of rules and a background narrative to comply to, at least as long as the game lasts.

As Glasberg showed<sup>27</sup>, the interpretative handling of objects is not connected to their cultural contextualisation, as long as a player is given leeway to ‘invent’ new usages. E.g. given a set of toys consisting of cups, pot and a tray, children would reliably play “teatime” in the majority of cases, while a set of cups, a shovel and a towel would elicit playful re-interpretations of the objects beyond their obvious cultural assignments, and challenge their contingent ab-use under a common context of play.

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<sup>25</sup> Bateson, (2000): “A Theory of Play and Fantasy”.

<sup>26</sup> A stick represents such a basic concept of a toy that 2008 it was nominated for ‘toy of the year’ in the National Museum of Toys, along e.g. the cardboard box. See <http://www.museumofplay.org/NTHoF/NTHoF.html> (accessed Oct 14, 2009)

<sup>27</sup> Sutton-Smith (1977): “Die Dialektik des Spiels”, p.77.

Toying strips objects from their common significations. To allow for a specific gameplay, a different set of these have to be refitted in an act of creation so that a game within this new set of defining limitations may be possible. Thus a branch may be broken from a tree, playfully tossed and twirled, and finally being used as a sword. But if the player breach this novel signification by aiming it at her fellow and saying “Bang!”, a new set of rules and narratives have to be communicated and agreed upon.



Figures 1-3

Figs. 1-3: A branch from a tree is stripped of its signification and used as a toy: Just the physical properties remain, and evoke a flux of associations. Finally the branch is used as a sword, and gets embedded in narratives and rules to create a game as a negotiable safe space of expression, shareable with other potential ‘knights’.

#### 1.4.2 Games: Organising virtuality

The defining properties of toying, game creation and gaming are the detachment, the creative reassignment and the acceptance of new significations of objects, processes and systems. The result is a simplified and communicable virtual aspect of reality, that is accompanied by the freedom of consequences beyond the scope of itself, which in turn provides the safety required for a positive (re-)interpretation of failure and shunned behaviour, and fosters exploration, innovation and novelty<sup>28</sup> – in short: a game.

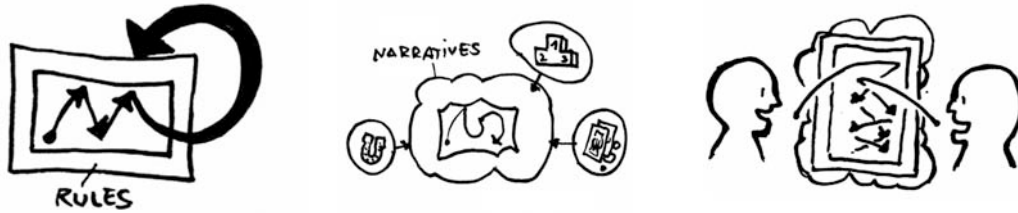
Games themselves consist of two layers: a static regulative-narrative frame as a result of game creation, and the course of individual games performed within, as result of players playing the game.

Games are organised information in the form of rules and narrative elements. But, more important, they themselves organise a players’ emerging knowledge in the form of rule interpretation and communicative exchange via meaningful moves. ‘Meaningful’ can be interpreted on two levels: First, there is a meaning to be assumed behind the player’s choice, that it is not an arbitrary act happening, but conveys decisive in-game information. Second that the choice is within a set of

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<sup>28</sup> For an explanation of how the training of novelty in play may be crucial for our culture, see *ibid.* p.82 ff.

possible – and expected – choices which comply to the game’s rules, making clear that the player is playing at all.



Figures 4-6

Fig. 4: A game provides abstract rules to establish what is allowed as a player’s move. If a made move is not complying to the rules, the players have to leave the virtual reality for a meta-communicative act to clarify or end the game: “You cheat!”, “Can we change this dumb rule?”, “I don’t want to play anymore.” etc.

Fig. 5: A game provides narratives and metaphors to explain and simplify gameplay. Falling back to well known cultural assets, a game reflects and stabilises common sets of actions, e.g. related to war, trade, gathering, hunting, competition etc.<sup>29</sup> There is for example no rule that prevents a chess player to help her opponent to win; though in a competitive board game of abstract war, this behaviour would probably lead to irritation.

Fig. 6: A game provides a space for different gameplay each time it is entered. While narratives and rules are fixed, the players may decide on how these are interpreted and what move from a set of possible moves should be chosen to be a meaningful one in a sequence of previous moves, comparable to the act of speaking in a dialogue.

To give an example: random moves on – or even off – a chessboard would render a game impossible. Both players would expect their opponent’s move to be a continuation of a sequence of moves hinting on a directing and directed strategy to win. Both would take any action, which does not comply to the rules of chess, like talking or sorting the captured chess pieces, to be outside of the game’s frame of significance and thus irrelevant for its course.

Even if a player has never encountered chess before, she might be familiar with the notion of a board game, of symbolised warfare, or of abstracted playing pieces. These cultural narratives help to understand the game and to act in the game: They remove nearby options like playing with or outside the physical board, of cooperative behaviour between the players, or of emotional distress if a playing piece is captured. Thus these narratives define and restrict the medium ‘chess’ to be playable by more than one player, to become a part of and reflect the culture it is played in, and stabilise the culture at the same time.

If a given game represent a simplified version of a medium – including an (artificial) cultural background in the form of background story or base

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<sup>29</sup> As an example for cultural-narrative embedding see the different background metaphors for racing games like „Mensch ärgere dich nicht“ resp. „Sorry!“ in a Korean („Yut“) or Mesoamerican („Patolli“) variation: [http://en.wikipedia.org/wiki/Category:Cross\\_and\\_Circle\\_games](http://en.wikipedia.org/wiki/Category:Cross_and_Circle_games).

metaphors<sup>30</sup> – then a *played* game represents a unique expressive exchange within this medium: the rules may limit the choices available, but cannot foretell which trail of decisions will be made by the player, while narratives motivate the player and justify certain directions of this course.

The range of the players' creatable 'expressions' may vary from game type to game type: from linear quiz games, where the only expressive options are to proceed or to fail by giving true or false answers; to strategic board games like chess, where possible moves and countermoves interdependently form a wide branching tree; to networked community-based interpretative games like Alternate Reality Games, which may open semantically, spatially and participatory into a landscape of interpretations and actions.

Games aren't just descriptions of forms, but also of the space where *potential* formations can take place and are challenged to happen.

For education, games ideally deliver contextual boundaries and motivational incentives for meaningful decisions. The player is challenged to repeatedly tackle virtual problems encoded within the rules and narratives. This may ideally be done by following differing strategies, while allowing for failure, digression and deviance within the game, not as hindrance or something to be avoided, but as something supportive, even essential to playing and learning.

Gameplay is thus a dynamic, iterative expression within a static medium, more related to topic-bound dialogue, improvised performing arts and digital simulations than to text, picture or film. As such, the potential of consequential and meaningful decisions of all kind should be taken into account when a learning objective is going to be based upon games as medium as well as on the limited actions of concrete, rule-bound gaming.

### 1.5 Expressive choices: The externalisation of decisions

Although 'good' books, photos or movies also beg to be received and interpreted more than once, only in games the interpretation itself is externalised as significant moves by the player. This sequence of game moves is itself a shareable and interpretable expression for co-players and on-lookers. This is a useful educational trait when seen from a constructionist point of view<sup>31</sup>, especially when compared to 'non-producing' media-reception like reading or viewing. Papert, founder of constructionism, describes the benefits of externalisation:

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<sup>30</sup> Squire (2005): "Game-Based Learning", p.28 f.

<sup>31</sup> Not to be mistaken for the epistemological approach of "constructivism", "constructionism" is an educational approach aiming for concrete, situated knowledge developed via creative practice. For a clarification see e.g. Tan (2006) "Konstruktivistisches Potenzial in Lernanwendungen", p.74-84.

“One of my central mathetic tenets is, that the construction ‘in the head’ will succeed especially well, when it is supported by a visible construction ‘in the world’ – a sandcastle, a cake, a Lego building or a company, a computer program, a poem or a theory of the universe. With ‘in the world’ I also mean that the product can be shown, discussed, proven, tried and admired. It is visible from the outside.”<sup>32</sup>

Though Papert describes in most cases static objects, an observable, meaningful sequence – or set of sequences – of actions would qualify, too, especially with the possibility of digitally recordable and replayable sequences. Wilensky explains the manifestation of choice and decision that creates these sequences:

“When people construct objects in the world external to them, they are forced to make explicit decisions about how to connect different pieces of their knowledge. How does one representation fit with another? Which pieces of their knowledge are the most basic? Which are important enough to incorporate into the construction, and which can be safely left out? Which really matter to them and which don’t engage them at all? The constructionist paradigm, by encouraging the externalization of knowledge, promotes seeing it as a distinct other with which we can come into meaningful relationship.”<sup>33</sup>

This view can be easily expanded for a synchronoporous<sup>34</sup> or multiperspective approach by ‘saving’ the construction – the state and course of the game – in different states of fulfilment.

These shareable constructions of meaningful choices can be found in different forms as product of digital or networked play, e.g. as saved game state, as video, as a network of websites, as written or illustrated walkthrough<sup>35</sup>. We will encounter these forms later on as vehicles for second order gaming.

For educational terms this leads to following conclusion: While classic media<sup>36</sup> deliver structured information, games provide a structure for the experimental formation of structured information.

As explained above, liberating virtuality and expressive choice are two defining aspects of games. Related to these, there is a third aspect also important for educational use, repeatability.

If playing has no consequences outside of the game, and a game with the same premises may take on many courses, then the player is challenged to play more than once to really enjoy, understand and master a game.

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<sup>32</sup> Papert (1994): “Revolution des Lernens”, p.158, translation by Tan.

<sup>33</sup> Uri Wilensky (1993): “Abstract Meditations on the Concrete and Concrete Implications for Mathematics Education”.

<sup>34</sup> Synchronoposity, a term coined in my diploma thesis, describes the taking of different paths ‚at the same time’. This is possible mostly in discrete state digital games for single players: a process or course of game may be rewound and encountered anew, with different strategies. See Tan (2006): „Konstruktivistisches Potenzial in Lernanwendungen”, p.125 f.

<sup>35</sup> The media rich environment of the Alternate Reality Game “World without Oil” is a good example for a game’s course to be expressive, innovative, communicable and educational both for the players as well as for spectators. See Independent Lens (2007): “World Without Oil”.

<sup>36</sup> I.e. media based on a fixed, non-branching sequence or arrangement of information, like image, text or film.

## 1.6 Repeatability: A played game is never the same

Why do we read a text again and again? A text will not change – instead, we will change over time, we forget, we grow, we discover relations to content in other media. But the original text is like a tether, immovable and steady.

So, why do we play a game again and again? The rules take the position of classic text in their stability, but what is intriguing is the option that we *create* our own elusive ‘text’ within the medial boundaries of this specific game, a different one every time we play. We will not be satisfied with every ‘text’ created this way: we may have lost, we may have made embarrassing mistakes, we may have ambitions to turn the next ‘text’ to be ‘better’ than the last one. Or we may even want to repeat a specific ‘text’, which is usually lost after being ‘written’. Scheuerl defines “inner infinity” and “presence” as two of six characteristics of playing<sup>37</sup>, Huizinga “repeatability” as one of the most constitutive ones<sup>38</sup>, implying that it is rather the act of ‘writing’ in general than that of ‘knowing’ a ‘text’, that draws us again and again to play a specific game, emphasising the performative character of playing.

An attribute and also a restriction of most analogue games is, that a new ‘text’ means the player has to begin again from scratch: if a game is to be played differently, i.e. if a ‘text’ is to be modified, then it has to start over.

Digital single-player games and some analogue games now have a unique quality, beneficial for educational purposes: discrete states and discrete processing steps. Discreteness means that a game’s state in its entirety may be saved and later on restored; and that developing consequences caused by a decision may be accelerated, decelerated, stopped or rewound. Thus discrete state games support skill development in form of dialogic environmental interaction, in a way hard to achieve in an analogue situation or with human actors as co-players. The same game situation may be tackled again and again, either with different strategies as synchronicity<sup>39</sup>, following multiple ways ‘at the same time’; or from different viewpoints as multiperspectivity, taking different views on the same subject.

The most basic examples for synchronicity may be level-based construction games like “Bridgebuilder”. Because there is no given single correct solution, the player may decide to go for the most stable, the most aesthetically pleasing, the most economic or just the weirdest bridge construction possible to span a level’s

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<sup>37</sup> Scheuerl (1975): “Zur Begriffsbestimmung von “Spiel” und “spielen””, p.342 f.; in German the traits are called “innere Unendlichkeit” and “Gegenwärtigkeit”.

<sup>38</sup> Huizinga (2001): „Homo Ludens”, p.18; in German it is called “Wiederholbarkeit”.

