A Toolkit for Introducing Game Mechanics to Players

Using Constructivist Learning Theory

Thesis Project

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Abstract

This thesis creates a toolkit for game designers to use, when considering how to introduce new mechanics to players. The thesis takes it stand in constructivist learning theory. It uses Bruner's Discovery Learning and Ausubel's Advanced Organizers to create the toolkit. Theory, concerning the in-game learning experience, is used together with game design theory and traditional learning theory, to make the toolkit. The thesis focuses on single player action-adventure games, and a sample of games are compared to show how games introduce mechanics. The analysis of the sample shows four different ways to introduce mechanics. Two of these are used to create the toolkit. The toolkit and its value is then criticized and discussed. The toolkit points to a useful application of Advanced Organizers and scenarios to support Discovery Learning, which helps the player understand the mechanics. The toolkit needs to be verified for other genres of games. Research of how well the toolkit's methods work, is also a requirement for further development of the toolkit. Further research into how players learn mechanics and how to keep this fun is also needed, to evolve the toolkit into a tool for a game designers to use in practice.

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1. Introduction

Have you ever played a game, where you had problems remembering the mechanics and how to actually do different actions in games? If you have, then I also expect that you have experienced the opposite, where you always have an idea of how to do an action. Where you have no issue with knowing, which mechanics are at your disposal, which makes it a good challenging game. Gee (2003, p. 6) asks the following question: "How are good video games designed to enhance getting themselves learned— learned well and quickly so people can play and enjoy them even when they are long and hard? What we are really looking for here is this: the theory of human learning built into good video games".

The question is a starting point for introducing the field this thesis lies within. Games are not a new thing and have a lot of history, but digital video games are still a relatively new field. It is however an ever growing field. The learning theories try to answer the following questions, how people learn and how to teach learners? In the two fields, games and learning, people have also started to look into how learning and games work together. Whitton (2014, pp. 4-5) gives eight ways that the idea of games and learning can be interpreted; learning *with* entertainment games, learning *with* educational games, learning *inspired* by games, learning *within* games, learning *about* games, learning *from* games, learning *through* game creation and learning *within* game communities. The focus of this thesis is learning *within* games.

There are many reasons why people research learning and games. Whitton (2014, p. 9) gives a possible reason: "In the context of learning, games are exciting because they are all about action and interaction, rather than passively watching or listening. Games require players to be more than spectators, and take part in the game in an active way".

Games can be fun, but the player needs to learn the mechanics of the game or as Gee (2003) argues, when people learn to play computer games, they are actually learning a new literacy by understanding the multimodal symbols and representations of meaning embedded within the game itself, and the cultural practices that surround it. This thesis focuses on the player learning the mechanics of a game. The hypothesis behind the thesis is to create a toolkit, which game designers use to consider how to introduce mechanics to players. The use of learning theory is an opportunity to base the toolkit on theory, which can create effortless opportunities for the player to learn the mechanics. Because as Juul (2005, p. 5) puts it: "Playing a game is an activity of improving skills in order to overcome these challenges, and playing a game if therefore fundamentally a learning experience".

This thesis examines how to create a toolkit for game designers to use, when choosing how to design their game. The idea is that using the toolkit should help the creation of an effortless opportunity for the player to learn the mechanics. The toolkit takes a constructivist approach to learning and uses specific learning theories. The theories used are Bruner's Discovery Learning and Ausubel's Advanced Organizers. The toolkit focuses on one genre of games, but can potentially be a starting point for expansion into other genres.
The focus is on how to teach the mechanics of the game to a player. In some games this is done by putting the player through a tutorial, which is either mandatory or possible to skip. The focus is not only on tutorials, as in my experience tutorials are not always the most enjoyable way to learn mechanics. Tutorials can feel as a part separate from the rest of the game, which can stop the player from being immediately immersed in the gameworld. It should simply be part of the game to learn the mechanics. As the guys from Extra Credit (2012) says the best tutorial is the one no one remembers is there.

The topic this thesis explores is, if better ways of introducing mechanics can be created based on theory, instead of simply either doing what is normally done or what the game designer feels like. Game design can use more toolkits to guide a game designer. More toolkits can potentially result in better game experiences. The toolkit in this thesis is in no way the 'correct' way to do it. The toolkit presents ways of introducing mechanics, which might work for some types of games. The ways from the toolkit can potentially be adapted for other types of games.

1.1. Problem Statement and Approach

The main question of this thesis is: *How to create a toolkit, which uses constructivist learning theory as a basis for how to introduce mechanics to players in single player action-adventure games?*
To answer the main question the following sub-questions are explored:
How are mechanics introduced in games?
Does the way mechanics are introduced in any way follow teaching methods of learning theory?
How can learning theory be used to facilitate the introduction of mechanics to players?

To answer these questions a small sample of games is used to establish how mechanics are introduced. The games are single-player action-adventure games. The analysis examines how the games are similar and different in their ways of introducing mechanics. This is done on a basis of play-throughs

of the games. The analysis determines that there can be found more than one general way to introduce mechanics. These ways are compared with instructional methods from learning theory. The thesis concludes with defining the basis of a toolkit, which uses learning theory to support why certain ways of informing the player work.

1.2. Structure of Paper

The thesis has the following structure. In Chapter 2 the theories and theoretical background are described. Chapter 2 gives a short summary of the development in learning theories before explaining the overall approach of constructivism. Then the two theories: Discovery Learning and Advance Organizers, are described and how they can be applied to games is discussed. Finally some definitions from game design theory are given. Chapter 3 explains the methods and approach to the research in full. The sample of games and criteria for the choosing these are explained. The games are analysed in chapter 4. The analysis starts by analysing how each game introduces mechanics. Then the games are compared and four ways of introducing mechanics are identified. These ways and the learning theory are then compared. In chapter 5 the toolkit is described and the discussion in chapter 6 critiques the toolkit as well as the method and approach. Finally in chapter 7 the conclusion summarizes the thesis and gives ideas for further research.

2. Theory

This chapter introduces the theories, which are used as a basis for developing the toolkit. The first thing this chapter explores is learning theory. The theoretical background established here makes it possible to build the toolkit based on these theories. The chapter also describes important definitions from the field of game design, which are needed to understand what the toolkit focuses on.

