Masters Course in Digital Games Research and Design

Module 3

Week 3: Didactic Analysis of Digital Games

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GAME STUDIES COURSE MATERIALS

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1. Didactic analysis of digital games

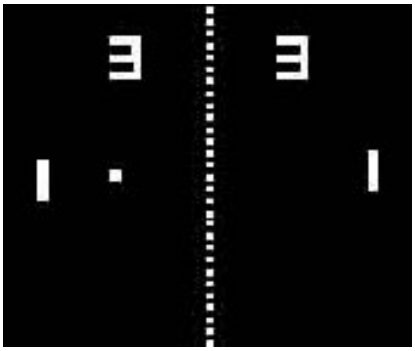


Image 1: *Pong*, a screenshot © Atari.

Didactic analysis traditionally deals with learning and teaching in educational settings. In a broader sense, it applies to all kinds of environments that are arranged to support learning in a systematic way. Digital games are such kinds of arranged learning environments: they are designed to support entertaining learning. Why is this?

In 1972 the manual of the classic computer game *Pong* (Atari/Atari) (see image 1) was made up of three sentences: "Insert coin", "Press start" and "Avoid missing ball for high score". In 1998, the manual for the flight simulation *Falcon 4.0* (Hasbo 1998) contained about 600 pages. Of cause, flight simulations are not characteristic of digital games in general, but the contrast of this opposition nevertheless illustrates a point: the knowledge the player may use in a game is getting more and more complex.

There still are digital games today with just a few rules that can be easily discovered by fumbling around with the game pad, and there still are games where the player learns the application of rules by just repeating specific actions again and again. This is especially true for eye-hand-coordination necessary for classic action games. Designers call this type of games "Easy to learn, hard to master". But this type is getting rare. Even in the genre of action games the player today usually has to reflect throughout the whole gaming session. If you simply run into a new room in *Doom 3* (Id 2004) and pull the trigger, you get humiliated (as a reviewer sardonically put it).

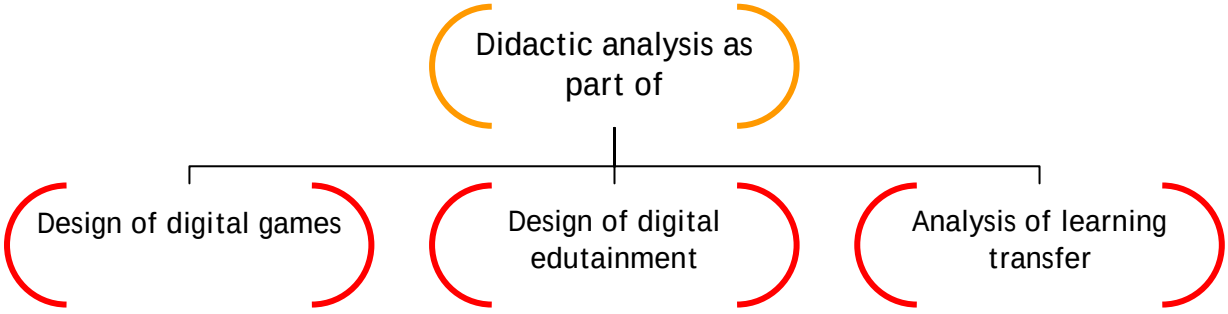
A reason for this trend towards complexity is the accumulation of basic gameplay skills, the so-called *game literacy*. Playing a game usually leads to new knowledge about how to play, for example how to take an object and throw it away to distract an enemy. When playing another game (of the same genre), the player tends to expect to be able to do the same things he or she has learned to do in recent gaming. If the game does not give the opportunity to do so, he or she is disappointed. In addition to this, the player will expect to be able to do new things in the new game. In this way, the expectation towards games as interactive environments grows and game design has to live up to this by increasing the complexity of games.

This has two consequences both for the player and the game designer. As for the players, they have to learn more and more gaming rules. Some of them are 'official' ones, documented in the game's manual. Others they have to discover throughout the process of gaming. This may be called the *demystification* of a game (Friedman 1999). Secondly, they have to learn how to apply these rules.

Knowing the rules of chess is not the same as being a good chess player. Pedagogically, this is known as the distinction between 'knowing-that' and 'knowing-how'.

For designers the trend towards complexity is a huge challenge, because the majority of players do not like to read manuals before the fun starts and even if they did do so, they would not get the knowing-how that the gameplay requires. How do they deal with this situation? They do not only create more and more complex games, but also develop more and more complex and efficient methods to support the learning process while playing. Currently this is a more or less unconscious behaviour, driven by the evolutionary processes of the capitalistic market, which the digital games industry is a part of. Games that trigger learning and thus allow players to do new interesting things are games that people like to play. The games people play are the games that are sold. The (learning) design of well-selling games is being copied and varied; it evolves and gains in market shares. Thus digital games, for economic reasons, are a media of fast evolving self-referentially arranged learning environments.

The didactic analysis of this process obviously can serve several interests (see graph 1). Firstly, it can be useful for the design of compelling digital games in general. As learning is a core element of gameplay, didactic analysis may provide a "canon" of methodical tools which reflects the state of the art of digital games in general, or specific genres in particular. In this way, didactic analysis is part of the game design training. Secondly, a canon of methodical tools can be helpful in designing games for educational purposes. Thirdly, didactic analysis can supplement the transfer of the traditional research fields of learning from the virtual game world into the real world of the player. This research has to look closely at what is actually learned in games, and a good starting point for this is to look at what the 'games themselves' want to teach the player. Additionally, assertions about the positive transfer effects of games have to take in account carefully what the player actually does (and learns) and to what extent a game takes the players by the hand and solves a specific problem for them.



Graph 1

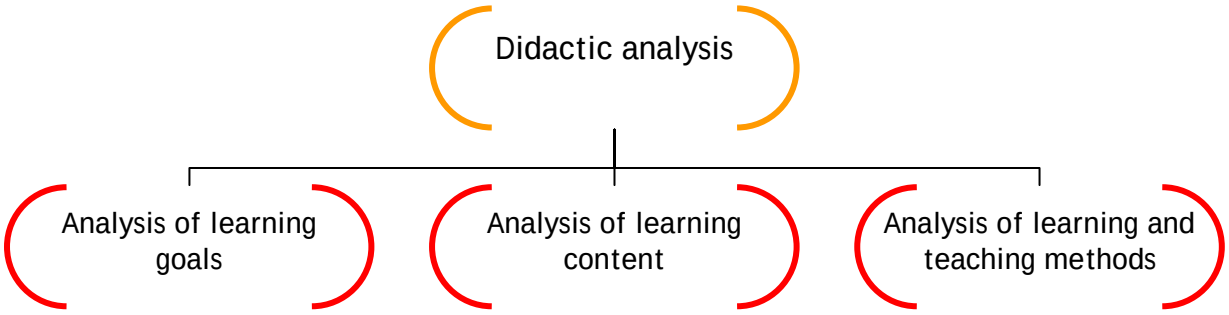
Didactic analysis traditionally deals with three main questions that are important to game design, as well (see graph 2):

1) What actually is and what should be learned (learning goals)?