<sup>39</sup> Tan (2006): “Konstruktivistisches Potenzial in Lernanwendungen”, p.126 f.

given obstacle; or she may try for all, consecutively, before tackling the next level. More complex examples of synchporosity may include branching dialog- and storylines, like in “Global Conflicts: Palestine”<sup>40</sup>, or systemic simulations with many variables, as they can be found in the “Simcity”-series of Wright or in educational simulations like “Aiyti: The high cost of living”<sup>41</sup>.

For multiperspectivity, more sophisticated adventures with roleplaying elements offer the taking of different characters, including their viewpoint and fitting different ‘skills’<sup>42</sup> to solve a given plot. An example may be the humoristic “Rex Nebular and the cosmic gender bender”<sup>43</sup>, where the protagonist is able to change his gender by technical means, leading not only to different actions possible, but also the descriptions of specific locales and objects, given to the player by the game interface, will vary according to stereotypical male or female perception.



Figures 7-9

Fig. 7: Repeatability: Playing is not about finding the one true path, but about mapping the terrain.

Fig. 8: In “Ayiti – the cost of life”<sup>44</sup> players may set one of our different goals for a simulated Haitian family – wealth, happiness, education or health – and follow different strategies, some bound to fail by insurmountable odds encoded in the rules that govern the simulation. The lesson plan recommends playing the game several times, presumably with different goals, to get a ‘feel’ of workable *and* unworkable approaches to the systemic problems of developing countries<sup>45</sup>.

Fig. 9: In his lecture “Time and Simulation”, Wright<sup>46</sup> shows that all possible courses of gameplay in “The Sims” form an uneven landscape – a “possibility space”, as he calls it in best constructivist tradition<sup>47</sup> – between material and social success, where the vertical axis equals the difficulty of approach. With each game played the player ‘traverses’ more or less difficult terrain, choosing to either reach for material or social success – or, most difficult, for both.

A game designed like a linear quiz show may be not as motivating to be repeatedly played as would be a systemic simulation with narrative rich background and emergent properties. The appeal of the latter one comes from the

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<sup>40</sup> Serious Games Interactive (2007): “Global conflicts: Palestine”.

<sup>41</sup> Global Kids Inc. and Gamelab (2006): “Ayiti: The Cost of Life”.

<sup>42</sup> Of course the skill of an avatar does not translate into a player’s skill. But it does provide a challenge for the player to discover situations where this virtual ‘skill’ is applicable, and this in turn maybe transferred into an actual increase in applying the skill, once acquired, in real life.

<sup>43</sup> Microprose (1992): “Rex Nebular and the Cosmic Gender Bender”.

<sup>44</sup> Global Kids Inc. and Gamelab (2006): “Ayiti: The Cost of Life”.

<sup>45</sup> Global Kids Inc. (2006): “Ayiti: The Cost of Life: A Game-based Lesson Plan Addressing Poverty as an Obstacle to Education in Haiti”.

<sup>46</sup> Wright (2005): “Time and Simulation”.

<sup>47</sup> See e.g. Luhmann (1996): “Die Realität der Massenmedien”, p.38.

complex consequences emerging from a sequence or set of meaningful decisions made by the player, and the repeatability by which these decisions can be changed again and again.

As an example for an educational use, Frasca proposes in his conceptual meta-simulative “Sims of the oppressed” a game to create a dysfunctional family out of a set of simulated character types and observe their interactions based upon their mental disorders, addictions and convictions. The opportunity to change each variable each time the game is played anew may lead to a deeper understanding of the systemic conditions for the dysfunction of specific family constellations.

If classic educational games – similar to classic utopias – go for the teleological approach of a single, optimal goal to be reached and stabilised, digital systemic simulations facilitate the synchronoporous co-existence of a diversity of drafts. Von Glasersfeld uses a metaphor to explain a similar epistemology as seen by radical constructivism: a blind man trying to find a path through a forest to a river, the path set by collisions with the trees:

“Even if he went a thousand times and would map all the chosen paths in his memory, he wouldn’t have a picture of the forest, but a network of ways leading to the desired destination [...]”<sup>48</sup>

Here a “truth” is determined as just one of the many possible courses that lead around the trees. An extension of this metaphor could be applied quite well to games, for entertainment and as educational medium for complex domains of knowledge: playing is not about finding the one true path, but about mapping the terrain.

Games that are complex enough to offer the player a rich ‘terrain’ to explore instead of just a single path to follow, are described by Lischka as embodiment of a second order utopia:

“Literature and movies are technically not able to make emergence experienceable. Because of this they cannot be blamed for not to try to think utopia anew. In popular culture, only computer games create the utopias of the utopia.”<sup>49</sup>

So it is not just a single, working strategy that may be searched for and finally found, but the player/learner may be going for a host of possible strategies and playing styles, virtually ‘at the same time’, “criss-crossing conceptual landscapes”<sup>50</sup>, while mapping the possibility space of all potential actions and

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<sup>48</sup> Glasersfeld (2008): “Konstruktion der Wirklichkeit und des Begriffs der Objektivität”, p.19 ff.

<sup>49</sup> Lischka (2002): “Eine Welt ist nicht genug: Computerspiele als Utopien der Utopie”.

<sup>50</sup> Spiro et al. (1991): “Cognitive Flexibility, Constructivism, and Hypertext”, see also chapter 2.1.2.



consequences. Repetition and variation thus provides for a much deeper, intuitive insight into a complex problem field, into its accessibility, extent and texture<sup>51</sup>.



Figures 10-12

Fig. 10: Virtuality: By assimilating an aspect of reality the players create a virtual semantic space apart from it.

Fig. 11: Expressive Choice: The players can choose to enter or leave the game. Within the game, they can decide on meaningful expressions in the form of moves.

Fig. 12: Repeatability: The same game may be played repeatedly many times, with differing strategies and alternative decisions on moves.

From the three game characteristics of virtuality, choice and repeatability, which I deem crucial for educational gaming and educational game design, the question follows: How can structures provided by games facilitate, support and challenge certain types of formations?

For a first order approach, let's first take a look at structures the player already has accepted as given when she starts to play.

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<sup>51</sup> See also Wright (2005): "Time and Simulation"; Lischka (2002): "Eine Welt ist nicht genug". For an educational example see Jenkins and Squire (2002): "Understanding Civilization (III)."

## 2. First order gaming

### 2.1 Integrated educational game design: A moderate constructivist approach

In many 'classic' pedagogical learning games (german "Lernspiele"), the game is just an incentive; the declarative knowledge to be learned is strapped to an otherwise unrelated existing game mechanic. Virtuality, choice and repeatability are secondary to a discrete goal: the transfer of content to the learner. Dehn defines learning games in 1986 as follows:

"Learning games are a label for materials which adopt the rules of parlor games – they conform to lotto, domino, puzzles, card and dice games – and where the contents are didactically designed."<sup>52</sup>

'Parlor games' may be exchanged for 'well known game genres', today also with 'well known digital games'. The successful transfer of information is seen as paramount, and it is understandable from this point of view that rateable and comparable results require stricter direction than in games played 'just for fun'. Kube states in 1977 for educational game design:

"Openness can thus be related only to such elements of play which are didactically effectless, but define the instructional activity of the pupils as play."<sup>53</sup>

In 2005, Squire gives as one of the gravest complaint about eLearning that there has been too much focus on content, and not enough on context, and that educational games are seen as just another means of delivery, not a method-rich approach in itself<sup>54</sup>. This criticism can be applied to game based learning in its classic, and still ubiquitous form: just refitting a popular quiz game like "Trivial Pursuit" with different questions, or attaching moving graphics as motivational asset for a correct answer will probably deliver content, but not necessarily contextual or procedural understanding, or sustaining intrinsic interest in the topic.

Moderate constructivist approaches like situated cognition, anchored instruction, cognitive flexibility or cognitive apprenticeship are based upon the assumption that knowledge is an experientable, personal relation to the world rather than just an objective asset; that it has the character of a meaningful tool and is inevitably connected to the situations of its acquisition and application<sup>55</sup>. This approach is exemplified in different methods of facilitating holistic, interactive learning,

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<sup>52</sup> Dehn (1986): "Lernspiele", p.518, translation by Tan.

<sup>53</sup> Kube (1977): "Spieldidaktik für die Unterrichtspraxis", p.40, translation by Tan.

<sup>54</sup> Squire (2005): "Game-Based Learning", p.12 ff. See also Papert (1997) "Does easy do it?"

<sup>55</sup> Brown et al. (1989): "Situated Cognition and the Culture of Learning". Blumstengel summarises for a practical constructivist approach following attributes: authenticity of the learning environment, situated contexts of application, multiple perspectives, multiple contexts, social contexts, complex starting problems, articulation and reflection. See Blumstengel (1998): "Entwicklung Hypermedialer Lernsysteme", chapter "Konstruktivismus: Anforderungen an konstruktivistische Lernumgebungen".

which, interestingly, can also be found in popular game culture: e.g. in situated, meaningful, intrinsically motivated choices; in narrative framing; in multiperspectivity; or in cultural embedding.

### **2.1.1 Anchored Instruction: Narrative framing and dramatisation**

Anchored instruction as proposed by Bransford et al.<sup>56</sup> situates knowledge in a narrative frame, which delivers sets of related concrete and emotionally challenging problems to be solved by a group of learners, but also provides hints of how to do this. The 'anchor' of anchored instruction is the random-accessible narrative as purveyor of context, method, and last but not least intriguing dramatisation of these. It takes on a similar role as the narrative framing of an educational game, while the pupils' collaboration, with information provided by a random-access-medium, lead to the solving of a given, not self-chosen, problem. Successful learning relies on the students decoding and applying the information encoded in the given narrative.

The relative ease of technical and editorial realisation, as well as the motivating presentation and contextualisation of a problem to be solved, may explain the appeal that approaches similar to anchored instruction have as a moderate constructivist practice for educational game design.

### **2.1.2 Cognitive Flexibility: Multiperspectivity and cognitive mapping**

Cognitive flexibility<sup>57</sup> and its instructional realisation, the random access instruction, aim for the appropriation of ill-defined domains of knowledge by the learner, for appropriation of topics that deny a clear, linear and well defined approach. The learner is given a set of elements to rearrange and to connect in different ways, to take on a multiperspective view on a self-created, changing and changeable map of a territory. As Spiro puts it:

“A central claim of Cognitive Flexibility is that revisiting the same material, at different times, in rearranged contexts, for different purposes, and from different conceptual perspectives is essential for attaining the goals of advanced knowledge acquisition.”<sup>58</sup>

This is a fitting summary of games' inherent attribute of repeatability, which easily surpasses the well-defined goal of just winning the game. The actual appeal of more complex games is to experience and cognitively map the structure and texture of the space spanned by its rules and narratives.

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<sup>56</sup> Mandl et al. (1997): “Situieretes Lernen in multimedialen Lernumgebungen”. For an example see the website of Learning Technology Center Vanderbilt (1992): “Adventures of Jasper Woodbury”.

<sup>57</sup> Spiro et al. (1991): “Cognitive Flexibility, Constructivism, and Hypertext”.

<sup>58</sup> Ibid. paragraph “Concluding Remarks”.

### 2.1.3 Situated Cognition: Embedded knowledge and enculturation

Situated cognition sees the learner as embedded in a culture and community of learning and practice, where learning means participation in, acting upon, talking about, and growing into a complex, socially interwoven fabric of knowledge. Cognitive apprenticeship, as instructional approach, advocates scaffolding by experts and learning by peers on concrete tasks of a culture of knowledge. For the achievement of e.g. a mathematician's mindset, Brown remarks:

"By allowing students to generate their own solution paths, it helps make them conscious, creative members of the culture of problem-solving mathematicians. And, in enculturating through this activity, they acquire some of the culture's tools – a shared vocabulary and the means to discuss, reflect upon, evaluate, and validate community procedures in a collaborative process."<sup>59</sup>

As shown in chapter 2, background narratives and base metaphors establish an 'in-game' cultural background, as an extension and mirror of the player's 'real' culture. Prensky gives an example for a pervasive cultural narrative, which is also a successful game metaphor – and a human liability:

"[...] since war is a highly competitive situation, with rules [...], goals, winners and losers, competitive games are a great way to train. In the words of one former officer: 'You play these games as a kid, you grow up understanding the risks and rewards of making decisions in real life.' [...]"<sup>60</sup>

Competition, teleological progress and steady growth for example, are all deeply ingrained in our culture. These cultural narratives help understand and play mainstream games, and render moves and strategies expectable, understandable, and meaningful, while at the same time stabilising the culture the game is played in<sup>61</sup>.

## 2.2 Implications for educational game design

When following moderate constructivist claims, educational game designers have to contextualise knowledge, extending the classic "what" and "how" with "why" and "when". Effective educational game design thus has to take into account not only the overt content of an educational game, but also its regulative and narrative framework in which the content is encountered, explored and mapped by the player, both cognitively and affectively.

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<sup>59</sup> Brown et al. (1989): "Situated Cognition and the Culture of Learning", paragraph "Learning through cognitive apprenticeship".

<sup>60</sup> Prensky (2001): "True Believers", p.5. For a critical response to war- and combat based games see Wong, Frasca and Costykian in chapter 3.2..3.