2.1. Learning Theories

The field of learning theories is vast and this paper only gives a short introduction to parts of the field. This paper focuses on constructivism but other approaches to learning theory are briefly summarized, to put constructivism into context. As the approach used is constructivist, constructivism is defined. Then the specific theories used for this research are defined.

“Games for learning are typically designed from either a dominant behaviourist or constructivist perspective” (Whitton, 2014, p. 28). On account of Whitton’s statement it is obvious that a focus on

either behaviourist or constructivist theories makes sense, even if I am not exploring games for learning, but learning in entertainment games. At first I considered a focus on behaviourist theories. But as behaviourism only focuses on behaviour I argue too much is ignored by not including any cognitive processes. The focus is instead on constructivism. Constructivist theories attempt to give access to knowledge and encourages active participation. As playing games give lots of opportunities to participate actively, it seems optimal to use constructivism as a basis for creating the toolkit.

The first thing needed before going into the different learning theories, is to have a definition of learning. This paper uses the following definition: "Learning is an enduring change in behaviour, or in the capacity to behave in a given fashion, which results from practice or other forms of experience" (Schunk, 2012, p. 3).

The theories of learning have different approaches to how learning happens. The theories have evolved, changed and been disputed through the times as the field of learning theory evolved. Learning theories have a field of their own, but the fields of psychology and neuroscience influences learning theory. In the start of the twentieth century behaviourism started to rise towards being the leading psychological discipline (Schunk, 2012, p. 20).

Behaviourism focuses on behaviour and studies this. Behaviour is possible to measure and therefore it is useful to study and research upon. This developed as an attempt to create a more scientific approach for the study of behaviour (Grassian & Kaplowitz, 2009, p. 28). Behaviourism does not take into account that the person might have a cognitive reasoning, it only focuses on what is observable, such as behaviours. "Behaviorists attempt to demonstrate that all behaviour is environmentally controlled and is based on each behavior being externally rewarded or reinforced" (Grassian & Kaplowitz, 2009, p. 29). The behaviourists developed the conditioning theories, which all theorise that behaviour can be conditioned by stimuli.

As the field evolved several researchers started to realise, that they could not fully understand psychology and learning without considering the cognitive side of it. This gave ground for new theories to emerge. Here the cognitive theories came about. Cognitive learning theories focus on how people perceive, organize, interact with, and respond to patterns or whole situations. Learning is seen as understanding the relationship between parts and the whole (Grassian & Kaplowitz, 2009).

As the cognitive theories developed a different approach to them emerged along with them. This perspective is known as constructivism. Constructivism is built on the basis that people construct their reality and therefore their learning. Constructivism is described more in depth later as it is the approach used in this thesis.

Finally there is the humanist approach, which has roots in the free-spirited nature of the 1960s (Grassian & Kaplowitz, 2009, p. 36). This approach looks at learning from a different perspective and examines the affective side of learning. The learner's feelings are a main point of interest as well as what motivates people.

2.2. Constructivism

Constructivism is not a specific set of theories but an epistemology. Constructivists reject the notion that scientific truths exist. All statements should be viewed with reasonable doubt. Constructivism has many varieties and one version cannot be assumed more correct than any other (Schunk, 2012, p. 230). According to constructivism learners create their own learning. "A person's constructions are true to that person but not necessarily to anyone else. This is because people produce knowledge based on their beliefs and experiences in situations, which differ from person to person." (Schunk, 2012, p. 231)

One of the main assumptions of constructivism is that people are active learners and develop knowledge for themselves. Learners need to discover the basic principles of the material to understand it well. Another assumption of constructivism regards how teachers should teach. Constructivism says, teachers shall structure situations so learners become actively involved with content through manipulation of materials and social interaction (Schunk, 2012, p. 231).

Constructivism has different perspectives: exogenous, endogenous and dialectical constructivism. The exogenous perspective follows the idea that any acquisition of knowledge is a reconstruction of structures that exist in the external world. The perspective give the external world a strong influence on knowledge construction. Experiences, teaching and exposure to models are the way knowledge is constructed.

The endogenous perspective is on the opposite end of the scale as exogenous. It focuses on cognitive actions. Knowledge develops through abstraction. Environmental information does not directly create mental structures, instead they derive from previous structures.

The dialectical perspective lies in between the two other perspectives. The perspective is based on the notion that knowledge is derived from interaction between people and their environments. Constructions are not tied to the external world nor to the working of the mind. Constructions reflect the outcomes of mental contradictions that result from interactions with the environment (Schunk, 2012, p. 232).

This thesis has the dialectical perspective as a main perspective, as it focuses both on the game (the environment) and the player, which has knowledge and constructs new knowledge. Two important definitions that constructivism brings with it are assimilation and accommodation. The two are ways to handle new knowledge after getting input from the environment. Assimilation refers to fitting external reality to existing cognitive structures. It means the learner makes the new information fit into what they already know, the input is interpreted to fit. Accommodation refers to changing internal structures as to fit external reality. It means the new knowledge changes the learner's understanding of what is correct to fit the input (Schunk, 2012, p. 236).

2.2.1. Constructivism and Games

Schunk (2012) says, constructivist learning environments should create rich experiences which encourage learning. Games are made to be experiences, whether they encourage learning is however not certain, but it is possible. Whitton (2014, p. 29) applies a definition of constructivist learning environments to entertainment games: "at the heart of the game, players have a context in which they have to solve problems; they have a variety of tools and information at their disposal; and they work either collaboratively, or within gaming communities, to achieve these ends." Based on Whitton's statement it should be possible for games to work as constructivist learning environments.

2.3. Learning Theories Used for Thesis

The previous part of this chapter explores different approaches to learning theory and goes deeper into describing constructivism. The following part describes the two theories used and discusses how they can be applied to games. Bruner's Discovery Learning is chosen for this thesis based on the belief that the theory fit well with methods already used in games. Ausubel's Advance Organizers is chosen for a similar reason. It should be mentioned that Advance Organizers is technically a cognitive theory and not constructive. Because constructivism can be seen as a different approach to cognitive theories, it should be possible to use the theory with a constructive approach. Grassian and Kaplowitz (2009) argues that constructivism recognizes that learners can make connections with knowledge in many different ways, and encourage multiple approaches to the presentation of the information so as to accommodate this diversity. Therefore Advance Organizers can be used as a different approach when presenting the information. By having theories from two approaches it is possible to cover more ways to introduce mechanics. This might make it possible for more players to understand the mechanics. The two theories are very different and therefore the theories were chosen as they should be able to bring different things to games, which is more interesting than two theories which are

similar.