2) What is and should be the material/themes used to reach these goals (learning content)?

3) How should this learning content be learned (learning and teaching methods)?

These three subfields of didactic analysis are strongly interrelated. Nevertheless, this text mainly deals with the question of learning and teaching methods. This approach can be termed *didactic-methodical analysis*.



Graph 2

Important terms

didactic analysis, demystification, game literacy, didactic-methodical analysis.

2. Methodological basics

Analysing the didactic methods by which digital games support learning is a methodological challenge. Up until now there has been no real awareness of this area within the profession of game designing (this is perhaps because being some kind of 'teacher' does not fit into a game designer's self-concept, although they most certainly are at least a kind of 'coach'). Design books contain some scattered hints, but nothing more (check, for example, Bates 2001). Beside this, studies on school teaching point to the fact that teachers (and creative professionals like game designers, as well) are not fully aware of what they actually do. This is due to the two sides of professional knowledge in general: it melts descriptive (knowing-that) and procedural knowledge (knowing-how) and it is usually very difficult or even impossible to verbalise procedural knowledge. That is why, for example, the attempts to program teaching expert modules as parts of intelligent tutoring systems (ITS) are still not very successful. Thus, didactic researchers cannot simply ask designers how they support learning.

The next obvious thing to do is to analyse games with methods that are used in other arranged learning environments, for example, teaching, educational software, and edutainment. This, too, is demanding. Currently, there are two major attempts to analyse computer games in this way.

The first one is Prensky (2001), who identifies fourteen different methods of learning and teaching in computer games (Prensky 157-163): Practice and feedback; learning by doing (practice and feedback, exploring, discovery and problem solving, and task-based learning); learning from mistakes; goal-oriented learning ('learning to do something' instead of learning facts); discovery learning and 'guided discovery'; task-based learning; question-led learning (questions that induce a process of reflection); role playing; coaching; constructivist learning; multisensory learning; selecting from learning objects (learning of knowledge that can be hooked up on demand in any order by either an instructor or the learner); intelligent tutoring (intelligent tutoring systems).

The second attempt is Gee (2003) with a list of 36 learning principles in computer and video games (Gee, 2003: 207-212) and Gee (2004), which contains 12 principles. Gee's principles are strongly centred on the traditional ways of guided learning by doing.

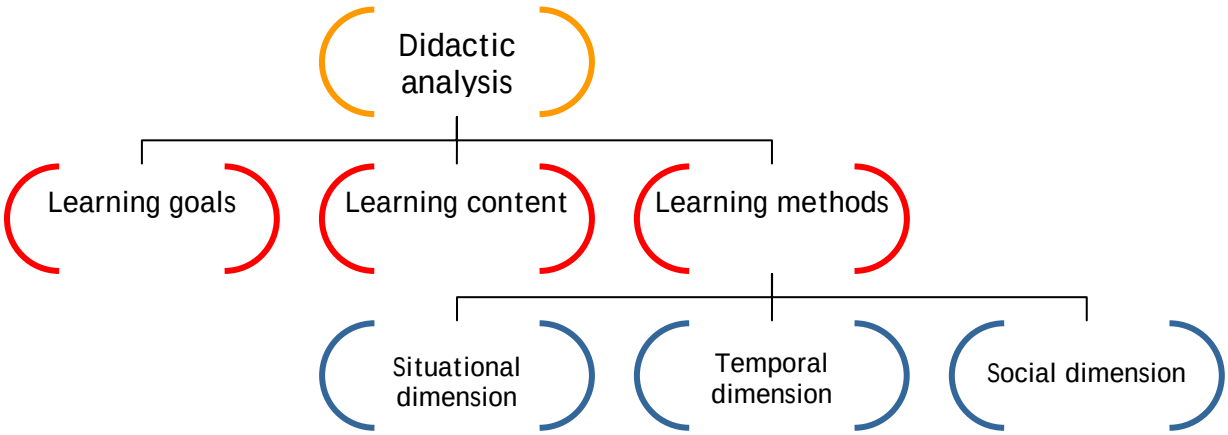
Reading the (oddly assorted) lists of Prensky and Gee brings to light two methodological problems concerning the analysis of digital games as learning environments. Firstly,

there are thousands of teaching and learning principles at hand. Thus, some kind of systematic ordering may be useful. Secondly, research on the effectiveness of teaching methods indicates that it is important to analyse teaching methods at a very detailed level. There are effective and ineffective ways of lecturing, of learning in small groups, of guided discovery, of using multi-modal ways of communication, and so on. Therefore, you do not know much about computer games when you can tell that they apply 'guided discovery'. Tools of analysis need a much higher resolution than this. This is especially important when one wants to improve school learning and edutainment software by looking at digital games. Neither Prensky nor Gee reflect on these problems.

I suggest focusing on three fine-grained dimensions in the description of games as learning environment (note that this is a contingent decision which has to justify itself through its fruitfulness in the course of research):

- the dimension of arranged learning situations (situational dimension),
- the temporal dimension in which situated actions are arranged,
- the social dimension in which actions take place.

All of these dimensions are interrelated and may be applied within a larger framework of didactic analysis which takes into consideration learning goals and learning content, as well (see graph 3). The following paragraph will deal with these methodical dimensions in detail.



Graph 3

Important terms

Situational dimension, temporal dimension, social dimension

Further reading

Gee, James Paul (2004) “Learning by Design: Games as Learning Machines”. In: *Gamasutra,* March 24; download <www.gamasutra.com/gdc2004/features/20040324/gee_01.shtml>.

Prensky, Marc (2001) *Digital Game Based Learning*. New York: McGraw-Hill.

3. Basic dimensions of arranged digital learning environments

3.1. The situational dimension

The situational dimension of gaming is based on the concept of gaming situations. The term is derived from theories of microanalysis in sociology and pedagogy (see, for example, Goffman 1972). Microanalysis theories are based on an *action theory* paradigm and describe the phenomenon of gaming as a series of *gaming situations*. A (gaming) situation is characterised by

- a person's concept of an environment (the environment may include other people and their actions),
- the goals the person wants to achieve within this environment,
- the tools and plans at hand to reach these goals,
- certain intentional (goal-seeking) actions to actually achieve the goals

(see Miller, Galanter, Pribram 1960 and in the field of Human-Computer Interaction (HCI) Suchman 1987).

3.1.1. Types of gaming situations in a didactic perspective

An *arranged learning situation* is a certain type of gaming situation that is structured by a) the actions of the game designer (or a team of designers), who creates environmental learning stimuli for the player; and b) the actions of the player, who responds to these stimuli in a way that leads to the kind of learning which the designer wants to stimulate.