<sup>61</sup> For the causal and stabilising relationship between games and cultures, see Huizinga (2001): "Homo Ludens". This stabilisation may also be a liability when seen as knowledge acquired by category II learning as explained by Bateson, see chapter 4.1.3.

### 2.2.1 Narrative design

One way to realise this is via the choice of a basic metaphor, background story, design of elements, non-linear course of the game etc. Relying on narrative design instead of rule design is quite attractive to educational game designers, because of its accessibility and stability for both designers and players, not to speak of its cost-efficiency. Narrative design is able to structure the player's experience in a highly complex way, far beyond a linear developing story line<sup>62</sup>; but as soon as it requires choice by the player, it will also turn into a matter of rule design.

By reverting to culturally established metaphors, games may ease the contextualisation of problems: Competition ("It's war!"), goal-orientation ("Solve the puzzle to win!"), progress and growth ("Level up!") are used in abundance. These metaphors may be inappropriate, though, if the topic is contradictive to them. Though e.g. war, competition and business are without doubt successful as motivating narrative framings for games (and society), they might be counter-productive if helpful understanding, sharing of resources, or collaboration beyond one's peer group are on the game's agenda.

Two examples for narrative design: Successful learning games like the adventure "Physikus"<sup>63</sup> rely on a given background story and world design for motivation and explanation, while an in-game narrative development is neglected in favour of a sequence of didactic puzzles. Since the subject of the game is the acceptance and understanding of physical principles, this may be thematically adequate, though not very intriguing for the player.

"Global Conflicts: Palestine"<sup>64</sup> on the other hand integrates a complex developing, interactive and branching storyline design befitting to the topic, i.e. initiating and reflecting dialog and understanding in the middle east conflict. What the player, as Israeli or Palestinian reporter, gets as answers or reactions from refugees, soldiers and citizens, depends on her in-game choices. How the player – and thus the avatar – initially behaves in the game may be influenced by established cultural narratives of war and exclusion; the goal of the game is to explore this narrative, culturally 'closed' space and open it up by experimentation to include multiperspective views on a complex, prejudice-ridden problem. Since narrative design ends where rules have to decide upon the consequences of a player's choices within a game, the narrative design of "Global Conflicts: Palestine" is already part of its rule design.

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<sup>62</sup> Tan (2008): "Topological Metaphors to structure Games (I): Storyspaces".

<sup>63</sup> Ruske & Pühretmaier (2000): "Physikus".

<sup>64</sup> Serious Games Interactive (2007): "Global Conflict: Palestine".

### 2.2.2 Rule design

Since knowledge is deeply connected with its application, an integrated approach to game design should also consider the rule set – the game mechanics – which allows or calls for specific behaviour by the players, while suppressing or discouraging other. Rules define the possible actions for a player, and what consequences result from these actions. Like grammar in speech they give directions and jurisdiction, and usually require unquestioned acceptance from the player to play a game<sup>65</sup>.

For becoming a better player, the knowledge of the game's rules for deciding on possible and beneficial actions has to grow ingrained, procedural and automatic. As with any language, a fluent native speaker is probably less aware of grammar and vocabulary as a first year student of this language.

Specific paradigms of teaching have repercussions on what is learned beyond the overt content by supporting specific types of interaction with knowledge bases, peers and experts, comparable to aspects of the "hidden curriculum" encountered in schools<sup>66</sup>. For example behaviouristic approaches try for an imprint of facts by repeated drill & practice of objective knowledge, while constructivist approaches may go for social interaction and collaboration towards a self-set goal in a field of expertise: the overt topic may be the same in both approaches, though. In educational games, rules represent similar paradigmatic settings, guiding the playing style and thus the situating of attitudes, skills and knowledge achieved in-game.

For topics like "How does our economy work?", "How do I get safely to school?", or "How do I do research on the web?" the choice of a rule set demanding and thus fostering a certain behaviour connected to the aimed for skill is an important design decision. If the closed, simplified game environment has to resonate the actual field of application, then the required mechanics to perceive, judge and act should do, too.

In the same ilk, narrative elements like background story, basic metaphor, visualisation of game elements or a game's obvious genre assignment may influence how the game is perceived by the player and what actions may obviously be required. Narrative elements may be added to motivate and justify the player's decisions in a game's rule space.

For example a competitive player vs. player behaviour is supported by the narrative background of a quiz-show, but this may run counter to what the

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<sup>65</sup> Cailliois (2001): "Man, Play and Games", p.10 and p.46.

<sup>66</sup> Baumgartner (1997), „Didaktische Anforderungen an (multimediale) Lernsoftware“, p.244.

learner is supposed to learn when the topic is e.g. about affirmative action and considerate behaviour at the job.

Thus a proven competitive game mechanic like in a quiz game, i.e. question-correct answer-reward, may mirror the hidden curriculum in school education in ways not wanted by some educational game designers.

Some examples of rule dimensions to be included in design decisions<sup>67</sup>:

<b>Dimension</b>	<b>Directions</b>	<b>Examples for design and games</b>	<b>Examples for fitting topics</b>
<b>Mode of Cooperation</b> <i>What is the role of co-players, opponents, allies, or friends?</i>	Competitive	Player vs. player "Trivial Pursuit"	"Economic workings"
	Collaborative	Team based games "America's Army" (team vs. team), "World without Oil" (collaborative storytelling)	"Democratic values"
<b>Temporal boundaries</b> <i>Are there clearly defined end conditions?</i>	Limited	Goal-oriented games "eLECTIONS"	"Study planning"
	Unlimited	Networked Massively Multiplayer Online Games "Netherworld (PMOG)"	"Lifelong learning"
<b>Spatial boundaries</b> <i>Is there a clearly defined playing field?</i>	Limited	Path based or area-based games and simulations "Simcity"	"Urban development"
	Unlimited	Participative networked Alternative Reality Games "World without Oil"	"Sustainability in face of an oil crisis"
<b>Mode of jurisdiction</b> <i>What moves are allowed, and what are the consequences?</i>	Algorithmic, objective	Jurisdiction and evaluation by software algorithm "Global Conflicts: Palestine"	"Medical differential diagnosis"
	Interpretative, subjective	Contextual jurisdiction and evaluation by peer players "Once upon a time"	"Storytelling"
<b>Information as resource</b> <i>Is possession of knowledge or its generation important?</i>	Depletable	Question & answer, Quiz games, puzzle games	"Learning European capitals"
	Replenishable	Participative networked Alternate Reality Games "World without Oil"	"Web-based Information retrieval"
<b>Complexity</b> <i>How foreseeable are the consequences of moves?</i>	Linear causality	Unidirectional linear causality, player steers "Trivial Pursuit"	"Road safety for kids"
	Systemic feedback	systemic simulations, causal feedback loops, player tunes <sup>68</sup> "Simcity", "Nomic"	"Eco-systems"

<sup>67</sup> See also Tan (2008): "Rulespaces". All games mentioned in the table can be found in the mediography.

<sup>68</sup> "Tuning" describes the balancing of interdependent game elements, either while playing or designing systemic simulation games.

### 2.2.3 Cultural and educational bias in design decisions

Gaming can be seen as a composition of the players' dynamic decisions and interpretations in the possibility space spanned by static regulative and narrative elements. But gaming is always preceded by the game designers' decisions about *what* set of regulative and narrative elements should be used to support safe, meaningful, motivational and repeatable – and therefore effective – gameplay.

These design decisions may unintentionally mirror and thus preserve a cultural bias embedded in the game's rules and narratives, or they may be wilfully utilised for advertisement, indoctrination or propaganda. Obvious stereotyping in design may be easy to spot for educated players, e.g. when violence, ethnicity or gender are exploited, while others may be very hard to notice, due to their cultural pervasiveness and ubiquity. For example growth, competition, material gain and teleological progress as leading game mechanisms or desirable aspects can be found in nearly all contemporary mainstream games. Games with well defined end conditions, e.g. to control limited spatial, temporal, informational or material resources, fit into this category, e.g. chess, soccer, quizzes, adventures, first-person-shooters.

Alternate guiding principles like homeostasis, cyclicity or aesthetics can be encountered less in games with explicit rules, but in games – or rather toys – relying on verbal interaction and subjective interpretation, or on the aesthetic and sustaining construction and maintenance of objects or systems. Classic building bricks, or the digital game "Bridge builder"<sup>69</sup> fall into this category, as do dynamic systems simulations like the "Simcity"<sup>70</sup> series, where a city, after its growth phase, has to be made 'perturbance-proof' against natural and man-made disasters. Narrative games, like face-to-face role playing games, may also put the focus on storytelling and exploring fictional characters rather than just on the solving of quests, or on the aspiration of wealth and might.

Seeing games as simplified media in terms of Luhmann<sup>71</sup>, then each game's constitutive narratives and rules are also embedded in layers of pervasive cultural expectations to be aware of.

As an expansion to regulative design, there is – even in sound first order game design – a necessary breach into second order design: Games that 'cheat', especially in form of the behaviours of opponents in digital game<sup>72</sup>s. These simulated opponents do not behave like 'real' opponents, for the purpose of

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<sup>69</sup> Chronic Logic (2000): "Bridge builder".

<sup>70</sup> Wright and Maxis (1989): "Simcity".

<sup>71</sup> See chapter 4.1.2.

<sup>72</sup> See e.g. Wallis (2007): "Things to do in game design #1: cheat", also the follow-up blog entry.



supporting an effective – read: motivational and challenging – gaming and thus learning environment.

Sophisticated commercial games are out of necessity thus highly didactical in their approach to teach and motivate the player to play them, and stay in the game. Bopp describes these games as “inconspicuous didactic learning environments”, which use an implicit “stealth teaching” as methodical approach, thereby going beyond the to be expected in-game tutorials and in-story-tutorials<sup>73</sup>: The obstacles are provided in their difficulty in a gradual way, or are modified according to the actual performance rating of the player. “Pong” may be one of the earliest examples of a software opponent cheating, i.e. not playing as good as possible, but with consideration on the present abilities of the player. This common approach to be regularly found in digital games is called “rubberbanding”. “Rubberbanding” is both a motivational game design trick, but also a viable approach to what the Russian educational scientist Vygotsky describes as keeping a learner in the “zone of proximal development”<sup>74</sup>. This means that the environment – parent, teacher, virtual learning environment – keeps up a certain level of difficulty in its tasks. Staying in this zone fosters emerging abilities in the learner, while exceeding it leads to frustration, and a shortfall to boredom. Coincidentally this goes quite well with theories, which state that play and game are the most fulfilling when experienced in a state of internal insecurity of the outcome<sup>75</sup>.

It could be discussed whether any game, educational or just entertaining, is already a cheat mode for the game we call ‘reality’ – by artificially creating narratives and rules facilitating a fair, inherently meaningful and fulfilling gaming experience. We will not encounter a benevolent game designer in reality’s ‘games’. The rules and narratives we encounter in real life may not be balanced, or dramatic *and* objective, but rigged – either in favour for or against us, as ‘players’ in an invisible game.

“The cheat is still inside the universe of play. If he violates the rules of the game, he at least pretends to respect them.”<sup>76</sup>

If Caillois states that cheating is still part of the closed microcosm of the game, what about educational games, designed to be effective ‘outside’ of the game, too? What about educational games that are ‘manipulated’, according to a designer’s or an educator’s best intentions?

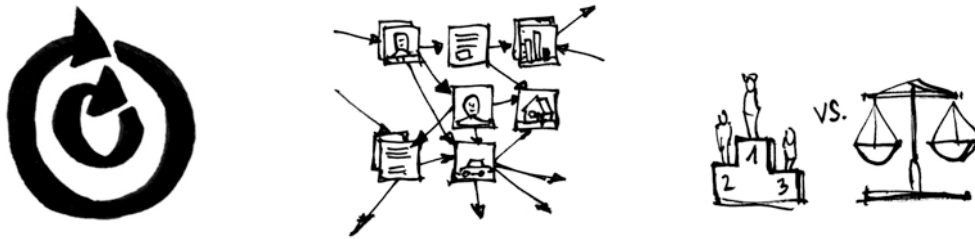
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<sup>73</sup> Bopp (2003): “Teach the player”. Stealth teaching structures educational challenges so as not to be perceivable as such by the player/learner.

<sup>74</sup> Vygotsky (1980): “Mind in Society”, p.85 f.

<sup>75</sup> E.g. Huizinga (2001): „Homo Ludens“, p.19; Scheuerl (1975): “Zur Begriffsbestimmung von “Spiel” und “spielen””, p.342.

<sup>76</sup> Caillois (2001): “Man, Play and Games”, p.45.



Figures 13-15

Fig. 13: Integrated Game Design tries to harmonise educational content with perception and behaviour suggested or required by the game's rules and narratives.

Fig. 14: In "World Without Oil"<sup>77</sup> the topic is handling a global oil crisis with local and individual consequences. The game mechanics fit the difficult topic like a glove: The game is an open, networked multiplayer game, where the player's moves consists of creating (realistic) narratives, actions, and social connections, e.g. via youtube-clips or blogs, to counter emerging developments as described by the game masters.