2.3.1. Discovery Learning

Discovery learning is a theory that involves letting the learner discover knowledge by herself (Schunk, 2012, p. 266). The theory was shaped by Jerome S. Bruner, who provided major insights into how the cognitive perspective can be applied in the classroom (Grassian & Kaplowitz, 2009, p. 34). The theory is a type of inductive reasoning, where the learner constructs and tests hypotheses instead of simply reading or listening to teacher presentations. The approach is minimally guided, but the teacher arranges activities that the students then investigate (Schunk, 2012, p. 266). Students need to possess prerequisite knowledge, before the method works. The teacher can provide structure by posing questions and giving suggestions for how to search for answers. The learners should not be left to their own devices, but the teacher should provide support and arrange the situation as such (Schunk, 2012, p. 267).

How this approach fits within games

A game can be a way to create a world, where the player can discover and learn. All done in an environment that has many activities, for the player to try by themselves. Because of this discovery learning can fit within games. A game limits the player to only do what is possible within the system. The game can also have in-built structure, which helps to guide the player. To make it possible for the player to solve problems by themselves, the player needs some knowledge to help them advance in the game. This thesis has the expectation that game design can help provide the basic structure needed. By combining game design and discovery learning it should be possible to create a game, which supports the player to learn by discovery.

2.3.2. Advance Organizers

David Ausubel created the conceptual basis for Advance Organizers with his theory of meaningful reception learning (Schunk, 2012, p. 218). Ausubel advocated to teach general ideas first and then specific points. The teacher helps learners to break ideas into smaller, related points and to link new ideas to similar content in memory. This method is deductive, which generally works better with older students (ibid). Advance organizers are broad statements that are presented at the start of lessons which help to connect the new material to prior learning. It is also possible to use advance organizers to summarize the material after it has been presented (Grassian & Kaplowitz, 2009). There are two types of organizers: expository or comparative.

An expository organizer provides new knowledge, which is needed to comprehend the lesson. This

can include concept definitions and generalizations. Concept definitions states the concept, the superordinate concept and the characteristics of the concept. Generalizations are broad statements of general principles, were hypotheses and ideas can be drawn from (Schunk, 2012, p. 218). An example of expository organizer can look like the following if presenting the concept 'warm-blooded animal'. The definition of a warm-blooded animal is an animal whose internal body temperature remains relatively constant. It is related to the animal kingdom, which is the superordinate concept and the characteristics can be birds and mammals (ibid).

Comparative organizers introduce new material by drawing analogies with familiar material. This demands that the learner has a good understanding of the material used for the analogy (ibid). An example of a comparative organizer for a history lesson on revolutions can be: a statement that contrasts military uprisings with the physical and social changes involved in the industrial revolution. Ausubel (1969, p. 148) has three ways in which organizers facilitate the incorparability and longevity of meaningfully learned material. Firstly: organizers use relevant anchoring concepts which the learner already know and make them part of the subsuming entity. This not only makes the new material more familiar and potentially meaningful, it also uses relevant prior cognitive structures to build upon. Second, organizers at an appropriate level of inclusiveness provide optimal anchorage. This promotes both initial learning and later resistance to obliterative subsumption. Third, the use of organizers renders much rote memorizations unnecessary.

How this Approach Fits within Games

There are several ways advance organizers can fit within games. First of all a game has a genre or similar, which gives a general statement about what the game is. This the player can then relate to what they already know about games of that genre. In this way the new game can be connected to knowledge from other known games. The player knows which buttons or input options she has. These are early in the game connected with controls, which are a base for the player to understand the mechanic. When introducing mechanics it is very possible that similar mechanics are known to the player from other games. This makes it possible for the player to connect a 'new' mechanic to a known mechanic, which can make it easier for the player to understand and remember the mechanic.

2.3.3. Inductive and Deductive

The two theories, discovery learning and advance organizers, are two very different approaches. One is inductive while the other is deductive. This can make it difficult for the two theories to be used together. It is also possible that it will make for an efficient way to teach, since it can cover both

approaches. Covering both approaches can take more learners into consideration as different learners might learn better from one approach than the other. The idea is that one goes from the deductive method of organizers to discovery learning and then possibly back again. Or sometimes one starts with discovery learning and then adds the organizers. It can end up being a circle or where one continually goes from one to the other, while learning something more each time or simply getting better at it. The game or the player will break the circle at some point and learn a new mechanic where it is possible to start a new circle. It should also be said that it might not in all instances of learning be necessary or appropriate to use both methods, but it should be considered how to best cover all bases.

2.4. Definitions from Game Design Theory

Games are not a new thing, there are games going far back in history (Egenfeldt-Nielsen, et al., 2013). Video games are simply the newest step in the history of games. This thesis will not go through the history of games as it is not relevant for the scope of the thesis. Below some definitions are described, which are relevant to the research of this thesis.

The question of what a game is has been answered several times and it is a question this thesis will not look deeper into. The thesis uses the following definition by Jesper Juul (2005, p. 36): "A game is a rule-based formal system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels attached to the outcome, and the consequences of the activity are optional and negotiable". All of the games that are used in the analysis falls inside the definition and are games that are classified by almost everyone and every definition as games.

Before defining what game mechanics are a short declaration about genres is needed. Genres is a way to categorize games, but there is far from one clear definition of the different genres, mostly because the criteria for the genre systems are very varied (Egenfeldt-Nielsen, et al., 2013, p. 45). The issue is that there is no objective way to measure the differences between two things, as it is very subjective, which similarities or differences are most important. Genres do however have some value, since each genre has some conventions, which lead to expectations of what a game in a certain genre can include (Egenfeldt-Nielsen, et al., 2013, p. 46).