Arranged learning situations can be distinguished from three other gaming situations that are important for the analysis of games as learning environments: a situation where the player does not learn the way that the designer wants him to, may be called an unsuccessful or pure *teaching situation*. An example of this may be a boring, unsuccessful situation within a tutorial. A situation in which the player learns something, which the designer did *not* intend him to learn, it is a pure *learning situation*. The latter often takes place, when a player is creative in a way the designer did not anticipated. The designer Harvey Smith gives an example of such a pure learning situation when talking about DEUS EX (Ion Storm 2000):

> "For instance, some clever players figured out that they could attach a proximity mine to the wall and hop up onto it (because it was physically solid and therefore became a small ledge, essentially). So then these players would attach a second mine a bit higher, hop up onto the prox mine, reach back and remove the first proximity mine, replace it higher on the wall, hop up one step higher, and then repeat, thus climbing any

wall in the game, escaping our carefully predefined boundaries." (Smith 2002)

Arranged learning situations are by definition characterised by an intention of the designer to prompt *learning*. This is the main difference to situations where the designer just wants to cause the player to do something but does not intend any long-term changes in player behaviour. These situations may be called *guiding situations*. With regard to the designer's methods, both types of situations often use similar forms of instruction. Usually it is only the larger context of a situation that makes it possible to distinguish one from the other.

Important terms
Situational dimension, action theory, arranged learning situations, guiding situations.

3.1.2. Types of arranged learning situations

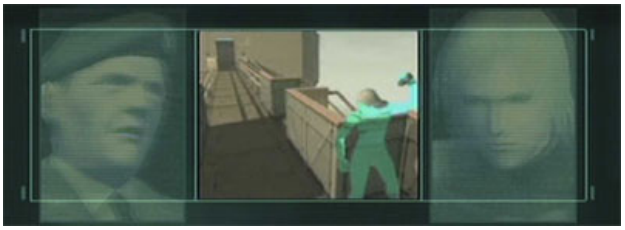
Images 2, 3, 4: Screenshots from *Splinter Cell 2* © Ubisoft 2002, *Half-Life* © Valve/Sierra 1998, *Tomb Raider 6: Angel of Darkness* © Core Design/Eidos.

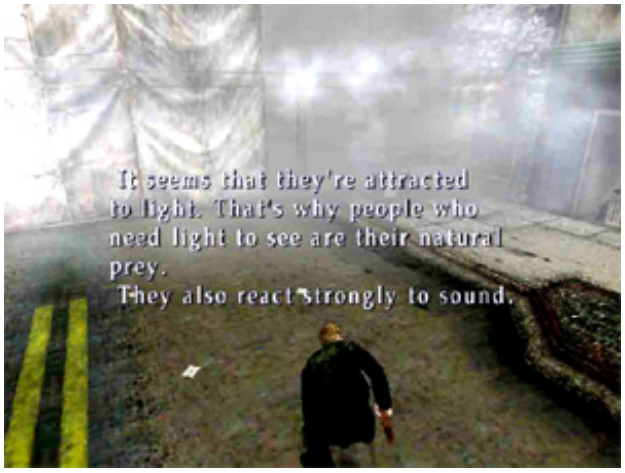
The designer, of course, is not actually present within the gaming situation, but his or her prior actions lead to certain events within the game world and the player reacts to these events. Thus, typical arranged learning situations are made of specific *pairs* or patterns of designer and player actions. Some common *types* of patterns are described below.

Writing, telling, illustrating – reading, listening, looking at
The most obvious type of arranged learning situations in digital games is the presentation of learning content in a written or illustrative form. In the past, these were often simply presented by info screens that interrupted the play. Meanwhile it is common to motivate these presentations by simulating various media within the game world, for example PDAs as in *Splinter Cell 2* (Ubisoft 2002; see image 2) and Doom 3 (Id 2003), books, cell phones, records, computer files, sheets of paper, and wall or street signs as in Half-Life (Valve 1998; see image 3) and *Tomb Raider 6: The Angel of Darkness* (Core Design 2003; see image 4). A similar thing happens when, in a certain situation in Silent Hill 2 (Konami 2002), the avatar walks along a street and discovers the corpse of a slaughtered man and several sheets of paper on the ground. As soon as he reaches down, the text of the sheet is displayed on the screen (see image 6).

Learning content may also be presented audibly, for example by a NPC (Non Player Character). It is common to simultaneously display in written form what the NPC is saying (multisensory learning). These telling/writing-situations often occur extensively within tutorials and introduction levels (see chapter 4), but may also be scattered throughout the whole game. FPS and stealth-shooters like the *Splinter Cell* series (Ubisoft) use this method quite often. The hero

communicates with his mission team via radio and receives situated advice. In these situations, the player usually just has to listen; whereas in *the Metal Gear Solid* series (Konami) he or she additionally has the opportunity to actively ask for advice by using the "codec" (feedback on demand). Of course, the players do not here formulate a question on their own. Instead, the game displays a scripted conversation, usually covering situated matters. Important information of this kind is often stored in a virtual notebook.





mages 5, 6, 7: Screenshots from *Metal Gear Solid* 2: *Substance* © Konami, *Silent Hill* 2 © Konami, *Silent Hill 2* © Konami.

Demonstrating – observing

Another typical learning/teaching -situation is the display of a process or skill while the learner observes the display and acquires knowledge (see Bandura 1963). This can be realised in different ways. In an explicit way, the learner is informed about the learning character of the situation. Take for example a situation from *Metal Gear Solid* 2: *Substance* (Konami 2003). Here the Colonel (a member of the mission team in contact with the protagonist via radio) gives Raiden (the hero) audio advice to throw a chaff grenade to clear a connecting bridge. Simultaneously, this action is demonstrated in a little video clip (see image 5). In a more implicit way, the model process may be displayed to the player without a direct comment about the situation. Take as an example a situation from *Silent Hill 2*. In the Woodside Apartment, the protagonist enters a rather dark room (see image 7). A torch that is attached to a tailor's dummy illuminates the part of the room in front of him. In the dark background, something is lying motionlessly on the ground. When the player takes the flashlight, the rear part of the room suddenly is illuminated and the object on the ground (a monster) comes to life and attacks the player. This may be interpreted as an implicit demonstration of the same learning content, which is presented in written form in image 6. [The less overt a demonstration is, the closer it is to the didactic method of 'guided discovery']. Furthermore, these situations are an example of the possibility of using different types of didactic methods to teach the same kind of learning content.

An important focus of didactic analysis and planning is the question of what learning content (and goal) may be used together with what kind of method.