Fig. 15: Game principles like gain, growth and progress have become nearly invisible because of their pervasiveness and ubiquity, mirroring their social counterparts in reality. Games that challenge the player to create e.g. homeostatic stability and sustainability in face of external perturbations are less common.

With first order educational games we have a medium which strives for situating knowledge, subjective to a specific agenda, both as overt and hidden curricula. From this point of view, first order games, as a medium to influence people's behaviour, skills and attitudes, do not vary much from earlier media like print, radio or television when used for education or information, for propaganda or advertisement.

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<sup>77</sup> Independent Lens (2007): "World without Oil".

### 3. Second Order Gaming

#### 3.1 Second order gaming: A radical constructivist approach

If the previous chapter is based upon moderate constructivist theories, what is the difference to its counterpart, a radical constructivist view, which can be found with e.g. von Foerster, Luhmann or Bateson?

As explained above, a game as set of narratives and rules can be seen as a simplified medium ‚en miniature‘. For both, player and learner, it is usable as creative tool of expression and as an explorable landscape of possibilities. On the other hand it is embedded in expectations and preconceptions, in socio-cultural narratives and metaphors, that establish and ease its handling for the user, and turn it recognisable as game in the first place. This embedding in existing contexts is a given. A conscious observation or reflection of it would hinder gaming.

While first order gaming is dependent on the avoidance of discrepancies between the given gaming environment and the possible paths to (re)create knowledge within it, the focus of second order gaming lies on this very divide between the given and the created.

Seen from a radical constructivist point of view, turning attention to this divide is essential for the handling of non-objective information, for the understanding of how a medium works, or for higher order reflection and learning.

##### 3.1.1 Von Foerster: Decidable and undecidable questions

Von Foerster<sup>78</sup> distinguishes in principle decidable from in principle undecidable questions, between presupposed objective and ‘only’ subjective answers.

For example the question “Is 13 a prime number?” has its answer already determined by rules by which ‘13’ and ‘prime number’ exist as mathematical entities; the answer is unambiguously decidable as “true”. But if we ask “Are games a better medium to learn from than books?”, we enter, due to the complexity and socio-cultural references of the question, the realm of undecidable questions. These are questions which cannot be (re)solved objectively, and where the answer will give more information on the person who answers it – or the culture she lives in – than on the issue itself.

Again we have a divide, itself defined in form of an undecidable question: What are decidable, what are undecidable questions? Von Foerster does not advocate a favouring of subjectivity, but hints on our present cultural bias towards seemingly objective answers. He proposes a reciprocal, balanced relationship

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<sup>78</sup> Foerster (1995) “Ethics and Second-order Cybernetics”.

between exploration – discovering ‘existing’ answers – and invention – creating ‘new’ answers.

Games incorporate this balance without getting entangled in epistemological dilemma: rules and narratives do require ‘unquestioning acceptance’ to play, but the safe frame created by a game can be entered or left at will. A game is thus both, an objective reality while being played, but also accessible to be scrutinized, modified or rejected when seen as a medium.

For second order gaming, metagaming represents this diffusion of the divide, and the re-balancing of the given and the created.

### 3.1.2 Luhmann: Discerning between playing and choosing to play

What turns specific games into interesting objects for media education and reflection is their character as simplified media of communication. If Luhmann defines communication as improbable interplay of information, message and meaning, a game delivers a closed environment for a host of “probabilities directed by expectations” (“erwartungsgeleitete Wahrscheinlichkeiten”)<sup>79</sup>. The improbabilities of in-game communication are greatly reduced once the concept of playing games as such is established. If this condition is met, it opens up a plethora of possible ‘languages of games’ for the prospective player to try out, enjoy, compare and relate to: not to speak *of*, but to *speak* chess, soccer, Counter-Strike.

As Luhmann can be interpreted, gameplay is a medium of mediums.

This applies to

“[...] chess, for example, to make a specific move in face of a specific, self created position of the playing pieces. It [note: the system] sees the possibility space with its already carried out restrictions as the game and decides thereupon the next move; it realises within the medium of the game the one or the other form.”<sup>80</sup>

In a specific game, moves relate to information to be transferred; rules define the framing of moves as messages; and the narratives of competition, war, teleological progress etc. provide the expectation of an intended meaning behind every message<sup>81</sup>. This ‘reality’, defined by contingency-decreasing attributes, is something to be deliberately and consciously stepped into by the players, and can also be left at will if the game ends or another layer of communication becomes necessary:

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<sup>79</sup> Luhman (1997), “Die Gesellschaft der Gesellschaft”, p.86.

<sup>80</sup> Luhmann (2002), “Das Erziehungssystem der Gesellschaft”, p.89, translation by Tan. Will Wright uses the same metaphor – “possibility space” – to describe the gameplay in systemic simulation games. See Wright (2005): “Time and Simulation”.

<sup>81</sup> Luhman (1997), “Die Gesellschaft der gesellschaft”, p.86.

“The game always contains in every of its operations references to simultaneously existing real realities. It designates itself in every move as game; and it can collapse any moment, when it is suddenly getting serious.”<sup>82</sup>

The players’ awareness of entering and communicating in a shared, created medium – one could say: experiencing the contingency of contingencies – may provide for and challenge the differentiation between being a first order and second order observer<sup>83</sup>, between being a player and someone who decides to be a player<sup>84</sup>. On top of this, being able to *modify or create* a medium usable for communication is an attribute connected mostly with interactive digital media. Referring to ‘the’ medium as general media space, Sesink’s definition of it would fit games as model of this meta-medium quite well:

“Here the medium is not an intervening but an all embracing, enveloping entity; not something to relate to, but for humans to relate in. [...] There is the possibility to grant possibilities. We have the space to create spaces.”<sup>85</sup>

For an educational approach, games as medium of mediums thus can be a starting point for a constructivist understanding of media in general: By creating a medium in metagaming, by intermedial transfer of content in transmediality, or by being challenged by sabotaged contingency-reducing mechanisms in unusability.

### 3.1.3 Bateson: Contexts and the choice between sets of choices

In a nutshell, Bateson<sup>86</sup> postulates that learning can be categorised in – for educational purposes – three categories or layers, where each layer coordinates either choice, sets of choices, or sets of sets of choices. Contexts allow to generalise and recognise situations, where a specific choice or set of choices is appropriate. ‘True’ learning takes place, when a choice on a specific level does not lead to the wished for result, as an error of the choosing person’s contextualisation. This error then requires a higher level (re)organisation of context markers and actions.

First category learning (learning I) is about being able to choose the right interpretation, answer or action to a problem from an acquired set of possible solutions. Learning hand-eye coordination and background-target distinction to win in an ego-shooter, or learning how to manage systemic city development in a

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<sup>82</sup> Luhmann (1996): “Die Realität der Massenmedien”, p.97, translation by Tan. This is also a play of words by Luhmann: “it” getting serious could refer to both the in-game ‘reality’, as well as the external ‘real’ reality.

<sup>83</sup> Luhmann (1997): “Die Gesellschaft der Gesellschaft”, p.169 ff.

<sup>84</sup> Bateson takes the related cognitive processes of playing together as decisive for humans to develop the complexities of metacommunication at all: communicating about communication and reflecting on communication is thus a consequence of play. See Bateson, (2000): “A Theory of Play and Fantasy”.

<sup>85</sup> Sesink (2008): “Bildungstheorie und Medienpädagogik”, p.15. translation by Tan. Games can be later on seen as a playful mirror image of what Sesink defines as “New Media”, *ibid.* p.32 f.

<sup>86</sup> Bateson (2000): “The Logical Categories of Learning and Communications”.

simulation game to get the highest rating would be examples for this kind of learning.

Second category learning (learning II) defines how these sets of first level solutions are acquired, evaluated and applied. These sets may be e.g. filled by methods acquired by self-made experimentation, or by memorising information backed by an authority, etc. For a concrete example: developing reliable strategies, skill sets, expectations and preferences for specific genres of games could be seen as second level acquisition of knowledge: it is about the unconscious establishment of a dominant 'shooter' or 'systemic simulation' mindset and personality to master a game, even when confronted with other game types<sup>87</sup>. As an example, a stereotypical 'first person shooter' would probably go for quick, local solutions when forced to play a systemic simulation, e.g. in "Simcity" rushing over the map to find hotspots to handle, and in the end maybe either give up or get bored by the different demands of this genre, without realising what went wrong<sup>88</sup>.

In Batesons' original description, this category establishes and stabilises our cognitive persona, and is thus difficult to change, since the process would include disorientation and aporia. It defines how we relate to the world and ourselves; or in the above example to the problems and possible sets of actions in games.

In the third category (learning III), the very change of these relations is defined by the shifting between different, mutually exclusive points of views, or by ways to acquire sets of sets of choices respectively, and the awareness that this is possible at all. If, for example, a 'shooter'-personality fails in solving adventure games because the combination of the context markers 'avatar with a weapon' – 'threatening figure in sight' – 'dark and foreboding place' lets her always kill the assumed enemy as natural reaction to the situation, she either has to give up on this genre, or has to develop an 'adventurer' personality, where everything could be a valuable source of information. The changing back-and-forth between these two mutually exclusive player types, and the awareness that this is possible in the first place, may open up as new sets of sets of choices for her.

In real life this change is, according to Bateson, usually a painful, difficult process. In games we have virtuality, choice and repeatability as safe guard: Changing – or the attempt of changing – constitutive gaming attitudes may stay in its

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<sup>87</sup> A presumably classic 'shooter' personality confronted with a systemic simulation can be encountered in the interview with a game tester for the USK, a German NGO to evaluate and rate games in their suitability for children and young adults. The interviewed young man categorises "The Sims 2" as "lowbrow game for girls", because of the lack of clear goals. Reciprocally, from a constructivist point of view, a clearly predefined goal as in most shooters would qualify *them* as cognitively "lowbrow". See Hessische Landesanstalt für privaten Rundfunk und neue Medien (2007): "Spiele: Simulation 'Die Sims 2': Einführung in das Spiel".

<sup>88</sup> This is, of course, just an analogy to real life personalities. Here we may have e.g. the 'empiricist' or the 'theoriser', the 'autonomous' or the 'authoritarian', the 'monogamist' or the 'free love proponent' etc.

consequences, mishaps and disasters within the sphere of games. In real life it would mean giving up on lifelong constituting elements of one's identity as being stable and appropriate.

As practical approaches to initiate a third level learning, Bateson proposes three approaches<sup>89</sup>, extended by me with a fourth one:

- The creation of a paradox within a premise
- The creation of a contradiction between two premises, or between a premise and a concrete case of interpretation and action
- The creation of an exaggeration or a caricature of experiences based on premises
- Subverting the dominant point of view by showing that the own premises are just one set among many possible ones which are subjectively valid as well.

For second order gaming, eliciting doubt and reflection in face of ingrained, stabilising contextualisations can be interpreted as the generation of unusability.

### 3.2 Implications for educational game design

Radical constructivist's criticism sets in when the authenticity of context – the semblance of reality – is seen as one of the decisive attributes of effective learning situations and generally for the situating of knowledge. If the learner is allowed to, and in fact is challenged to (re)construct knowledge inside of a constructed learning environment, as it can be found in an educational game, then where will the authenticity of this framing construction come from?<sup>90</sup>

Games, knowledge and media all entail the divide between the presupposed given, the objective and authentic on the one hand, and the appropriatable, the modifiable and rejectable on the other hand. The question arises: How to turn the latter visible and accessible – and motivate to transgress well established boundaries, in spite of the former one's great appeal of stability and clarity<sup>91</sup>? Kupffer describes the educational goal:

“It is inherent to postmodern education, that one does not stick to questions to which one can, after some thought, find the answer by oneself. If there is a worthy question, then it is one which in itself uncovers a new, yet undiscovered layer of reality and does not require a direct answer.”<sup>92</sup>

This statement resembles a claim made by digital game designer Koster:

“[...] games will never be mature as long as the designers create them with complete answers to their own puzzles in mind.”<sup>93</sup>

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<sup>89</sup> Tan (2006): “Konstruktivistisches Potenzial in Lernanwendungen”, p.96.

<sup>90</sup> Ibid. p.56.

<sup>91</sup> Foerster (1996): “Lethologie”, p.12.

<sup>92</sup> Kupffer (1990): “Pädagogik der Postmoderne”, p.29, translation by Tan.

<sup>93</sup> Koster (2005): “A Theory of Fun for Game Design”, p.191.