Egenfeldt-Nielsen, Smith and Tosca (2013, pp. 45-50) propose a genre system based on a game's criteria for success. Their system has four genres: action games, adventure games, strategy games and process-oriented games. The system is well considered and a way to clearly define the genres,

however this thesis does not follow this genre system. Mostly the genres of the games referred to in this thesis are based on popular websites such as Wikipedia. All the games would however fall within action or adventure games in the system and several of them have elements from both genres.

After having defined what a game is, the next step is to define what a game mechanic is. For this thesis Sicart's (2008) definition of game mechanics is the one used: "game mechanics are methods invoked by agents, designed for interaction with the game state".
Examples of game mechanics can be: *jump* or *run* or from Tomb Raider *set fire to (object)*. The mechanics are both the actions the player can take in the game world, but also the actions a non-player character (NPC) can take. Some mechanics can only be done in certain contexts such as *set fire to*, which demands the player to have a torch and can only be done to certain objects.
Sicart (2008) also distinguishes between core, primary and secondary mechanics. Core mechanics are the game mechanics used to achieve the end-game state. Primary and secondary mechanics are both core mechanics. The primary mechanics are the ones that are directly applied to solving the challenges, which lead to the desired end state, usually explained early in the game and consistent throughout the game. Secondary mechanics are the mechanics that help towards reaching the end state, these mechanics are either only available occasionally or used in combination with primary mechanics. Lastly there is compound mechanics, which is a set of related game mechanics that function together, and are thought of as unified. An example can be driving, which consists of accelerating, braking and steering (Sicart, 2008).
In this thesis it is mainly the core mechanics which are the focus of the analysis, be they either primary, secondary or compound. These are the ones the player should understand and therefore the ones in focus.

3. Methods

The methods of this thesis is based on using the theories to develop the toolkit. The toolkit is a scaffold for a game designer to use when designing, how to introduce game mechanics to players. The thesis focuses on a single genre and the toolkit needs further work to fit other genres. The following part of the thesis starts with an account of how the research is done. Then it accounts for how the analysis is performed and how the theory can help develop the toolkit. After this the games used for the sample are presented.

3.1. How the Research is done

The approach to the research is a qualitative one. The focus is on how games introduce mechanics and the learning experience surrounding this. With this focus a qualitative approach can give most detailed data (Silverman, 2010). The research starts by documenting how players are introduced to mechanics in games. A small sample of games are documented and the result makes it possible to compare how the games differ and are alike. Each game is played by the same person and the play-through is recorded. These recordings are used to examine how each game introduces mechanics. The analysis is a formal analysis (Lankoski & Björk, 2015) that is adapted to fit the project. The data from the formal analysis of each game is then compared. The comparison is used to generate several general ways of introducing mechanics. Two of these are used as a foundation for developing the toolkit.

The ways of introducing mechanics are all compared with the instructional methods of the learning theories, this helps to choose the two ways of introducing mechanics, which are used in the toolkit. This should give an overview of how close the games are to the theory. After this the basis for the toolkit is created.

A summary of what a formal analysis is and how it is adapted for this thesis is given below. Formal analysis is examining an artefact and its specific elements closely. Relations of the elements are described in detail. Formal analysis of gameplay is done independent of context. Therefore who the specific people playing a game are, is not regarded as a particular point of interest. Practically formal analysis depends on playing a game and forming an understanding of how the game system works (Lankoski & Björk, 2015, p. 23).

The method of formal analysis differs from Lankoski and Björk's (2015, pp. 26-28) *how-to* in some ways. First off, the games are not played multiple times. Instead, one play session is recorded and used for further analysis. The main reason for only doing one play-through is the focus on learning mechanics. Several play-throughs done by one player would make it difficult to play as if the mechanics are learned for the first time. Because of this only one play-through is recorded. The reason for recording and not just taking notes, was to be able to go back and look closely at what happened. Also taking notes while playing meant interrupting the experience, which can affect the learning experience. The recordings makes it possible to go back and notice hints and other elements, which are not consciously noticed by the player while playing. These elements are important to be able to map how the game tries to teach mechanics.

Formal analysis of a game often requires finding a relevant focus of interest, as a whole game often is too large (Lankoski & Björk, 2015, p. 27). In the scope of this analysis the focus is mainly on mechanics. For each game only part of the games are used, generally the first ½-1 hour of gameplay. For the analysis all elements which help the player understand a new mechanic is used in the analysis, such as text boxes and images, NPCs talking or showing actions, and scenarios which makes the player use the mechanic.[1]

One of the reasons for using formal analysis is the focus on the game and not the context. While exploring specific players can be useful, this toolkit is based on the games. Therefore a formal analysis that focuses on the game is appropriate. Since a formal analysis requires looking at the elements and mapping them, it worked to make a comparison of the games simpler.
The results are expected to show how each game teaches mechanics to players. This includes examining, which elements are used and how the scenarios and challenges in the levels support learning. The formal analysis of each game gives a possibility to compare the games, which is expected to show that some of the games use similar methods.
The results of the comparison are used in a theoretical discussion of how the methods resemble the learning theories. Here the expectation is that some elements resemble the theory, but that it can be done differently to follow the theory closer. This leads to the toolkit which describes how introducing mechanics can be done, based on the theories.

3.2. Analysis Framework

Each game is documented according to the questions found in Appendix A: Template for analysis. For each game the focus is on the first part of the game, where the player gets introduced to the mechanics and the basic of how to use these. There is not a strict timeframe, as it can differ from game to game when the mechanics are introduced, and how widely spread throughout the game they are. But at least a half an hour to an hour of each game is documented. The analysis focuses on the mechanics, but it also documents how controls are explained and how the goal or objectives of the game are given. The reason for this is because controls and objectives can be closely related to mechanics.
The results of the formal analysis of the games are compared to see if there are similarities in the

[1] See Appendix A: Template for analysis for details

methods of introducing mechanics. For example are the same elements used, like user interface (UI) pictures of buttons, highlights, text? For each game it is shown how the controls are introduced, if mechanics are explained or explored more in depth, than just the controls for them. How the goals of the game and levels are given to the player is also looked at, to see if any connection to the mechanics is made clear to the player.