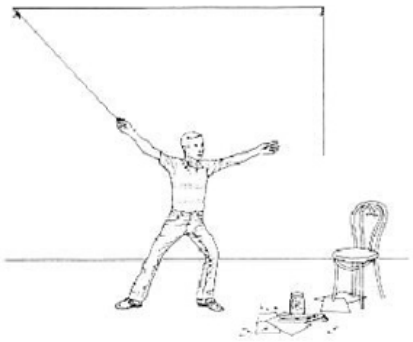


Image 8: Maier's two cords experiment, drawing.

Images 9, 10, 11: Screenshots from *Broken Sword 3: The sleeping dragon* © Revolution/THQ.

Stealth teaching situations

Gamers do not like being taught or guided, because the enjoyment of gaming often comes from the enjoyment of solving problems on one's own (or within a team of peers). Because of this, designers sometimes try to avoid the impression that games use didactic methods. As this camouflage is a didactic strategy as well, I propose to call this *stealth teaching* or *stealth guidance*. The terms are loosely affiliated to the concepts of implicit learning and teaching.

Stealth teaching is a generic term, which covers several types of learning and teaching situations. The concept (not the term) can be traced back to the Gestalt-psychologist Maier and his classic two cords experiment (see Maier 1931). In Maier's experiment, two cords were hung from the ceiling of a laboratory strewn with many objects such as poles, screwdrivers, and pliers. The subject was told his task was to tie the two ends of the cords together. The problem in doing so was that the cords were placed so far apart that the subject could not, while holding onto one cord, reach the other (see image 8). After the subject had been stumped for several minutes, Maier, who had been wandering around the room, *casually* put one of the cords in motion. Then, typically within 45 seconds of this cue, the subject picked up a weight, tied it to the end of one of the cords, set it swinging like a pendulum, ran to the other cord, grabbed it, and waited for the first cord to swing close enough for it to be seized. Immediately thereafter, Maier asked the subject how he had got the idea of a pendulum. The question elicited such answers as "it just dawned on me", and "I just realised the cord would swing if I attached a weight to it". All of the subjects denied that Maier's cue had played any role in their solution.

A similar principle of 'covered guided discovery' can be found, for example, in the adventure game *Broken Sword 3: The Sleeping Dragon* (Revolution 2003). Here the hero searches a table in a scientist's laboratory and picks up several items, for example a postcard from Glastonbury, England and a magnifying glass. When he takes the glass, he makes a casual remark on an episode from his youth in sunny California, when he set his father's straw hat on fire. Several gaming situations later, outside the laboratory, the player has to solve the problem of making fire within a stone statue that serves as a fireplace. He must solve this problem by taking a dry bird's nest, putting it onto the fireplace within the statue and using the magnifying glass to light up the bird's nest (see images 9-11). The main point here is that the casual remark several gaming situations earlier may not be remembered consciously but it, nevertheless, *primes* the correct solution for the problem (for literature on different

ways of 'priming' see the experiments of Nisbett/Bellows 1977 and Nisbett/Wilson 1977).

Games use stealth techniques not just in regard to problem solving, but also in regard to the guidance of the user, as well. Here a typical field of application is to lead the player from one place within the game world to another while giving the impression that the player has found out the way independently. An example of this can be observed in *Deus Ex: Invisible War*. On the first level of the game, the player enters a hallway and has to find apartment No. 454. As soon as he approaches the next crossing, an explosion occurs and a frightened janitor appears, runs down the hall and chooses the next corridor to the left. If the player follows him around the corner, he sees the janitor standing at the end of the hall, looking at him.

Images 12, 13, 14: Screenshots from *Deus Ex: Invisible War* © Ion Storm/Eidos.

Images 15, 15a: Screenshots from *Grand Theft Auto: Vice City* © Rockstar North/Rockstar, *Thief: Deadly Shadows* © Ion Storm/Eidos.

After a short conversation about the explosion, when the player again starts to look for apartment 454, he realises that he is standing right in front of it (see image 12-14.).

Pointing at – being observant

Digital games, especially 3D-games, display large areas of landscape or rooms that the player has to explore or deal with. To ease these requirements games sometimes 'point at' certain objects to guide the player's attention. This may be done in various ways. For example, designers may point at objects by using alienation effects as in *Grand Theft Auto: Vice City* (Rockstar North 2003) (see image 15) and in *Thief:*

Images 16, 17: Screenshots from *XIII* © Ubisoft and *Jedi Knight III: Jedi Academy* © Raven/LucasArts.

Deadly Shadows (Ion Storm 2004) (see image 15a). They may label objects in the game world by a kind of underlining, in a way common to strategy games in unit labelling; and they may frame them as in *XIII* (Ubisoft 2003) (see image 16). Or they may, for example, design a level in a special way, for example by using fluorescent sticks as in *Jedi Knight III: Jedi Academy* (Raven 2003) to indicate a path (see image 17).

And again NPCs may be used for this task. For example, in the first gaming situation of *Jedi Knight II: Jedi Outcast* (Raven 2002), the NPC Jan walks across a great square, kneels down behind some containers and looks in a certain direction. When the player follows him and looks in the same direction, he or she can see some storm troops – the first enemies within the game (see images 18 a and 18b).

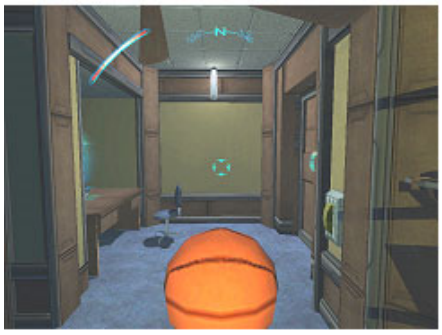
Many of the mentioned situations are instantly followed by other situations in which the player must immediately apply the knowledge he or she has just acquired. This may be called the 'just-in-time' principle of teaching/learning in digital games (for analysis of such temporal relations between arranged learning situations see chapter 3.2).

These situations are just a selection of types of arranged learning situations in digital games. Others are, for example, provoking the player, giving rewards (as tools, money, praise

Images 18 a, 18 b: *Jedi Knight II: Jedi Outcast,* details of two screenshots © Raven/LucasArts.

etc.), punishing (for example with the 'time-out'-method of games: reloading) etc. As the technical basis of games develops, other traditional educational methods will be transformed and used in the virtual world of gaming.

It is important to notice that a *situational analysis* of games should be integrated into a more complex didactic analysis which takes into account the learning content and



Images 18 c, 18d, 18e: *Deus Ex: Invisible War* © Ion Storm/Eidos.

the learning goals that are to be achieved. This is important as some combinations of methods, goals, and content suit each other better than others.