Beyond obvious game design decisions, there is the problem of a cultural bias ingrained in the choice of fitting rules and narratives, a circumstance that tends to produce questions already answered. What is seen as an asset for effective first order game design is a liability for criticism and reflection in face of a given, invisible framing. Political game designer Pedercini remarks:

“The ideology of a game is in its rules, its invisible mechanism, and not only in its narrative parts. Thus a global innovation of this medium will be very difficult.”<sup>94</sup>

If the perception, modification and transgression of medial and contextual, regulative and narrative boundaries is the goal, “stepping out of the game” may be the first step to a deeper understanding. Ackerman, a constructionist, deduces:

“[...] we know from Piaget, Kegan, and others (Winnicott, 1971) that the ability to reach deeper understanding also requires moments of separation. As Kegan eloquently put it, cognitive growth emerges as a result of people’s repeated attempts to solve the unresolvable tension between getting embedded and emerging from embeddedness (Kegan, 1982). Without connection people cannot grow, yet without separation they cannot relate.”<sup>95</sup>

Games, in contrast to print, photo or movie, are seen as something not only slightly “apart from reality”, but as something not even rooted in reality. They – still – have the advantage of requiring a more conscious “stepping in” to become an interactive player, and their formats are seen as something inherently “not serious”<sup>96</sup>.

So, how to challenge and support a reflective and creative ‘stepping out’ from within? To raise awareness for the medium “game”, as well as for its specific limitations, manipulative dangers and stereotypes, I suggest three approaches from the ‘outside’ of the game: Metagaming, Transmediality and Unusability.

While first order gaming aims for an integrated, self-contained and balanced game experience within a given framework of rules and narratives, second order gaming strives for creative modification, transfer and subversion of these, and thus also of related cognitive and medial limitations and stereotypes. Comparable to a second order observer who deals with the conditions of observation, a second order gamer does not play *within* the given confines of a game, but *with* its confines.

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<sup>94</sup> Paolo Pedercini quoted in Vogel (2008): “Gegen die Diktatur der Unterhaltung”, translation by Tan.

<sup>95</sup> Ackerman (1996): “Perspective-Taking and Object-Construction”, p.28.

<sup>96</sup> Huizinga (2001): “Homo Ludens”, p.37. The difference between seriousness and fun may dwindle with the permeation of ludic assessment or ludic design in working, learning and information. See e.g. Burmester et al. “Usability ist nicht alles – Wege zu attraktiven Produkten.” i-com. Zeitschrift für interaktive und kooperative Medien, Heft 1/2002, 32-41.



### 3.2.1 Metagaming: Pop up the hood.

“The participatory nature of playing a game encourages us to think about, and sometimes modify, its rules that is, its design. [...] We've all played games that we thought could be improved by a few adjustments.”<sup>97</sup>

We once were all game designers, when we made up rules about how to play with a ball, or invented our own narratives that turned our bed into a pirate ship in a shark infested sea.

Though unlike with text, picture or film the creative process of ‘professional’ game design seems hermetic: While the technical and creative means to write, photograph or film are easy to come by, the skills and means to analyse, create, modify and test rule systems, as well as the creation of accompanying motivational narrative backgrounds, seem much harder to achieve. This may be a consequence of our medial culture being one of scripture and picture. Kay, in his advocacy for computer literacy, states:

“In print writing, the tools you generate are rhetorical; they demonstrate and convince. In computer writing, the tools you generate are processes; they simulate and decide.”<sup>98</sup>

Taken into account that our environment, culture, economics etc. are systemic in nature and consist of complex *processes* shaped by human actions decided within rule sets<sup>99</sup>, motivated and made meaningful by narrative elements, a mere demonstration and documentation of these systems by static, non-interactive media seems insufficient<sup>100</sup>. It is time to (re)create and subvert them, play with(in) their boundaries, and share the results. As Kafai and Resnick proclaim, “One area ripe for rethinking is the study of systems.”<sup>101</sup>

In my diploma thesis I identified several established modes of metagaming<sup>102</sup>, i.e. the temporary change of a given game into a toy, with a modified, playable and shareable new game as a result.

These modes of metagaming usually aren't recognised as playing because they happen outside of the actual game. The mechanisms applied are similar, though, as the ones described in this thesis for the troika of toying – game creation – playing: With metagaming a game's frame of reference is temporarily or indefinitely transcended, modified and embraced anew.

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<sup>97</sup> Rollins and Adams (2003): “Andrew Rollings and Ernest Adams on Game Design”, p.11.

<sup>98</sup> Alan Kay quoted in Wardrip-Fruin and Montfort (2003): “The NewMedia Reader”, p.392.

<sup>99</sup> Bateson (2000): “The Logical Categories of Learning and Communications”.

<sup>100</sup> E.g. with his project “Cybernetics for children” Papert had the practical research of systems' behaviour in mind, see Papert (1994): “Revolution des Lernens”, p.195.

<sup>101</sup> Kafai und Resnick (1996): “Constructionism in Practice”, p.7.

<sup>102</sup> Tan (2006): “Konstruktivistisches Potenzial in Lernanwendungen”, p.116 ff. Here, metagames are described as second order simulations, in contrast to first order physical, logical and systemic simulations.

Among the modes to achieve this are quite mundane features, e.g. menu functions, cheats and walkthroughs, more complex semantic respectively systemic approaches like exploits and emergent gameplay<sup>103</sup>, and also approaches that require also technical skills, like skinnings, modifications, extensions and conversions<sup>104</sup>. As exotic as many of the alterations may seem when first encountered, they represent the anarchistic spirit inherent in toying. On the other hand many results – like the famous ‘rocketjump’ – have turned or will turn into tropes of genres and game forms, to be expected by the player community in subsequent game generations, thus closing the circle of innovation and conservation.

Metagaming gives the player the chance to modify her gaming – or learning – experience by self-setting goals, tweaking rules, integrating external personally meaningful material into the game’s mechanisms and narratives, and share the results with other players. To lower the threshold, these options should be made available by educational game designers, ideally challenging and supporting the player to do so, but at least not actively block such activity.

#### **3.2.1.1 Basic menu functions**

Basic menu functions like ‘save’, ‘load’, ‘restart’ etc. will expand a discrete state game’s linear course to one of a possibility space, creating branching paths, for different (re)solutions of the game. As already stated in this thesis, this feature, prominent in digital single-player games, also expands the educationally interesting repeatability of games, supporting a finer, more adaptable mapping of the topic. Per se, these functions may just facilitate a more effective first order gaming, but as ubiquitous digital attribute, comparable to the copy-paste-function, it contrasts our perception of complex analogue, unrepeatably decisions in real life.

#### **3.2.1.2 Cheats and walkthroughs**

Cheats and walkthroughs may alter the premise or even the medial nature of a game, they may reveal aspects of the game hidden intentionally by the game designers, but may also be used as a possible change-of-view in educational games, to contrast given factual knowledge to knowledge and skills open to interpretation and choice.

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<sup>103</sup> For statements about emergent gameplay from scientific and design perspectives, see Juul (2002): “The Open and the Closed: Game of Emergence and Games of Progression”, see also Stöcker (2005): “Interview mit Gamedesigner Molyneux”, Kosak (2004) “The Future of Games from A Design Perspective” and Kringiel (2005): “Spielen gegen jede Regel: Wahnsinn mit Methode”.

<sup>104</sup> Kücklich (2004): “Modding, Cheating und Skinning”.

A *cheat*, usually a small code entered during or before gameplay, may alter the relation of a player to the game played in the same way as the decision of either driving by car or going by train in real life. The choice of transportation establishes corresponding relations to the moving environment and its objects: Potential obstacles perceived as driver may turn into interesting objects to view as passenger.

If a god-mode cheat turns a player e.g. in “Half-Life” invincible, the aesthetics of the virtual surroundings will play a higher role than in a constant state of alertness or combat. “The Sims” will change via unlimited funds from a simulation of resource management to a building simulation. And movement cheats in the 3D-shooter “Doom” affect graphic clipping, thus solid objects and material borders turn insubstantial and give a lesson in digital superficiality: Every object has a rendered surface, but is essentially hollow; in-game interaction can be seen as between the empty husks of the virtual world and the avatar as mask of the player, turning it into a potential lesson in constructivism.

*Walkthroughs* are texts that explain step-by-step a single, most efficient path through the riddles of – mostly – adventure or quiz games. If a player, in the tradition of von Foerster or von Glasersfeld, wants to concentrate on deciding on knowledge, rather than finding knowledge, a walkthrough reduces the “in principle decidable questions”, leaving the ethical ones to stand out – or bring out their absence.

E.g. a walkthrough for “Myst”<sup>105</sup>, as a quiz-adventure, will turn it into a linear visual storytelling experience. Walkthroughs for successful learning adventures like “Physikus”<sup>106</sup> or “Biolab”<sup>107</sup> will reveal the omission of any real decisions to be made by the player, the lack of any undecidable questions as proposed by von Foerster. In these learning adventures, there is just the possibility to do something in a single, correct way – or not at all.

Cheats and walkthroughs may be provided by game designers as well as by dedicated players. The possibility of these may be turned into design decisions, e.g. by supporting forums to exchange cheats and walkthroughs, or by opening the program to be modified in specific, game relevant variables or algorithms. This latter approach would also support the modification of the game.

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<sup>105</sup> Cyan Worlds (1993): “Myst”.

<sup>106</sup> Ruske & Pühretmaier (2000): “Physikus”.

<sup>107</sup> Ruske & Pühretmaier (2001): “Biolab”.

### 3.2.1.3 Exploits and emergent gameplay

Exploits and emergent gameplay include the altering of game features unforeseen or unintended by the designers, by players expanding their possible actions in the game beyond the overt rule set or genre expectations. In contrast to cheats or technical modifications, the expansion of possible gameplay is not bound to the actual suspension or altering of rules, but is based on the creative exploit of the combinations of rules and game elements, or on new interpretations of given or expected narratives concerning the meaning of actions and goals.

An example for a famous exploit of rules guiding the physical behaviour in 3D-shooter-games is the 'rocketjump': a player fires an exploding missile directly in front of her avatar while jumping at the same time. The blast will hurt her avatar, but the combination of shockwave and jump will allow for reaching heights – and locations – never meant to be accessible by the player. This exploit has been used so ubiquitously since its introduction, that newer generation shooter games integrate it into their gameplay.

Emergence is an attribute of complex systems, e.g. of simulative games with interdependent rules and elements. In short, it is the possible and unforeseeable surplus in the sum of a system's parts, with the player either filling in the place of an intentionally left-out element, or as the system's creator or modifier in building simulations, where emergence may occur in the in-game creation. As for the first option, emergence is dependent on the behaviour of the player. "Fable"<sup>108</sup> is a simulative game of this category, and Molyneux remarks quite surprised:

"With 'Fable' something fantastic happened: One administration official in some European country got one copy of the game to rate it, and it came back as "Of moral value for all ages" – and I thought to myself, that couldn't be, they're chopping off people's heads in the game! We sent it in again and it turned out that this man had played the game well behaved and good, he never came to see these gruesome things! He just saved people and was nice!"<sup>109</sup>

Here the game mirrors the existing behavioural traits of the player, showing the same characteristics as an inkblot-Rohrschach-test<sup>110</sup>. Of course Molyneux mentions morbid counter-examples as well<sup>111</sup>.

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<sup>108</sup> Molyneux, Peter, and Lionhead Studios (2004): "Fable: The Lost Chapters".

<sup>109</sup> Molyneux quoted in Stöcker (2005): „Interview mit Gamedesigner Molyneux“, translation by Tan.

<sup>110</sup> When confronted with games intentionally fostering emergent gameplay, political efforts to censor 'content' can be seen as to be as futile as the prohibition of pens or cameras. The narrative background and visual design may be taken into account, but the appeal of these games for the player is to fill an empty space in a complex system to create and enjoy emergent phenomena. As an example for an inadequate linear-script-censorship-procedure see e.g. US senator Brownback's demand to play "games in their entirety" before giving them a rating. See Broache (2007): "Senator wants to ban 'deceptive' video game ratings".

<sup>111</sup> See Molyneux in Kosak (2004) "The Future of Games from A Design Perspective", paragraph "Simulations: The Beauty of Emergent Gameplay".

Emergent gameplay and exploits could be used to describe the same phenomena, with manifestations reaching from effects within the frame of the game – as e.g. in “Fable” or “Bridgebuilder”, more related to innovative ‘cheating’ to reach a game’s explicit or implicit goals – and effects creating a new view on the game, a form of innovative game creation which can be found e.g. in “Speedrunning”, or the usage of games subverting given goals.

As an example for this latter kind of emergent gameplay, a first person shooter initially to be played as a shoot-em-up may be turned into a competitive ‘speed-run’, where getting from A to B as fast as possible – with a bodycount of zero – is the new winning condition. Although ‘speedrunning’ is not prohibited by the rules, the dominant game narratives of combat and looting turn the considerable community of speedrunners into an example for creative semantic transgression. The exchange and enjoyment of the speedrun-videos reaches into transmediality, by turning an interactive combat game into an instructive show of elegant craftsmanship.