3.2.1. A Note on the Play-throughs:

The play-throughs are done by myself, which was done because of availability. It should be noted that there are some of the games which I had played before and others I had not. This can have affected the play-throughs to make some learning processes harder to notice than others dependent on my prior knowledge of the games. The play-throughs are done with a focus on playing the game as a player, who had not played it before. At the same time the focus was also to make it possible to document which elements a game used to introduce mechanics. The play-throughs are an example of how the games can be played. This is done to uncover the instruction method. Therefore there can be elements which are not documented, since they were never triggered in the game. But learning is an individual thing and it would not in the scope of this thesis be possible to consider all types of learners, just as not all types of games are considered. As all the play-throughs are done by one person, there was not an issue of availability as it could be done at any time. One player makes it possible for the player to have similar observations in the games. This is based on the player's experience with the genre, which makes it possible to have a similar approach to each play session.

3.3. How the Theory is used in the Toolkit

For each of the ways to introduce mechanics found in the analysis of the games, each theory is then compared. This is done to explore how close to the theory the games are. The theory is then used to create the toolkit which gives rules of thumb of how games can introduce mechanics.

Both theories has a way it says to enhance the chances of learning. For Discovery Learning it is by letting the learner discover knowledge by herself. The idea is to arrange activities that provide structure for the learner. To support discovery learning it is important that learner has the knowledge needed to understand the new material. The two different advance organizers help learning by providing the knowledge needed to understand the new material. In expository organizers this can include generalizations and concept definitions. For comparative organizers the idea is to draw analogies to familiar material. The toolkit gives examples of how to use these theories in games and thereby support the player when learning mechanics.

3.4. The Games Used

The games used for the analysis are all single player games. I wanted to focus on games that only have one player at a time. Another constraint for the games is that they are mostly linear and story-driven, which leads me to only look a single player games. The games should all have mechanics that involve moving around in the game world, with exploring and combat included. This gives a wide pool of games. All the games are commercial games that are widely available. The games can mostly be labelled as part of the genre of action-adventure games. Portal is more a puzzle platformer and Dead Space is a horror survival game, but both games have most of the elements that an action-adventure game has, but there is just more focus on the elements of their given genres. Both games are included to see if being a different genre makes a difference in the way they introduce mechanics. But since both games also have elements similar to the genre it is possible to include them in the analysis without taking precautions.

The games used are:

- Dead Space (2008)
- Metal Gear Solid 4: Guns of the Patriots (2008)
- Mirror's Edge (2008)
- Portal (2007)
- Star Wars: The Force Unleashed (2008)
- Tomb Raider (2013)
- Uncharted: Drake's fortune (2007)

3.4.1. Uncharted: Drake's Fortune

Uncharted: Drake's fortune is the first game in the Uncharted series. The game is from 2007 and is an action-adventure game developed by Naughty Dog. The protagonist is Nathan Drake, who is searching for the lost treasure of El Dorado. The game combines three dimensional platforming and third-person shooter gameplay elements with a few environment puzzles. The platforming elements include jump, swim, grab and move along ledges. These allow Nathan Drake to explore the ruins he encounters in the search for treasure.

The combat can both be done by third-person shooting or by melee attacks. Nathan Drake can carry one pistol and one rifle and some grenades. All of these have a limited amount of ammunition. Nathan Drake can take cover behind walls and similar objects. When the player avatar gets hurt the graphics start to lose colour, the game does not have a visual health bar.

Why Uncharted: Drake's Fortune

Uncharted is a game that fits perfectly within the constraints I have set for the games. It combines combat with exploration and a few puzzles. The game has a lot of classic shooter elements, but also includes some platforming elements. Uncharted introduces mechanics while it advances the story of the game. Here the game has an approach which is fairly classic to the genre. It teaches the mechanics as the player needs them, which is done by making sure the game puts the player in specific situations during the early parts of the game. Since Uncharted: Drake's Fortune is the first game in its series there is no former knowledge about the game world or mechanics which the game references.

3.4.2. Tomb Raider (2013)

Tomb Raider is from 2013 and is a reboot of the franchise. The game is an action-adventure game developed by Crystal Dynamics and published by Square Enix. The protagonist of the game is the iconic character of Lara Croft, who gets stranded on an island while on an expedition. The game has a third-person perspective. The gameplay has many elements as it combines action-adventure, exploration and survival mechanics. The game has quick time events throughout the game, at specific points in the plot. The combat in the game has both free-aiming, melee combat and stealth kills. The survival instinct ability let important objects be highlighted for the player, such as enemies, the direction to the goal and objects important for environmental puzzles. The game adds some Role-Playing Game (RPG) elements, by letting the player earn experience points that can be used to upgrade skills/abilities. Weapons can be upgraded by using stuff collected on the island.

Why Tomb Raider (2013)

Tomb raider is another game that fits the constraints. It has opportunities for the player to explore the game world as much as wanted and a large amount of combat, which can be handled in different ways. Tomb Raider is a franchise. Tomb Raider (2013) is a reboot and as such tries to show a new version of the franchise where no knowledge of the former games is needed.

3.4.3. Star Wars: The Force Unleashed

Star Wars: The Force Unleashed is an action-adventure game from 2008. The game was developed by LucasArts. The protagonist is Starkiller, who is Darth Vader's secret apprentice. Starkiller hunts Jedi, while hiding his existence from the emperor. The game is a third-person game, where the Force and a lightsaber is the weapons. Starkiller's powers and traits can be upgraded by experience points which are earned by killing enemies and finding artefacts.

Why Star Wars: The Force Unleashed

Star Wars: The Force Unleashed is a game from the well-known Star Wars franchise. The game is mostly an action game, where Starkiller's skills are upgraded in a fashion commonly used by RPG games. The gameplay has lots of combat and several abilities the player needs to learn to use. The game fits well within the constraints, but has a approach to introducing mechanics that differ somewhat from the others.

3.4.4. Mirror's Edge

Mirror's Edge is an action-adventure platform game from 2008. The game was developed by EA Digital Illusions CE. The protagonist is Faith Connors who is a courier, whose sister is in trouble. The game takes place in a city that is under a totalitarian regime. Faith's sister becomes a suspect in a murder and Faith then has to solve the murder while on the run from the government.