Consider, for example, the following didactic problem from *Deus Ex: Invisible War*. This was one of the first games that contained a physics engine (the "Havok" engine) which allowed the player to take objects and throw them, while the objects than bounced off more or less physically correct. The learning goal here is to teach the players that they may take objects in this way to solve problems. As a learning method, it suggests a learning-by-doing method to inform the player about this feature of the game instead of telling him about it. The interesting question now is how to stimulate the player to throw something around. A not very elegant way to do this would be to simply tell him to do so. *Deus Ex: Invisible War* applies another way. On the level of the learning content, it chooses a special object, which *calls itself* for being taken and thrown around: a baseball (see images 18 c, 18d, and 18e).

Important terms

Situational analysis, stealth teaching.

Further reading

Goffman, Erving (1972) "Fun in games". In: Goffman, Erving (1972) *Encounters,* London: The Penguin Press, 15-31.

Maier, Norman R. F. (1931) "Reasoning in humans II. The solution of a problem and its appearance in consciousness". In: *Journal of Comparative Psychology*, 12, 181-194.

3.2. The temporal dimension and phases of learning

Learning situations in games often last just a few seconds. Thus, analysing digital games suggests several questions. How are these learning situations arranged within the game temporally? In a linear sequence, a random order, a bottleneck pattern, or what? How fast is the learning curve within the game? What is the temporal relation between information and the opportunity to apply it? Are there *phases,* or steps of gameplay? Questions of this type concern the *temporal dimension* of games.

A phase of *learning* is a part of the game that usually contains several individual situations which together serve a special function within a higher-ranking learning process plan. Digital games have systematically arranged learning situations in this way since their dawn 35 years ago. The most common way to do this is the *hierarchical approach* (see Eraut 1985 and Dick/Carey 1996). Here the designer has to ask: what does the player already have to know so that

this challenge (for example fighting a 'boss') can be learned? By asking this question, the designer can identify one or more critical subordinate skills that the game has to teach the player prior to a main challenge. Learning situations may then be constructed and disposed accordingly. For example, simple learning situations concerning movement within the game world usually are the first to be presented within a game, followed by situations with more prerequisites.

Images 19, 20, 21: Screenshots from a video documentation on *Splinter Cell* © Ubisoft.

During the evolution of game didactics, the design of learning phases has got more and more complex. For example, in *Space Invaders* (Taito 1978), there are just two basic skills: shooting at aliens, which approach from the top of the screen, and avoiding getting in touch with their bombs and bodies. According to this, the speed of the attacking aliens accelerates from level to level (in this perspective the common term 'level' is a synonym for learning phase). Nowadays digital games usually imply not one but dozens of different basic skills, and the arrangement of learning situations is correspondingly more difficult. *Splinter Cell* (2002) level designer Clint Hocking gives an example (see images 19, 20 and 21):

> "The player must learn them [the skills; M.B.] once, than [he must; M.B.] be able to build on that knowledge… You can start with a simple challenge in an early level … like Level 1 … you learn how to climb a pipe. Come Level 3, you'll want the player to have to climb that pipe again, but in a more challenging scenario. An enemy might be looking out a window. Then in Level 5 or 7 the player will climb a pipe with the enemy at the window and a moving dynamic light searching the area of the pipe. [See image 7] Once the player has learned a set of skills in one part of a map or over the course of a few maps you'll then want to encourage the player to face all of these challenges together or in close proximity to each other." (Hocking 2003).

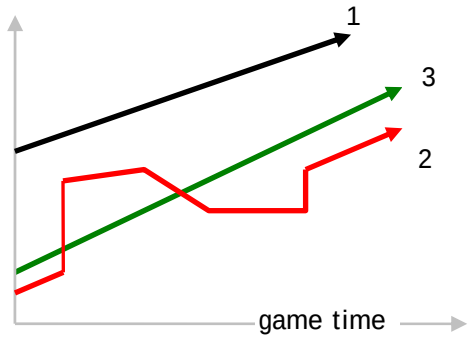
Another example is *Prince of Persia* (Konami 1989).

> "[…] when the player first encounters a break-away floor in *Prince of Persia* falling through it is non-lethal. Similarly, spikes are introduced in such a way that the player is very likely to notice them and to be able to survive them. Subsequent encounters with spikes will not be so forgiving, but by then the player has learned of the threat they pose to his game-world character, and if he is clever he will be able to survive them." (Rouse 133f.)

This type of arrangement is a typical *large*-scale variation of the hierarchical approach. Large-scale hierarchies organise long periods of gaming. *Small-scale* hierarchies can be found as well, usually within a single level. For example, on the fifth level of *Forbidden Siren* (Sony 2004) the player, for the first time, has to attack a zombie. A subskill for this is the ability to hit something that does not move. Hence, a situation is first arranged by the designer where the player must overcome an iron gate. To overcome it he or she has to smash the gate with a poker, using at least three heavy blows. This poker can then be used as a weapon to fight the zombies behind the gate. Small-scale hierarchical arrangements like this are typical for tutorials and introduction levels (see chapter 4).

The hierarchical approach is closely related to the concept of *learning curves* in games. The term is usually used to describe the relation between the demands of gameplay situations and the progress of the gameplay in time. A curve gradient that reflects this relationship can be used to illustrate the didactic structure of a specific game design and related problems.

For example, the starting point and steep gradient of curve 1 in graph 4 indicates a didactic design that relays strongly on the game literacy of the player. This is sensible, for example, in the case of an add-on. The gradient of curve 2 indicates that the game confronts the players with new challenges without having given them time to learn the skills they need to deal with these challenges. A decline in the learning curve indicates a part of gameplay that is easier than the previous ones. Curve 3 illustrates the *skill curve* of a player. For this individual, game 1 with learning curve 1 would probably be frustrating; game 2 would be too difficult in the beginning and too easy in the end.



Graph 4

Methodically, it is difficult to quantitatively measure the demands and difficulties of a gaming situation or a player's skills. Nevertheless, learning and skill curves such as in graph 4 are of heuristic value, as they point to the basic didactic problem of bringing game demands on level with player skills and vice versa.

Describing games by means of the hierarchical approach or learning curves is just one of the two various possibilities of identifying phases of learning in digital games. Other categories to identify phases of learning are:

- **Taking account of prior learning/adaptation**: This usually happens at the beginning of a game. The player may be able to set the level of difficulty within the game, for example by identifying himself as a rookie, veteran etc. or by directly choosing between the levels of easy, normal or hard. This does not only apply to the action level of games, but, for example, to riddles as well (see the *Silent Hill* series). Alternatively, the game

may ask the player whether he or she has finished a prequel of the game or whether he or she likes action in games (both in *Metal Gear Solid 2: Substance*); or it may pose personality related questions about general wishes and fears (both in *Kingdom Hearts*, Squaresoft 2002). The game may also take in account the performance of the player throughout the whole game and automatically adjust the challenges in one way or another (for the importance of prior knowledge and a *player's vocabulary* from a designer's perspective, see Johnson 2001).