On a smaller scale we can discover acts of emergent gameplay as protest to given but boring game narratives. Peters e.g. describes a first order educational game:

“The training games that I tried are unsparingly, terrifyingly banal. Take Stone City, a game Persuasive wrote to train Cold Stone Creamery employees. You play a scoop jockey who has to fill customers' orders. At the end of the game, you're told just how much ice cream you wasted, and how much your poor performance will end up costing Cold Stone over the span of one year. The only fun to be had in Stone City comes from deliberately mishandling the orders. (At my Cold Stone franchise, everyone gets strawberry.)”<sup>112</sup>

What if all employees would use the game in this way? Pias elegantly describes hacking, which is identical to acts of regulative exploitation and narrative reinterpretation:

“Even something quite remote may turn surprisingly quick into a standard application [...]. The hacker always carries with him the boundaries he tries to overcome, and set them continuously anew. Wherever he provides for games which weren't possible before, he not only sets a demand for economic, juristic or moral regulation, but also creates a hacker free space. Because the hacker carries this ambivalence within himself, he may also decide whether he will act as enlightener or destroyer, become utopian or cynic, educator or security counsellor.”<sup>113</sup>

To provide for exploits and reinterpretations, second order game design would aim for the provision of complex, systemic gameplay, with a rich set of interdependent game elements and possible interactions of players with these. Especially in games where moves, goals and narratives are open to jurisdiction,

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<sup>112</sup> Peters (2007): “World of Borecraft”.

<sup>113</sup> Pias (2002): “Der Hacker”, p.9, translation by Tan.

expansion and reinterpretation by human players, as for example with Alternate Reality Games<sup>114</sup> or face-to-face role-playing systems, new storylines and new interpretative spaces may emerge.

#### 3.2.1.4 Modifications: Skinning, extension, conversion and (re)creation

Modifications of games require – yet – different levels of technical skill, and go for a change in graphics, audio, world-structure, object behaviour, interface etc. The result may be as simple as the ability to attach a digital photo of the player as inter-face to her avatar, or as intricate as “Counter-Strike”, a “Halo 2” modification. Their most interesting educational asset is their usage as interactive message, as a creative expression based on rules and narratives, not on static content. This ‘message’ may be an extension ‘just for fun’, but may be also a critical comment to expand and question a game’s given closed and restricting set of meanings and actions.

*Skinning* is the most basic act of modification, i.e. the replacement of narrative, graphic or audio elements, while leaving the regulative layer intact. Any chess game where the playing pieces are substituted by merchandise characters is exemplary to the simplicity of this method.

The effect on personal meaningful media elements in known digital game environments is more complex, though: In my Macromedia Director programming workshops<sup>115</sup> I observed regularly that playing a simple shooting gallery game becomes an eerie and queasy experience if a fellow student’s or the own face is inserted as a target. This diffusion of reality and virtual game may lead to a reflection about the usually quite safe boundaries between the two realms, and the consequences of its breaching. In (computer) games, the ‘objective’ moral value of actions is determined by the right ‘skin’.

*Extensions or add-ons* will add interactive elements to an existing game. These extensions may be created by the player e.g. by using an integrated or external editor, and may range from the purely aesthetic to usable and meaningful artefacts that extend the possibilities of the game. The appeal of this second order approach is the effect the player’s actions have on the authoritative, presupposed unchangeable layer of rules.

In a more complex form, we’ll encounter a formative “skinning” in transmediality, when stories and actions are “skinned” of their respective medium and transferred to another.

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<sup>114</sup> An Alternate Reality Game lets the player explore and comment on an unfolding background story provided by gamemasters. The comments can be seen as moves, the meaningful networking of facts and fictive events as goal of the game. One distinct feature is the players playing themselves in an alternate reality.

<sup>115</sup> The workshops took place in 2004-2005, 2008 at the Faculty for Educational Science, University of Hamburg.

Wright, creator of “The Sims”, estimates in 2001 about 80-90% of all items usable inside the Sims-world to be creations of players<sup>116</sup>. These objects range from simple household items to political or religious comments, to in-game minigames, to caricatures of public personae – including an autonomous Will Wright sim. Items like a TV “Idiot Box” that lowers educational characteristics of a sim when watched, qualify as social commentary and stand as proof for autonomous game add-ons as means for creative expression<sup>117</sup>.

The approach to include gamers to expand a gaming environment has meanwhile reached the game industry. Harrison, representative director of Sony Computer Entertainment, states:

“As you can see, it's all about empowering a community of gamers by embedding the creative tools into the game experience as well, so they don't even know they're editing and creating [...]”<sup>118</sup>

*Conversions and (re)creations* may leave the basic game ‘mechanics’ intact; in digital games sometimes only the physics engine remains. A thorough modification or recreation of playing interface, rules and narratives may lead to a new game with only weak ties to its ancestor.

E.g. the learning game “Physikus” can be seen as a modification of the highly successful point-and-click-adventure “Myst”; and today’s ubiquitous ‘classic’ chess is one of many once popular conversions of the unknown original<sup>119</sup>.

The distinction between a conversion and the creation of a totally new game is often fuzzy. Even game developers rely on proven game mechanisms or known narratives as starting point for their own developments.

This design-process is quite interesting from an expanded constructionist point of view as proposed by Papert, Kafai or Wilensky<sup>120</sup>. Though in today’s game industry conceptualisation, design, programming and game testing are distributed among different specialists, the educational appeal lies in a reintegration in one person: The cycling between different roles, as creator, game tester and player, opens up cognitive and empathic insights into the dynamic correlation of conceptual ideas, algorithmic rules, interpretable narratives, and subjective playing experience. Though tied together with a common concept for a game, every step has to cope with the specific boundaries of its medium: Idea, algorithm, story / visualisation, game and toy. Every transfer from one to the other involves learning about formative compromises, loss and new possibilities.

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<sup>116</sup> Becker (2001): “Newsmaker: The Secret Behind ,The Sims’”.

<sup>117</sup> For description and download of these and further objects, visit <http://www.simslice.com/> (accessed 10 Oct, 2009).

<sup>118</sup> Phil Harrison, executive director of Sony, quoted in Gibson (2007): “GDC: Phil Harrison's Keynote Speech”.

<sup>119</sup> See e.g. Wikipedia “Kurierspiel” at <http://de.wikipedia.org/wiki/Kurierspiel> (accessed Oct 3, 2009)

<sup>120</sup> Papert (1994): “Revolution des Lernens”; Kafai (1996): “Learning Design by Making Games”; Wilensky (1993): “Abstract Meditations on the Concrete and Concrete Implications for Mathematics Education”.



Figures 16-18

Fig. 16: Metagaming turns narratives, visuals, rules, given goals etc. into toys, to be modified and re-interpreted by the players, and the results to be shared with others.

Fig. 17: The 'rocketjump' is an archetypal exploit, having already turned into a staple of shooter games: When the avatar fires an explosive straight down and jumps at the same moment, the explosion will propel her higher and farther than intended by the game designers.

Fig. 18: Skinning a game, i.e. changing graphics, audio or text while leaving the rules intact, allow for an easy change of signification. In a digital game clowns and pies thus behave quite similar to terrorists and guns.

The high technical and aesthetic level set by commercially available games may be problematic, though. This set standard may lead to frustration due to raised expectations of what could be achieved in a short time, one-person-effort. In-game level editors and open source code may be a step to open up games to be educational as medial toys, but it is often overlooked that classic 'physical' analogue games, based e.g. on boards, cards, playing pieces and written rules, are much easier to access on all formative levels. The low technical threshold not only facilitates conceptualisation and realisation but also later modifications by the players.

### 3.2.2 Transmediality: When it is worth to be retold.

While writing, photographing or filming may experiment with boundaries of tropes, technique and technology of the respective medium, games have more in common with digital media in that their technical substrate may include all of the aforementioned media. Games aren't bound by codality or modality: Every object, process or system and every way of handling information may be integrated in a game. And a game may also be the source for other medial representations, as shown by the growing popularity of crossmedia publishing turning successful games into movies and books<sup>121</sup>.

If a medium, e.g. television, has been culturally established and individually mastered, its underlying properties may evade perception, although these

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<sup>121</sup> Movies like "Tomb Raider" (2001) or "Doom" (2005) may come to mind, but there are also novelisations of board games like Teuber's "Settlers of Catan", see interview with Teuber at [http://www.gamefest.com/news/feature\\_detail/1375\\_0\\_3\\_0\\_C/](http://www.gamefest.com/news/feature_detail/1375_0_3_0_C/) (accessed Oct 10, 2009)



properties still influence each expression created<sup>122</sup>. If a medium is, likewise, very dynamic and shifting in its properties, e.g. digital networked media or independent games, emerging new properties may be overlooked due to white noise.

Because experiences are medially transmitted and stored, it should be an educational goal to be aware of both, the inherent, shaping limitations of specific media, as well as the possibility of creative extensions, transfers and way outs.

Transmediality describes processes of 'transferring' content and context of one medium to another. The concept of 'medium' used here is not restricted to a technical medium like print, photo, film, but covers any means of expression bound to a given medial grammar and vocabulary. As McLuhan observed:

"This fact, characteristic of all media, means that the "content" of any medium is always another medium."<sup>123</sup>

Genres, tropes and stereotypes for example can be seen as conceptual media, where an artificial limitation of expressive range supports authorial creation and recipient re-creation of meaning: Horror, thriller, comedy and romantic movies each follow their own genre specific tropes, as do first-person-shooters, simulations, puzzles or dedicated educational games<sup>124</sup>. Though it is possible to turn a first-person-shooter into a TV-comedy or into an adventure game<sup>125</sup>, a transfer can be seen rather as a creative transmutation and reinterpretation of the original contexts and tropes, to 'fit' the new container.

Thus turning e.g. a personal learning experience into a story, and a story into a game or a movie, is problematic: There are always aspects which cannot be transferred because of the targeted medium's defining limitations. On the other hand, the targeted medium may support a wished for form that is impossible by the original's medial boundaries, represented in its rules, techniques and elements, its grammar and vocabulary, its genres and tropes.

This combination of limitations and opportunities may challenge a transfer depending on finding new technical extensions or new cross-media metaphors, and thus open up a space of possibilities that may transcend the original content and its contextual jurisdiction<sup>126</sup>. Though a story that is deemed worth to be retold is one that will be remembered, and vice versa, the actual educational effect can

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<sup>122</sup> McLuhan (1964): "Understanding Media", p.7 ff.

<sup>123</sup> Ibid. p.8.

<sup>124</sup> The TV Tropes Wiki has a growing, delightful and insightful collection of tropes and their subversions in TV, games, and educational games, too: <http://tvtropes.org/>

<sup>125</sup> For an example see the attempt of RicMoo (2007) to turn "Pac-man" into the text adventure "Pac-txt".

<sup>126</sup> See for example Brechts's radio theory, where he wishes for a "radio" with different properties than just being a centralised broadcast, to fulfil modern communicative and educational needs. Brecht (1982): "Der Rundfunk als Kommunikationsapparat".

be seen in the experience of creative transfer and medial differentiation, of active movement between and in-between worlds of expression<sup>127</sup>.

Though it is difficult to see in a time with a dominance of digital games, games are neither bound to a specific technical substrate, nor a specific receptive or expressive medium. Gaming material can take the form of books, boards, cards, of words, sounds, gestures, bodies, of software, data and the internet; games may require, include or exclude view, hearing, touch, gesture and mimic; they may forfeit or rely on emotional response or cool reasoning. This incredible adaptability and potential for transmediality is shared with digital media, which may explain the mutual attraction between these two formative spaces.

Thus a game created as potential educational toy should facilitate transmedial play as well as digital networked game genres would do: Both are accepted as in principle polymorph, constantly changing in their forms and inspiring respectively spawning new ones.

### 3.2.2.1 Games as starting point

In an accessible and popular form, we encounter transmediality in machinima and gamics: Videos and comics created by recording and editing sequences and pictures taken from games<sup>128</sup>. A specific realisation of sequential visual media may be placed somewhere between two approaches: On the one side, the utilisation of the given game's context, narrative and tropes in form of a documentation, homage or satire; on the other side the use of the game as mere picture generator to arrange and illustrate an idea or plot unrelated to the game.

In the first category we may find documentations of e.g. speedruns, clever game exploits or tutorials. In the latter one we may encounter complex political statements like Chan's "French Democracy"<sup>129</sup>. Chan's movie was produced with Molyneux' "The Movies"<sup>130</sup>, which can be seen as second order gaming environment dedicated to producing and sharing machinima.

Even easier to realise in a culture of scripture is fanfiction<sup>131</sup>, the continuation of storylines, description of new plots, or narrative exploitation of characters and situations found in popular games.

An important trait of transmediality is its use as created and creative communicable expression, that refers explicitly or implicitly to the original medium. Transmedial storytelling may thus be used to mock, praise or teach

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<sup>127</sup> Fromme und Meder (2001): "Computerspiele und Bildung".

<sup>128</sup> For examples of machinima see <http://www.machinima.com/>, for gamics see <http://www.gamics.com/> (both accessed Oct 9, 2009).

<sup>129</sup> Chan (2005): "French democracy".

<sup>130</sup> Molyneux and Lionhead Studios (2005): "The Movies".