A large part of the gameplay involves climbing, running and other parkour inspired moves, which gets the player around in the city. The game also has combat, both shooting and melee, but the main focus is on getting around in the city. The game is in first person perspective.

Why Mirror's Edge

Mirror's Edge fits into the constraints, the game is a action-adventure game that is also a platformer. The game focuses on getting from A to B and exploring the game world, all done while running. The combat elements mostly revolve around quickly getting away or disarming the enemies. Mirror's Edge is in first person view and that differs from most of the games used, so it can give some data to see if there is any difference in how mechanics are introduced if another view is used.

3.4.5. Portal

Portal is a puzzle-platform game from 2007. The game was developed by Valve Corporation. The protagonist of the game is Chell, who is challenged to navigate through a series of rooms using a portal gun. The portal gun creates two portals that are linked, so what enters one portal exits the other one. This is the main gameplay element, the puzzles also uses other elements such as buttons and switches which the player has to interact with to get through each puzzle. Mostly the player has to figure out the correct places for the portals to solve the puzzle. The game is in first person perspective.

Why Portal

Portal is included in this analysis since its way to introducing mechanics is one where the player is rarely told what to do. The mechanics are added one by one and then extended upon, letting the player

explore each mechanic till the player understands it enough to progress through the game. Portal is included because it does not completely fit into the genre that is otherwise the focus for the analysis. Portal has been chosen to see if it can give a different approach to introducing mechanics.
Portal is not normally classified as an action-adventure game. But it still contains most of the elements required for the games and can therefore still be used in the analysis. Since Portal is a different genre it has some different requirements regarding which mechanics and gameplay elements people expect. Portal has a story but it is not a main driving point. Portal has few classical combat elements, like shooting or melee combat. But Portal still has dangers and conflict with enemies that shoot at the player. The player is just not able to shoot back, but must figure out other ways to incapacitate the enemies and get past them. The environment in Portal is contained to mostly being within test chambers, which limits the player chances to explore the entire world. But nothing stops the player from exploring every nook and cranny of each chamber as well as exploring different solutions to each puzzle. Mainly Portal is in the analysis to be a contrast to the other games.

3.4.6. Dead Space

Dead Space is a science fiction survival horror game from 2008. The game was developed by EA Redwood Shores. The game is the first in the Dead Space series. The game's protagonist is an engineer named Isaac Clarke, who fights for survival against the Necromorphs aboard an interstellar mining ship, the USG Ishimura. The game is in over-the-shoulder third-person perspective. The main gameplay is combat, where the player has to dismember the Necromorphs to defeat them. The player has to be strategic in the combat as ammunition is limited. To repair the ship, the player also has to solve puzzles, which can give access to areas which were previously inaccessible.

Why Dead Space

Dead Space is not commonly seen as an action-adventure game, but has most of the elements. The focus of the game is just more on survival, because of the horror elements and more limited ammunition. The game is close to the standard and fits within the constraints for the games. But the focus and theme of the game is just slightly different. Which is why it is included to see if this makes a difference in the approach to teaching mechanics.

3.4.7. Metal Gear Solid 4

Metal Gear Solid 4: Gun of the Patriots (MGS4) is an action-adventure stealth game from 2008. The game is developed by Kojima Productions. It is the sixth game in the Metal Gear series directed by Hideo Kojima. The protagonist is an aged Solid Snake, called Old Snake. The game is in third-person

over-the-shoulder view, but has options for first-person view in combat. The gameplay consists of stealth, melee combat and shooting elements.

Why Metal Gear Solid 4

MGS4 is part of a series, so it can give a perspective to whether the game does things differently because it is not the first in a series of games. Since the game also has a large stealth element the game might give a slightly different approach to introducing mechanics. The game fit within the constraints and is a critically acclaimed game.

Now the games have all been presented and the reasoning for choosing these games explained. There are several other games that could have been included and in particular less 'mainstream' games could possibly have given interesting data. But it is not possible within the scope of this thesis to include them, therefore the games for the analysis are these seven that can give a good basis to analyse. The games have their similarities but also differences, which makes the analysis interesting.

4. Analysis

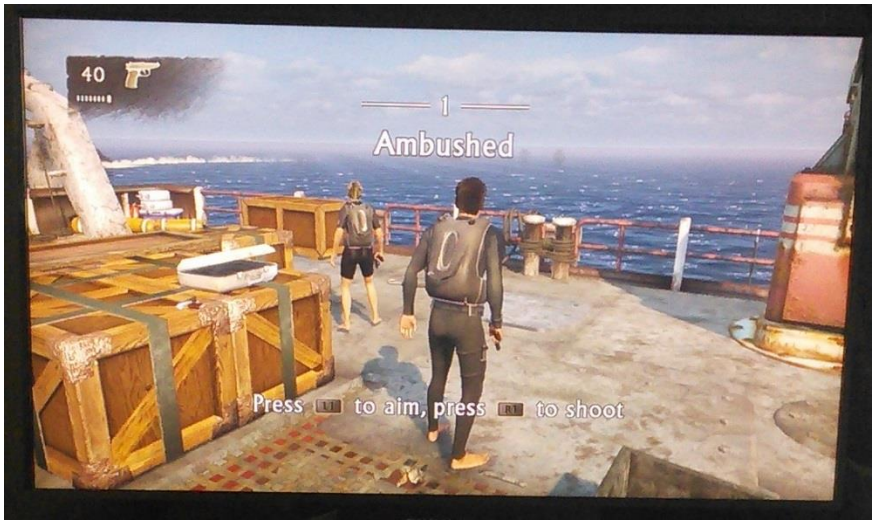
The analysis starts by describing how the games introduce mechanics. Then the games' manner of introducing mechanics are compared and four general ways are categorized. Each of the learning theories are then compared with the four ways to introduce mechanics.