- **Motivation/reinforcement**: Motivation in games appears in many ways. Significant phases for this are situations which reward the player, usually with helpful new tools, or socially, for example by praising him or provoking him using NPCs (see also chapter 3.3). Others are cutscenes and the non-interactive story parts of a game in general that can serve this purpose by establishing an interesting setting for the game challenges.
- **Informing the learner of the objective of an upcoming part of the game:** This, for example, may be done by using briefings at the beginning of a mission or during the course of a level.
- **Repeating and testing**: Both of these types, of course, are very common in games. Repetition may be arranged by designing series of more or less similar challenges or by a reload of a game passage after the player has failed a test. In games like the *Tomb Raider* and *Indiana Jones* series, falling to the ground and the necessity to climb up again is a typical variation of this 'failed-test-and repetition' pattern without an actual reload.
- **Stimulating recall of prerequisite learning:** Here usually an NPC points at the skills the player has learned before (for example at the beginning of the first level of *Deus Ex*.)
- **Directing attention phase**: This may, for example, happen visually (see images 15-18) or audibly (when a hostile NPC guard behind a corner talks to a colleague or asks: "Who is there?").
- **Providing direct learning guidance: This** is a phase usually employing telling-writing-situations.
- **Relaxation phases**
- **Providing explicit informative feedback:** This is usually done at the end of a mission; for example, by using score lists or statistic tables of the player's performance as in *Thief: Deadly Shadows* (see image 21a), a general verbal summary at the end, for example of TROPICO (Pop Top Software 2001) or a "replay" in a racing game.
- **Providing emotional feedback: This happens,** for example, by praising or punishing the player with a 'time out' while reloading a previous state of the game. Analysing feedback in games includes the question

Image 21a: *Thief: Deadly Shadows* © Ion Storn/Eidos.

whether feedback is given remotely or on the spot. This difference may have an influence on the learning process (see McKeachie 1974). In general, digital games provide a lot of instant feedback.

- As the examples above indicate, most phases of learning can be realised by different types of learning situations. In general, it is typical of digital games that information is presented in a situated and 'just-in-time' form, which means that the player has to use that information quite soon. By repeated usage, this declarative knowledge then is transformed into implicit knowledge and long time memory.

Learning situations are relatively easy to recognise in games because they are constituted by behaviour that is observable. By contrast, the identification of learning phases and other temporal aspects of gaming refer to psychological theories about learning on the part of the player and to designer's theories of learning. Therefore, their identification is often based on disputed theory.

Important terms

Temporal dimension, phase of learning, hierarchical approach, learning curve, skill curve.

Further reading

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Johnson, Brett (2001) "Great Expectations: Building a Player Vocabulary". In: *Gamasutra,* July 16, 2001. Download: http://www.gamasutra.com/features/20010716/johnson_01.htm> visited 7/2/2003>.

3.3. The social and parasocial dimension

Man is a social being and he learns differently depending on whether he is alone or not. Especially learning together with others, with a teacher or in a group can support learning significantly. Thus, it is important to take in account the impact of the *social dimension* on learning in games.

Relying on theories of social aspects in other learning environments, four basic forms of social arrangements and learning in digital games can be distinguished:

- playing alone and *learning by self instruction* (in a way this, of course, is just the absence of a social situation),
- playing with a partner, which may involve various forms of *partner learning*,
- playing in various forms of groups, which may lead to various forms of *group learning*,

- playing within a *virtual* social situation which may support *parasocial learning*.

The first three terms of learning are quite common in educational science. In contrast, the term "parasocial learning" is a rather unconventional concept and the focus of this paragraph.

As learning often is much more motivating when it takes place in a social situation, it would be a grave disadvantage for digital games not to be able to use this didactic dimension for arranging their learning environment. However, how should they do this in single-player games? Here, at first sight, there is no social situation at play. At second sight, however, a functional equivalent can be found.

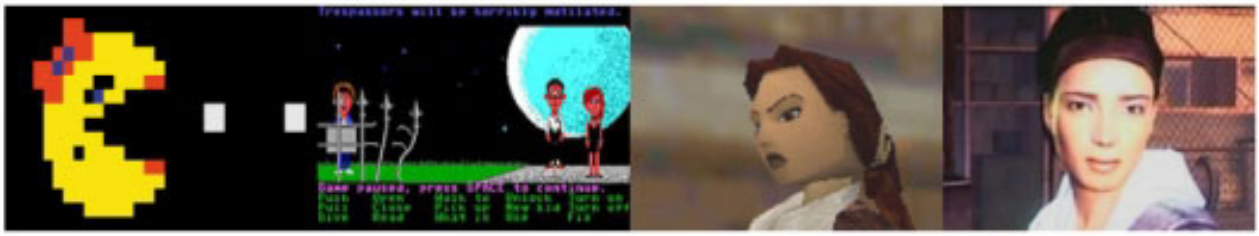
It is a well-documented phenomenon, that

> […] individuals apply social rules and social expectations to computers [and other media and objects as well; M.B.] That is, individuals use the same social rules to assess and respond to the performance of computers that they use when assessing or responding to other individuals, even when they are fully aware that they are interacting with machines. (Nass/Steuer 1993)

A well-known historical example of this behaviour is the interaction of players with the conversation program *Eliza*, (see http://i5.nyu.edu/~mm64/x52.9265/january1966.html) developed by Joseph Weizenbaum at the Massachusetts Institute of Technology (MIT). Some people got really emotional during the "conversation" and some psychologists suggested developing it and using it as a virtual therapist (see Weizenbaum 1976).

Feelings and behaviour that are typical for social interaction and that occur during interaction with computers may be called "parasocial". Originally, the term was used by Horton and Wohl (1956) to describe a special form of designing and watching TV shows: when the host of a show says "Good evening, how are you?" etc., he simulates a social interaction where there actually is none. Nevertheless, some viewers regard him as a good friend, a member of the family. TV shows intend to support parasocial feelings by simulating social *interaction* between real people. In contrast, digital games support parasocial behaviour (and feelings) by simulating social *actors*: the NPCs. They do this by simulating cues that are fundamental to human interaction.

> "Among the […] primary cues that appear to be important are the use of language […], interactivity […], filling of roles traditionally held by humans […], and voice […]." (Nass/Steuer, 1993)



Images 22: Screenshots from *Ms Pac-Man* (1982) © Atari, *Maniac Manson* (1987) © Lucasfilm, *Tomb Raider II* (1997) © Core Design/Eidos, teaser from *Half-Live 2* (2004) © Velve.

Obviously, all of this is more and more the case with NPCs in digital games. Nowadays, NPCs talk to the player, they take orders from him, accompany and support him; they praise, insult, challenge, and flatter him. Additionally, there are improvements in the graphic surface of game characters (see image 22), which allow for more convincing facial expressions, a feature which is very important for lifelike face-to-face-interaction. All this seems to be more and more effective. Thus, for example, a warning in a walkthrough (Shunichiro 2004) for *Forbidden Siren* (Sony 2004) that goes: "Don't get attached to the characters. That way you will feel much better when the game gets cruel..." (Shunichiro 2004).