<sup>131</sup> For examples for written fanfiction see <http://www.fanfiction.net/game/> (accessed Oct 9, 2009).

about a game's or a genre's strength and weakness from the "outside" of play. Assuming that games take place in a specific culture of communication, Brown's proposal for cultural situated learning applies:

"Within a culture, ideas are exchanged and modified and belief systems developed and appropriated through conversation and narratives, so these must be promoted, not inhibited. Though they are often anathema to traditional schooling, they are an essential component of social interaction and, thus, of learning. They provide access to much of the distributed knowledge and elaborate support of the social matrix (Orr, 1987). So learning environments must allow narratives to circulate and ,war stories' to be added to the collective wisdom of the community."<sup>132</sup>

As an example for mocking genre expectations, a part of the appeal – and hilarity – of the machinima "Red vs. Blue"<sup>133</sup> is rooted in game avatars autonomously reflecting their situation. In the original game "Halo" the main occupation is tactical combat, but the machinima, as 'solidified' and reinterpreted formations of the game, deal with the avatars' depression, doubt, dumbness and the longing for change in face of an environment created exclusively to be fought within.

### 3.2.2.2 Games as product

As explained in metagaming, the process of game creation already is a transmedial experience, dealing with the transfer between and integration of idea, concept, design, program and play. Furthermore, since every game is a micromedium in itself, games offer transmediality for game creators between its genres and permutations.

Every omission or inclusion of rule dimensions, as described above, changes the nature of the game, opening up new possibilities. "World without Oil" e.g. is related to the classic German "Planspiel"<sup>134</sup>, an educational game form where pupils adapt roles of factions with different, conflicting interests. The playing field was changed from closed group and classroom discussion to public internet; possible moves shifted from verbal arguments to all technical media forms available to the players, avatars from political representatives to the actual players; and the time frame was expanded from two hours to one month. All these modifications created a new genre, a new medium to explore the same question with similar background anew: What are the consequences of skyrocketing oil prices on a local level, and how could this crisis be coped with? Social crisis management in "World without Oil" may be the content to be

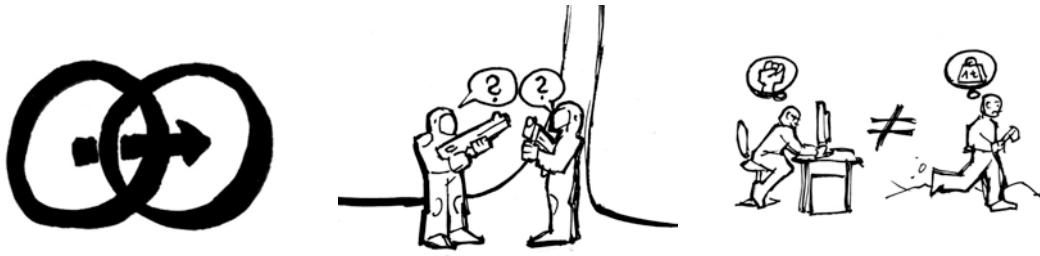
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<sup>132</sup> Brown et al. (1989): "Situated Cognition and the Culture of Learning", paragraph "Apprenticeship and Cognition".

<sup>133</sup> Rooster Teeth Productions (2004-2009): "Red vs. Blue".

<sup>134</sup> See Wikipedia, "Planspiel" at <http://de.wikipedia.org/wiki/Planspiel> (accessed May 12, 2009).

reflected upon, but *how* this is done also redefines the respective medium of an educational simulation game in its formative possibility space.



Figures 19-21

Fig. 19: Transmediality is about the bumpy transfer of content and context of one medium to another.

Fig. 20: In the machinima-series “Red vs. Blue”, “Halo 2” avatars are used as actors to depict a tragic-comic story about doubt and incompetence in face of a given, merciless game narrative of conflict. Machinima and Gamics are often used to set avatars, usually just empty cursors of the players’ actions, into a different context by letting them autonomous characters question their artificial game environments.

Fig. 21: Wiemken’s approach of “Breaking the rules”<sup>135</sup> turns digital games’ rules, goals and mechanics into ‘real life’ games, to educate children about the difficulties of transferring their expectations, actions and emotions from one medium to another, i.a. to prevent game induced violence: What is encountered as empowerment and fun on the screen, may be strenuous and cruel in real life.

In the same ilk Wiemken’s real-life games are obvious adaptations of digital games, mainly shooter and fighting games. Though the transfer is intended to be as ‘true to the original’ as justifiable, the real-life games intentionally fail to convey mood and feeling of the virtual originals. This is due to the physical, social and psychological restrictions human players have to cope with, as opposed to the simplified power fantasies often encountered in mainstream games. Here, the educational effect of transmediality lies in showing certain media as unsuitable – unusable – for supporting carefree play.

### 3.2.3 Unusability: You don’t want to play it again.

If a transmedial transfer or a metagaming alteration is intentionally and purposefully sabotaged by an educational game designer, the irritatingly dysfunctional result may find nonetheless effective use as “unusable” game.

Games demand from the player blind trust that they, as a medium, behave in a stable, foreseeable and conventional way. For example a game is usually accompanied by the exciting suspense of who may win in the end; a game that ‘cheats’, by subtly sabotaging this balance in favour of the game, of one player or a group of players, may turn gameplay into a frustrating experience.

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<sup>135</sup> Wiemken (1997): “Breaking the Rules”.

So, if given a game the player expects it to be balanced, to be fun, to contain a coherent contextualisation. She expects it to be either culturally and traditionally tethered and proven like chess, or, with contemporary games, created en bloc by a competent and benevolent game designer for her entertainment.

What is perceived as the defining properties of a medium evolve in lockstep with the perpetuation and establishment of it *as* a medium, effectively stabilising and solidifying it in its technical form, its genres, narratives and tropes. Avantgardistic experiments, revealed audience manipulations or emerging technological advances may challenge – or endanger – these properties. Such dissolutions can be seen for example with Orson Welles' 1938 broadcast of "War of the Worlds", in a hitherto unfamiliar format resembling a newscast; in revisionist manipulations of photographic documents by the seamless removal of undesired political persons; or the anarchistic though benevolent hackers who show that *physical* media that handles information are no match for *information-based* media that handles information in terms of manipulative potential.

Unusability as educational approach strives for an understanding of medial limitations and preconditions, by aiming for a disruption of trust in these. This happens through game design decisions which deliberately and unbeknownst by the user turn a game unworkable, aporic, disbalanced and disturbing, where it should be intuitive to use, guiding, fair and entertaining. Bateson would describe this as the wilful setting of deceptive contextmarkers to produce a category II error, a conflict only to be resolved on a higher level of cognisance. Bateson's description of how to induce an "experimental neurosis" mirrors the design approach of unusability:

"Typically an animal is trained, either in a Pavlovian or instrumental learning context, to discriminate between some X and some Y; e.g., between an ellipse and a circle. When this discrimination has been learned, the task is made more difficult: the ellipse is made progressively fatter and the circle is flattened. Finally a stage is reached at which discrimination is impossible. At this stage the animal starts to show symptoms of severe disturbance."<sup>136</sup>

In contrast to this rather grim laboratory setting, unusable games usually have emergency exits to reality: e.g. meta-communicative hints on what is educationally intended by the creator; the player's ability to end the game anytime; or the ability to transfer back and forth between reflecting and playing the game.

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<sup>136</sup> Bateson (2000): "The Logical Categories of Learning and Communications", p.296.

Dustin, a player of the game “Super Columbine Massacre RPG”<sup>137</sup>, gives an insight into a possible approach to handle an unusable game. He also paraphrases Ackerman’s constructionist approach of embedding and separation<sup>138</sup>:

“For me, this was one of the hardest games I’ve ever played. After 20 years of gaming, it’s almost natural at this point to try and immerse myself in what I play, but doing so in this case was impossible. If anything, the constant cycle of playing the game versus thinking about playing the game – the association, then dissociation – helped to sharpen the line between game and reality, not blur it.”<sup>139</sup>

Though unusable games are in their carefully created dysfunctions as manipulative as usable games in their smooth functioning, the former ones do not provide a setting how to resolve the higher order problem within the given game. Within the unusable game, there is in the end no other course for the player than to decide *not* to play on as usual. After this decision, it is up to the player what she will conclude or do *with* the game.

### 3.2.3.1 Topics of unusable games

The potential educational topics of unusable games are twofold: To raise critical awareness about preconceptions on games and media in general, but also about content clashing with its medial frame, rendering it ‘unusable’ until resolved from a higher level of learning and action. In both approaches, initiation of irritation and puzzlement may lead to cognisance about trusted expectations, bias and habits.

For medial awareness, the critical review usually reserved for the content of a medium is expanded to the medium itself: An established medium carries a social, cultural, artistic and technological bias that is hard to turn perceptible unless a ‘cracking noise in the joints’ can be heard – and felt – as Debray would put it<sup>140</sup>. Games that startlingly break expectations concerning gaming as such can enhance the understanding of games as intended, manipulated and manipulating creations. On a level also relatable to genres and tropes, Frasca terms this the “Videogames of the oppressed”<sup>141</sup>, which can also be read as gaming *with* the oppressed: The invisible, unconscious, ingrained properties of a medium are brought to unsettling attention. Welles’ 1938 radio adaptation of “War of the Worlds” for example showed the inability of the American public at that time to cope with an ‘unusable’ mix of a radio news format with science fiction content in a time of insecurity and threat of war.

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<sup>137</sup> Ledonne (2005): “Super Columbine Highschool Massacre RPG”.

<sup>138</sup> See Ackerman (1996), “Perspective-Taking and Object-Construction”, p.28; see also chapter 4.2.

<sup>139</sup> Quoted on the website of Ledonne (2005): “Super Columbine Highschool Massacre RPG”.

<sup>140</sup> Debray (2004): “Für eine Mediologie”, p.73.

<sup>141</sup> Frasca (2001): “Videogames of the Oppressed”.

Examples for unusable games that are, in contrast to Welles' broadcast, explicitly or implicitly created as ironic medial commentaries are Costykian's face-to-face role playing game "Violence"<sup>142</sup> and Wong's concept of "The Ultimate War Simulation Game"<sup>143</sup>. Both deal with their genres' gridlocked set of narratives and their players' restricted but securing expectations of inconsequential violence and easy gain; both give their concepts the semblance of a 'real' game. While Costykian works with insults and overstatement to turn his game unbearable and the players' possible actions sickening or meaningless, Wong describes the reality of war to be deeply entangled in a web of ideological, economic, political and medial interests, drenched in lies, misinformation and manipulation, as a background for a gritty and truly 'realistic' war game:

"[...] there were no naked human pyramids in *Starcraft*."<sup>144</sup>

As it is made obvious, games of war and combat are fun – but only if they are simplified beyond recognition, a commentary aimed i.a. at the gaming industry, claiming yet another level of presupposed 'realism' as sales argument for these games.

For a higher understanding of the determining socio-cultural contextualisation of content, including social bias and prejudices, the clashing premises have to be arranged between motivating narratives and resulting moves on the one hand, and the clash of consequences when acting according to this accepted framing on the other hand.

Frasca delivers with "September 12th"<sup>145</sup> an example, dealing with the dominant US American foreign policy at that time, of preemptive military strikes to counter the terrorism threat. The game interface apparently follows this approach, with crosshairs and a trigger to sent rockets into an unnamed Middle Eastern city to kill black clad terrorists walking around between civilians. The actual game has innocent bystanders grieve over collateral kills, turning them into terrorists themselves. After some shots, the city is in ruins and the population has turned hostile. The lesson learned by the frustrated 'player' is: You cannot 'win' this 'game' with the given set of possible moves.

The upsetting of trust, in either form or content, may in its more radical variants intentionally trigger irritation, frustration, fear, or aggression, thus part of the

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<sup>142</sup> Costykian (1999): "Violence: The Roleplaying Game of Egregious and Repulsive Bloodshed". The title is programmatic, as is this quote from the introduction: "[...] there's no point in trying to write a good set of rules because you idiots can't tell the difference between a good set and a bad set anyway."

<sup>143</sup> Wong (2007): "The Ultimate War Simulation Game", italics by the author.

<sup>144</sup> Ibid., italics by the author. Wong here refers to the pyramid of naked prisoners in Abu Ghuraib; "Starcraft" is the popular strategic war simulation by Blizzard Entertainment (1998).

<sup>145</sup> Frasca (2003): "September 12th".

educational concept has to include helping the player cope with the experience, or helping her understand the rationale behind the approach.

Wiemken's "Breaking the Rules"<sup>146</sup> tackles i.a. juvenile aggressiveness influenced by computer games. The approach demonstrates the real-life impossibility of game-like actions by giving physical adaptations of in-game brawling, ambushing or shooting a real-life cops-and-robbers framing. Here an affective-cognitive wrap-up is crucial and an integral part of this socio-pedagogical approach, as power fantasies are questioned and ingrained juvenile insecurities are touched.

Shirts's famous group game of social stratification "Starpower"<sup>147</sup> is targeted at adults and deals with ingrained notions of a justified and fair assignment of power and success in a stratified society. "Starpower" is a deliberately rigged game, which assigns the players randomly to a group of either 'squares', 'circles' or 'triangles'. The 'squares' set the rules how the other players may advance, stagnate or lose in the game, the 'circles' may try to advance to 'square' status, while the 'triangles' will remain powerless, come what may.