4.1. How Games Introduce Mechanics

The analysis of Tomb Raider shows that the player is generally put into situations where they are forced to use a mechanic, which is introduced. The controls for the mechanic are usually shown in a text box on screen, the text often describes, what the mechanic does as well as the controls for it. The text is

Picture 1: Example of Mechanic with text and picture. Tomb Raider (2013)

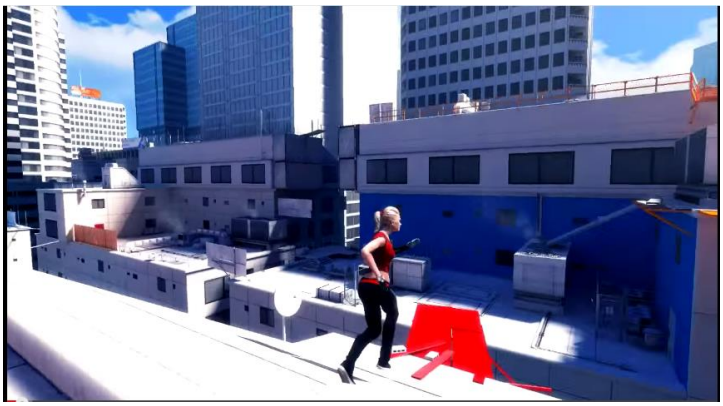
in some cases accompanied with a picture. The part of the game, which is analysed, is generally linear. Later in the game there is more options for exploration as the levels become larger. The game continues to introduce mechanics throughout most of the game. In Tomb Raider mechanics are introduced and then the player has to do them. When the player has succeeded and gotten further a new mechanic is introduced.



Picture 2: Example of text introduction. Uncharted (2007)

Uncharted has an approach similar to Tomb Raider's, the first level forces the player to learn the basic mechanics for combat: Shooting, cover and melee combos. Each mechanic is introduced shortly and then the player has a chance to try it before being introduced to the next. The next level focuses on letting the player get familiar with non-combat specific mechanics, such as platforming and solving environmental puzzles. After the player has been through both combat and noncombat, the player is put into more combat. Here more combat mechanics are introduced, such as shooting while hanging from a ledge, other weapons. The controls are shown on the screen via text or UI buttons. The text is short and has only the information needed to understand, what the control does, for example 'press x to jump' or 'Press circle to take cover when next to an object'.

Mirror's edge uses the same method of introducing a mechanic and then forcing the player to do it. The difference is that the first level is directly told to the player to be a training area and a NPC does each move before the player does it. The player is forced to do each mechanic before being introduced to the next one. The game has a


Picture 3: Example of NPC showing mechanic. Mirror's Edge (2008)

hint function which gives extra information about how to play the game. This was turned off in the play-through, which means some information about mechanics was not given to the player. The one mechanic which is not explained in depth is the momentum mechanic. The player is informed that some actions either build momentum or requires momentum, but further understanding of the mechanic is up for the player to discover. Momentum is a mechanic that hints explain more in dept. The controls for the game are shown by text. The first level is one of the more restricted ones, but it is done mostly to make sure the player is introduced to each mechanic. After this the game opens a bit more up, as there are several ways to get through each level. The destination is told via a cinematic or characters talking about it. Furthermore the game has a mechanic, which makes the camera focus on the destination. Beyond the destination the player is free to find her own way there. In the game certain objects are red, these are to guide the player towards the goal and indicate this is a way forward. This is called *runners vision* and is a feature, which can be turned off if the player wishes to. In the above picture it is possible to see where to go because of the red objects.

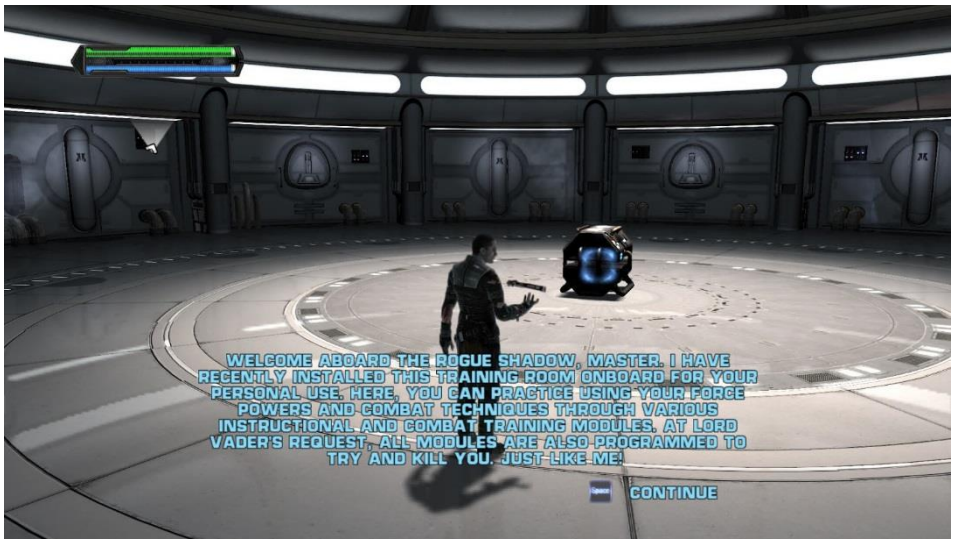
Picture 4: Example of Runner's Vision. Mirror's Edge (2008)

Dead Space has a slightly different way of introducing mechanics. The game also uses text to explain the controls and introduces mechanics one by one. The difference is that several of the mechanics, which the player is told the controls to, she is not immediately forced to use the mechanic. For example the locator mechanic, which helps to show the player where to go. The player does not have to use the mechanic, it is however very helpful. The *melee* mechanic is one that the player can go without using for a while after being informed about it. The two other core mechanics (shoot/cut and stasis) are however hard for the player to not use after learning of them, the *stasis module* has to be used just after the introduction of it. Shooting is explained while in a mostly safe area, but as soon as the player moves on, combat is hard to avoid. Here it is likely the player will use the mechanic. Most

mechanics are introduced by the text which explains the control, but several of them are accompanied by further information from NPC's in the game. An example of this is the shooting mechanic, here the NPCs add extra information, which relates to how to best use the mechanic. The game has the player going back and forth to different places in the level several times. Because of this the player will most likely rely either on the locator mechanic, which shows the way to the objective, or on the map, where the entire level is shown with indications of where to go.