Image 23: *Knights of the old Republic*, screenshot © BioWare/LucasArts.

Image 24: *Deus Ex: Invisible War*, screenshot © Ion Storm/Eidos.

The tend towards parasocial cues in games will go on in the future, due to such technical developments like microphones that allow the player to actually talk to NPCs, and (in the future) cameras that scan the body language and facial expression of the player and use it as an input.

Besides these technological developments, the strengthening of the narrative elements and the deepening of NPC's characters support parasocial relationships as well. An example is the role-playing game *Knights of the old Republic* (BioWare 2003). It explicitly asks the player to "talk to" NPCs in his party, because "something seems to worry" them (see image 23). Moreover, in *Brothers in Arms* (Gearbox 2005), NPCs mourn for comrades killed in action.

An interesting allusion to the phenomenon of parasocial relations in games can be found in *Deus Ex: Invisible War*. Here a lonely NPC citizen talks to a hologram AI (artificial intelligence), modelled after a famous singer ("NG Resonance") within the game world (see image 24). He asks the hologram if NG Resonance ever listens to the conversations between her holograms and her fans and the hologram answers: "Of course *she* does. *I* love to listen to my fans." (translation from the German version of the game).

The importance of parasocial phenomena for didactic methods lies in its potential to create motivating learning situations, among others. It is, for example, usually easier to take advice from someone you like than from someone you are not affected by. It is more motivating to command and take care of a team if you care about its members. It is more challenging to fight a bad guy that is convincingly nasty. It is

an effective reinforcement to praise a player by means of an NPC he is affected by, and so on. I suggest using the term *parasocial didactics* for methods and content, which systematically support and build on parasocial feelings and behaviour to support learning.

Parasocial didactics can be seen as a development of several traditional classroom methods; for example, the teaching story, a method sometimes used to make history alive by telling it from the perspective of real or made up persons from the past (for basic theory on thinking and narration, see Bruner 1990). Other examples are the broad tradition of educational role-play and the anchored-instruction approach. The best-known example of the latter is the "Jasper-Project" that produced a series of teaching films narrating "The adventures of Jasper Woodbury". Jasper is engaged in several practical problems the learner then has to solve by using mathematics. All the necessary information for this is to be found in the story itself (see CTGV 1997). These traditional methods (except for role-playing games) do not allow the learner to interact with the social setting they create – digital games do.

Compared to the arrangement of real social situations, parasocial didactics have some obvious advantages and disadvantages. On the one hand, in a real social setting behaviour and characters of the involved persons are not extensively controllable. Role players may act "badly", teachers may behave unprofessionally (get tired, tease learners etc). This, in return, often affects the effectiveness of learning. Compared to this, parasocial environments promise a much higher degree of controllability, as the NPC "cast list" can be modelled in whichever way to support learning and then to behave exactly in the way defined by their role.

On the other hand, NPCs do remain virtual and this, of course, may reduce the player's engagement significantly. Besides, the AI of NPCs today is still poor, especially in regard to all kinds of verbal exchange. Thus, the challenge for designers today is to create believable virtual social situations where the expectations of players towards their virtual social companions fit their limited AI skills.

Important terms

Social dimension, parasocial learning, parasocial didactics.

Further reading

Egenfeldt-Nielsen, Simon (2004) *A framework for the role of narratives in educational use of computer games*. Download: <http://www.itu.dk/people/sen/papers/A%20framework%20for%20the%20role%20of%20narratives%20in%20educational%20use%20of%20computer%20games.doc.>

Horton, Donald & Wohl, Richard R. (1956) “Mass Communication and para-social interaction. Observations on intimacy at a distance”. In *Psychiatry. Journal of the Study of Interpersonal Processes*, 3(19), 215 –229.

4. Didactic conventions: Tutorials and introduction levels

Image 25: *Thief: Deadly Shadows*, detail of a screenshot © Ion Storm/Eidos

Didactic-methodical elements are usually not distributed randomly within digital games. They build patterns. During more than 30 years of game evolution, several of these patterns have developed and crystallised into *didactic conventions* which are to be found in lots of games. Didactic conventions are an important target of didactic analysis of digital games. They may have a short or long range. Tutorials and introduction (the topic of this paragraph) levels are two long-ranged forms.

Tutorials may be seen as remediations of another didactic convention in games: the manuals. Manuals have accompanied computer games since their beginning, they have slowly been remediated into the game world itself and have became what may be called *in-game tutorials*. The reason for this remediation is that learning goals and content of games mainly cover practical skills, and practical skills are learned more easily by instructed doing than by just reading.

Nevertheless, manuals are sometimes still important in the genres of role-playing games and simulation. Here the learning goals often cover not only the practical skills but the knowledge of complex mathematical sets of rules, which cannot easily be learned only by instructed doing.

An early historical example of a tutorial in the action genre is *Karate Champ* (Nihon Bussan/AV Japan 1984), one of the first beat 'em ups. It starts with a short tutorial at the dojo where the computer makes a move and the player has to copy it to score extra points (demonstration). When this training is complete, the player is able to mix with the big boys and the tournament begins. Another early example in the adventure genre is *Robot Odyssey* (The Learning Company 1984). The objective of the game is to escape from a dangerous underground robotic city. To escape the player has to program his or her robots to solve various puzzles, and, before that, there is a facultative in-game tutorial to learn how to program his or her bots. Within the *situational dimension*, tutorials are game levels with a high degree of situated writing and telling, usually followed by an opportunity to apply the newly acquired knowledge. Additionally, there is just a small threat of failure and 'time out' feedback.

Temporally tutorials are usually a dense and linear chain of learning locations, where the player literally has to walk from room to room, get instructions, and master one task after the other (see image 25 - the introduction screen to the training mission in *Thief: Deadly Shadows*. Usually a pattern

is used that is typical of conventional tell-test-learning software (or programmed learning): explanation, instructions to do something, player's action, feedback, next explanation. However, in regard to the use of weapons, tutorials may provide voluntary phases of repetition.

Tutorials are often optional and serve as introductions at the beginning of a game. But there may be tutorials later on in the game, as well, if important parts of the gameplay change during the game. An example of this is *Jedi Knight II: Jedi Outcast*. Here the player does not get his first light sword and magical powers at the beginning of the game, but later on, and he has to complete a tutorial to learn how to handle his new tool and skills.