"The poor Triangles, with less and less power, wealth, or hope, first get angry, then apathetic. They sit around waiting for this dumb game to be over. They come to life only if they think up a way of cheating or of creating a revolution. Only subversion brings out their interest and creativity."<sup>148</sup>

The inevitable clashes between the player groups' perception of either entitlement or deep injustice concerning the assignment of regulative powers requires an after-game counselling to clarify the game's goal – which wasn't to let the players enjoy a game created with fair rules, but to render visible the appeal of a stratification of power for those on top, and the self-justifying, stabilising mechanisms to preserve the status quo. Meadows strikingly sums up this and other unusable games' true goal:

"Suppose we could admit that most of us act as we do because of our places in the system. Suppose we turned our energy from blaming each other to blaming the structure of the games we play."<sup>149</sup>

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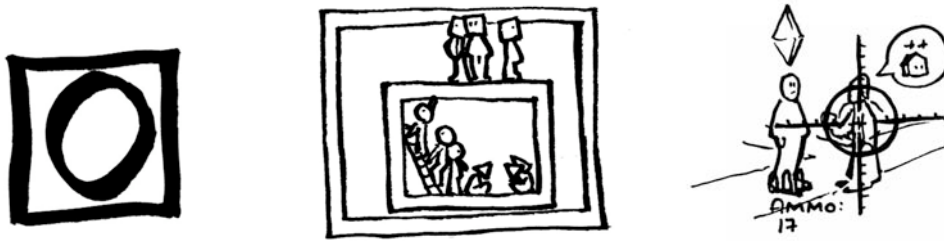
<sup>146</sup> Wiemken, Jens (1997): "Breaking the Rules".

<sup>147</sup> Shirts (1969): "Starpower". For a detailed description of the game and its stages see e.g. Pittenger (1999): "Star Power", also the commentary by game designer Wallis (2007): "Things to do in game design #1: cheat".

<sup>148</sup> Meadows (2004): "Why would anyone want to play Starpower?"

<sup>149</sup> Ibid.





Figures 22-24

Fig. 22: Unusability as educational game design approach challenges the player to critically reflect on media and content preconceptions by sabotaging the expected playing experience.

Fig. 23: Shirt's "Starpower"<sup>150</sup> is an educational group game that exemplifies the stratification mechanisms of society. The game's rules (the outer box) are rigged in favour of a random group of players (assigned 'squares'). They alone have in the end the power to alter specific rules regulating the other players' in-game mobility (inner box, with 'circles' and the hapless 'triangles') to their own benefit.

Fig. 24: In Frasca's "September 12th – A toy world"<sup>151</sup> the player is given a too limited set of possible actions to win the game, in this case there is a shooting-gallery interface to play a simplified social simulation. It is like trying to play "The Sims" with only a gun sight and a trigger. So, what will the player do if given a hammer and the task to turn in a screw?

Unusability differs from metagaming or transmediality in the way that it is usually initiated by educators or game designers, though it is also possible as (trans)medial commentary by ambitious gamers. It requires from the creators a high level of awareness and reflection on the topic, and, if not in an open humoristic form but camouflaged as 'real' game, a safeguard against harmful player reaction to this delusion. Though there is already a long tradition of experimental art and political satire<sup>152</sup>, unusable games, in contrast to formats in text, film or on stage, add the important factor of choice, and thus responsibility, on side of the player. As Wright puts it:

"Games [...] are perhaps the only medium, which allows us to experience guilt over the actions of fictional characters."<sup>153</sup>

If in a game we regret acting like we did, usable games give us a chance to do better next time. Unusable games force us to repeat the same regrettable action over and over, until we regret playing the game as it is, without alterations of its rules or its narratives to do better.

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<sup>150</sup> Shirts (1969): "Starpower".

<sup>151</sup> Frasca (2003): "September 12th".

<sup>152</sup> Examples would be the German literary style of "Romantische Ironie", Dadaism, the actions of current political activist groups like "Yesmen" or the aesthetic Postirony movement.

<sup>153</sup> Will Wright quoted in Jenkins and Squire (2003): "Meaningful Violence".

#### 4. Conclusion

Beyond using games as mere single-use containers for declarative knowledge, an integrated approach of educational gaming takes into account that regulative and narrative elements may span a space for the structuring of possible moves, without dictating an explicit true-false dichotomy. Games deliver self-contained, simplified media with explicit rules for formational processes. They challenge the player to map game-encoded knowledge via varying meaningful paths laid out by repeated playing.

Thus integrated educational game design aims for situated cognition in form of explorative reconstruction of knowledge fields loosely encoded in the game's content, narrative elements *and* rules, while utilising the analogue or digital medium's specific strengths.

This first order educational gaming and game design, which aim for a consistent learning experience, have to be complemented with a second order point of view, of design and of action, challenging or allowing critical reflection, creative modification and the sharing of results by the players.

Beyond the general appeal of gaming to add expressive choice and repeatability to educational and artistic design, I expect second order gaming – emergent, supported or initiated – to play an increasingly important role in future game based learning approaches as well as for game design issues in general:

- It offers low-cost sustainable game design by drawing on the potential of gamers to customize, alter, expand, communicate or reinterpret a game's regulative and narrative elements, thus keeping up the game's long term appeal.
- For aesthetics education and critical media education, the experience, modification or transgression of medial boundaries, as defining property of second order gaming, may be of interest.
- For media theory and practical media design, games share important traits with digital networked media, like polymorphism, emerging properties, or the provision of self-contained micromedia as expressive spaces. A game-toy approach may offer metaphors and approaches to experiment with these properties, both in game context as well as in 'serious' digital applications.
- For theory and practice of games and play in education (German "Spielpädagogik"), there are new definitions and applications waiting to expand the classic structural and functional approaches, with unforeseen attributes and uses of gaming, especially when coupled with the possibilities of digital networked media.

Due to the richness of implications and applications possible, this thesis is intended as just a basic introduction to concepts and approaches, and has to be backed up by concrete interdisciplinary design projects and empirical research.

Generally, the troika of toying – game creation – gameplay can be seen as a highly adaptive mode of cognition, which may render the resulting forms of games and play difficult – or even impossible – to define. An alternative to the categorisation of educational games by their content thus may be by engaging the treatment of medial and contextual limitations and requirements, or their called for, allowed, prevented or challenged workarounds.

“In strongly opposing the world of play to that of reality, and in stressing that play is essentially a *side* activity, the interference is drawn that any contamination by ordinary life runs the risk of corrupting and destroying its very nature.”<sup>154</sup>

Though Caillois thus indirectly warns for an exploitative use of games as mere devices for teaching, it stands to discuss what will happen if play’s attributes of anarchistic appropriation and creative reinterpretation are in turn applied to ‘serious’ media and ‘reality’.



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<sup>154</sup> Caillois (2001): “Men, Play and Games”, p.43, italics by author. When playing is established as obligatory cultural function, e.g. for socializing or learning, it may lose defining attributes, changing its character to a “must, task and duty”; see Huizinga (2001): “Homo Ludens”, p.16 f.

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### 5.3 Original quotes

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„Der Form nach betrachtet, kann man das Spiel also zusammenfassend eine freie Handlung nennen, die als „nicht so gemeint“ und außerhalb des gewöhnlichen Lebens stehend empfunden wird und trotzdem den Spieler völlig in Beschlag nehmen kann, an die kein materielles Interesse geknüpft ist und mit der kein Nutzen erworben wird, die sich innerhalb einer eigens bestimmten Zeit und eines eigens bestimmten Raums vollzieht, die nach bestimmten Regeln ordnungsgemäß verläuft und Gemeinschaftsverbände ins Leben ruft, die ihrerseits sich gern mit einem Geheimnis umgeben oder durch Verkleidung als anders als die gewöhnliche Welt abheben.“

Johan Huizinga (2001): „Homo Ludens“, p. 22.

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„Einer meiner zentralen mathetischen Grundsätze ist, daß die Konstruktion „im Kopf“ häufig dann besonders gut gelingt, wenn sie in einer sichtbaren Konstruktion „in der Welt“ Unterstützung findet – einer Sandburg oder einem Kuchen, einem Legohaus oder einer Firma, einem Computerprogramm, einem Gedicht oder einer Theorie des Universums. Mit „in der Welt“ meine ich auch, daß das Produkt gezeigt, diskutiert, geprüft, erprobt und bewundert werden kann. Es ist von außen sichtbar.“

Seymour Papert (1994): „Revolution des Lernens“, p. 158.

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„Literatur und Film sind technisch nicht in der Lage, Emergenz erfahrbar zu machen. Deshalb kann man ihnen auch nicht vorwerfen, dass sie nicht versuchen, Utopie neu zu denken. In der Populärkultur schaffen heute Computerspiele die einzigen Utopien der Utopie.“

Konrad Lischka (2002): „Eine Welt ist nicht genug.“

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„Offenheit kann sich somit im Lernspiel nur auf jene Spielelemente beziehen, die zwar nicht didaktisch wirksam werden, die unterrichtliche Tätigkeit der Schüler jedoch als Spiel charakterisieren.“

Klaus Kube (1977): „Spieldidaktik für die Unterrichtspraxis“, p. 40.

„Als Lernspiele werden Materialien gekennzeichnet, die die Regeln von Gesellschaftsspielen übernehmen – sie entsprechen Lotto, Domino, Puzzle, Karten- oder Würfelspiel – und deren Inhalte didaktisch konzipiert sind.“

Mechthild Dehn (1986): „Lernspiele“, p. 518.

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„Es „objektiviert“ gewissermaßen die intern erbrachten Leistungen, indem es sich vorstellt, unter gegebenen Möglichkeiten die eine oder die andere zu wählen - bei einem Schachspiel zum Beispiel angesichts einer bestimmten, im Spiel selbst erzeugten Stellung einen bestimmten Zug zu ziehen. Es sieht den Möglichkeitsraum mit seinen bereits erfolgten Einschränkungen als das Spiel und entscheidet daraufhin über den nächsten Zug; es realisiert im Medium des Spiels die eine oder die andere Form.“

Niklas Luhmann (2002), „Das Erziehungssystem der Gesellschaft“, p. 89.

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„Das Spiel enthält in jeder seiner Operationen immer auch Verweisungen auf die gleichzeitig existierende reale Realität. Es markiert sich selbst in jedem Zuge als Spiel; und es kann in jedem Moment zusammenbrechen, wenn es plötzlich ernst wird.“

Niklas Luhmann (1996): „Die Realität der Massenmedien“, p.97

„Das Medium ist hier keine intervenierende, sondern eine umfassende, einhüllende Instanz; nicht etwas, zu dem, sondern in dem Menschen sich verhalten. [...] Es gibt die Möglichkeit, Möglichkeiten einzuräumen. Wir haben den Raum, Räume zu schaffen.“

Werner Sesink (2008): „Bildungstheorie und Medienpädagogik“, p. 15.

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„Zur Pädagogik der Postmoderne gehört, daß man sich nicht bei Fragen aufhält, die man sich bei einigem Nachdenken auch selber beantworten könnte. Wenn man schon fragt, dann so, daß die Frage eine neue, unentdeckte Schicht der Wirklichkeit freilegt und dann gar keiner unmittelbaren Antwort bedarf.“

Heinrich Kupfer, „Pädagogik der Postmoderne“, p. 29.

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„Die Ideologie eines Spiels liegt in seinen Regeln, seinen unsichtbaren Mechanismen und nicht nur in seinen erzählenden Teilen. Daher wird eine globale Erneuerung dieses Mediums alles andere als einfach sein.“

Paolo Pedercini in Vogel (2008): „Gegen die Diktatur der Unterhaltung.“

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„Ein Verantwortlicher in irgendeinem europäischen Land bekam ein Exemplar, um es hinsichtlich der Altersfreigabe zu bewerten, und es kam zurück als ‚moralisch wertvoll für alle Altersstufen‘ – und ich dachte, das kann doch nicht sein, ich meine, sie hacken darin Leuten die Köpfe ab! Wir haben es noch mal hingeschickt und es stellte sich heraus, dass der Mann sich einfach wundervoll und gut benommen hatte im Spiel, er hatte diese schrecklichen Sachen einfach nie gesehen! Er hatte nur Leute gerettet und war nett gewesen!“

Peter Molyneux in Stöcker (2005): „Interview mit Gamedesigner Molyneux.“

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Auch was noch so abseitig beginnt, kann überraschend schnell zur Standardapplikation werden [...]. Der Hacker schleppt also die Grenze, die er zu überwinden scheint, immer mit und zieht sie ununterbrochen neu. Wo immer durch ihn offensichtlich Spiele möglich werden, die vorher nicht da waren, erzeugt er selbst nicht nur einen ökonomischen, juristischen oder moralischen Regelungsbedarf, sondern auch einen hackerfreien Raum. Weil der Hacker diese Ambivalenz in sich trägt, kann er sich auch selbst entscheiden, ob er sich als Aufklärer oder Zerstörer betätigt, ob er Utopist oder Zyniker wird, Pädagoge oder Sicherheitsberater.

Claus Pias (2002): "Der Hacker", p. 9.