In regard to the *narrative setting*, tutorials nowadays share some common features, most of which are to be found, for example, in the early sequels of the *Tomb Raider* series. Here Lara Croft's stately home is equipped with a huge training hall (see image 26 from *Tomb Raider 3*, Core Design 1998), in which the owner may learn and train basic moves. Often, games may vary this 'training theme' by simulating institutional training situations like military camps and entrance examinations. Other games like *Max Payne* (Remedy 2001) do not try to motivate the tutorial in such a narrative way. The game simply places the protagonist on two lone streets, where the player learns how to move, interact with objects, use weapons etc. The setting here is unconventionally surreal because of a public telephone, which gives and provides instructions, and an "enemy dispenser" button on a wall, which the player may use to get additional cannon fodder (see image 27).

Image 26: *Tomb Raider 3*, screenshot from tutorial © Core Design/Eidos.

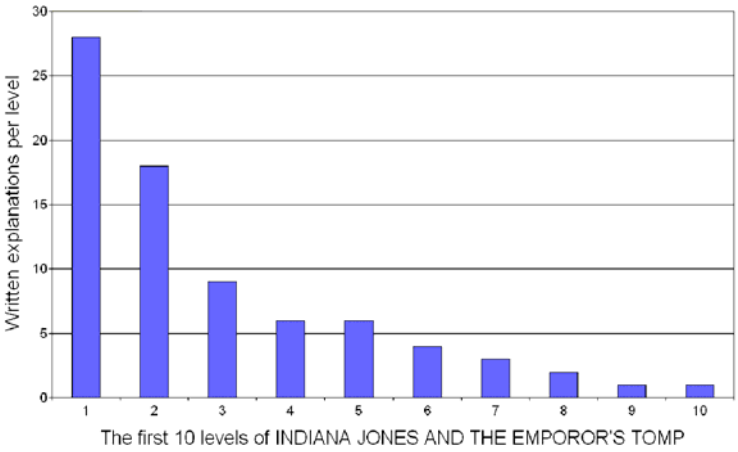
Image 27: *Max Payne*, tutorial screenshot © Remedy/3D Realms.

Some tutorials try to create a setting which avoids 'school connotations'. Note that these attempts sometimes are a bit clumsy, for example, when the protagonist's superiors in *Deus Ex* and *Splinter Cell* literally apologise for forcing the player to do the training, or the entrance examinations, or when, as in *Half-Life*, the training is (ironically?) labelled "Hazard Course".

What tutorials have in common is that the learning does not take place within the actual story or narrative of the game. They share the protagonist and the setting with the actual story but they are not part of the chain of events in the story. As learning within a narrative setting has several advantages, *training mission* and *introduction level* take the place of the classic tutorial.

Introduction levels are early parts in a game which include the same writing/telling-situations and content as tutorials do, but which are part of the game story and avoid educational connotations. Modern examples of this are the first level of *Warcraft III (*Blizzard 2002) and *Halo* (Bungie 2002).

Looking at the transformation of manuals into tutorials and from tutorials into training missions and introduction levels a trend towards the *fusion of tutorial elements and regular gameplay* can be identified. If this trend continues, the typical training mission or introduction level will in the future be replaced by game structures that distribute typical tutorial elements throughout the first parts of the game. An example of this is *Indiana Jones and the Emperor's Tomb* (The Collective 2003). A quantitative situational analysis of the number of written explanations (typical of tutorials) in each one of the first ten (sub-)levels of the game results in the graph below (see graph 5) and reveals the smooth systematic drop of the amount of written instructions in the first parts of the game.



Graph 5

I

Important terms

Didactic conventions, tutorial, in-game tutorial, training mission, introduction level.

5. Assignments for Week 3

Assignment 3a: Didactic design of stealth elements

Sometimes one has to go about a game like a detective to identify its didactic structures and stealth elements of teaching and guidance. Here are two examples:

1) Download the cutscene "Crossroad in *Silent Hill 2*" from www.xxxx.xxx. There are several elements of (stealth) guidance in the scene.
2) There is an *audible (stealth) hint* to be found in the lowest hall of the clock-tower level in THIEF 3 – for those of you who know the game.

Assignment for the student in charge

Select one of the two examples above and analyse its didactic structure. And/or find other examples for stealth teaching or guidance in games and challenge your fellows to discover them. Open the discussion by writing a short presentation (c. 500-1000 words) and post it to the discussion area for this assignment (due: XXX).

Assignment 3b: Good and bad didactics in games

Good didactic design solves the problem of teaching interesting knowledge in an entertaining way. Think of an example of *good* didactic design in a game. Describe its different elements and justify why this is a particularly good solution of a didactic problem.

Alternatively, do the same with an example of *bad* didactic design and propose a better way to solve the didactic problem.

Assignment for the student in charge

Open the discussion by writing a short presentation (c. 500-1000 words) and post it to the discussion area for this assignment (due: XXX).

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Games

XIII (Ubi Soft/Ubi Soft 2003)
BROKEN SWORD 3: THE SLEEPING DRAGON (Revolution/THQ 2003)
BROTHERS IN ARMS (Gearbox/Ubisoft 2005)
DEUS EX (Ion Storm/Eidos 2000)
DEUS EX: INVISIBLE WAR (Ion Storm/Eidos 2004)
DOOM 3 (Id/Activision 2004)
FALCON 4.0 (MicroProse/MicroProse 1998)
FORBIDDEN SIREN (In-house/Sony 2004)
GRAND THEFT AUTO: VICE CITY (Rockstar North/Rockstar 2003)
HALF-LIFE (Valve/Sierra 1998)
HALO (Bungie/Microsoft 2002).
INDIANA JONES AND THE EMPOROR’S TOMB
(The Collective/LucasArts 2003)
JEDI KNIGHT II: JEDI OUTCAST (Raven/LucasArts 2002)
JEDI KNIGHT III: JEDI ACADEMY (Raven/LucasArts/Activision 2003)
KARATE CHAMP (Nihon Bussan/AV Japan 1984)
KINGDOM HEARTS (Squaresoft/Disney/Sony 2002)
KNIGHTS OF THE OLD REPUBLIC (BioWare/LucasArts 2003)
MAX PAYNE (Remedy/3D Realms 2001)
METAL GEAR SOLID 2: SUBSTANCE (Konami/Konami 2003)
MS PAC-MAN (Atari/Atari 1982)
PONG (Atari/Atari 1972)
PRINCE OF PERSIA (Konami/Konami 1989)
ROBOT ODYSSEY (The Learning Company 1984)
SILENT HILL 2 (Konami/Konami 2002)
SPACE INVADERS (Taito/ 1978)
SPLINTER CELL (Ubisoft/Ubisoft 2002)
THIEF: DEADLY SHADOWS (Ion Storm/Eidos 2004)
TOMB RAIDER 3 (Core Design/Eidos 1998)
TOMB RAIDER 6: THE ANGEL OF DARKNESS (Core Design/Eidos 2003)
TROPICO (Pop Top Software 2001)
WARCRAFT III (Blizzard/Blizzard 2002)