Picture 5: NPC informs about dismemberment. Dead Space (2008)

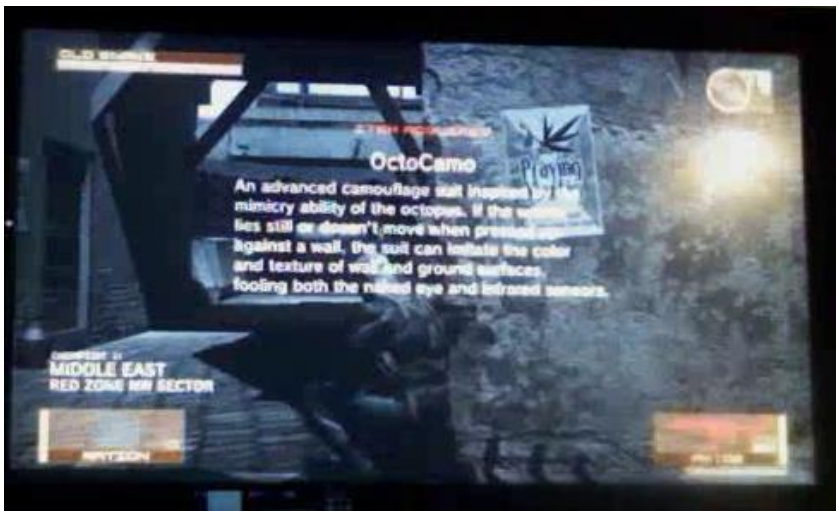
Star Wars is similar and at the same time different to the other games' methods. The biggest difference is that the first level has the player controlling someone other than the protagonist and is informed of the controls for only one mechanic during the level. The player has to simply try to figure out how to fight and move. The level is however very easy as the character the player is controlling is much stronger than the enemies. After this the player gets to be the protagonist and here is introduced to mechanics. The first mechanic is taught in a training room. The controls are given by text on the screen and a voice tells about what the mechanic does and can be used for. In the training room the player has to use the mechanic to do as instructed. The game in general gives fairly little information in the actual levels about the mechanics. As new core mechanics are needed the player is informed of the controls but not



Picture 6: Training Room. Star Wars: The Force Unleashed

much else, and the player can use the mechanic before being told the controls. Because the first level mostly lets the player just try buttons, it is a possibility the player discovers the controls and the mechanic by simply trying the buttons. It is at all times during the game possible for the player to go to the training room and get instructions in how to use a mechanic. However only the mechanics which corresponds to the skills, which the player has unlocked at the time. In the levels the overall goal is to find and kill a character, during the level subgoals are indicated by text on screen and the map has a pointer that shows in which direction the player needs to go. In some cases the NPC who pilots the protagonist's ship, will give helpful information, such as there is a lift nearby or that protagonist need to figure out a way to open a door.

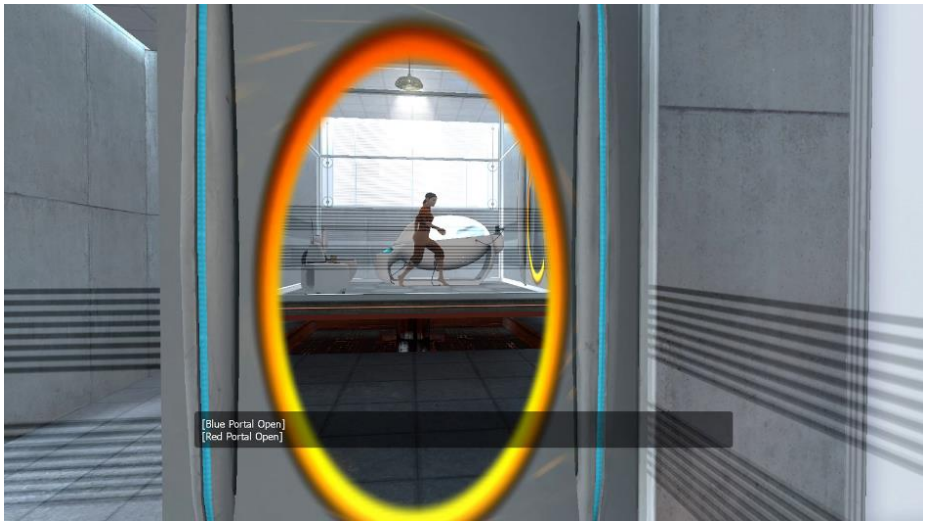
MGS4 has an approach that relies on the player reading text or simply discovering the mechanics for themselves. Most mechanics are tied to an object in the game. When the player gets that object, the game pauses and a text box informs of the properties of the object and the controls to use the mechanics. After this the player is rarely forced to use the mechanic, but in several cases it makes little sense to not use the mechanic. It is mostly up to the player to figure out how best to do things on their own. It is possible some things are expected to be known from previous games in the series, however most information is given in the text boxes. A few mechanics are dependent on being near an object, these mostly do not have a text box, but the controls are indicated by an UI button, for example the cover mechanic, which makes the character only walk along the object and take cover. The mechanics which are presented in this way are fairly basic mechanics, such as *cover* or *move body*. These do not need much explanation. One mechanic depends totally on the player discovering its properties by themselves, the alert counter, which is a mechanic that affects how NPC enemies act in an area. The mechanic is not a new one to the series. The counter shows up after enemies have spotted the player. It changes states depending on whether or not the enemies see the player. When the counter reaches 0, the NPCs stop looking for the player. The game has a map, which indicates where to go and the goals are generally



Picture 7: Example of text box. MGS4

told in cinematics or by NPCs.

Portal has an approach to introducing mechanics which differs from the others, but there are still similarities. The controls in Portal are introduced by text as in the other games. Portal introduces mechanics one by one. Some mechanics are explained by a NPC of the game, but for the majority of the game, the player has to figure out by themselves how to use the mechanics to solve the puzzles. Portal's main mechanic is the one that involves portals. This is one of the first mechanics introduced. The mechanic is introduced before the protagonist enters a puzzle chamber. The first portal is opened right in front of the player. The connecting portal is placed so the player can see themselves through the portals. This can help the player understand that the two portals are connected and that going through one makes you exit from the other portal. The first puzzle chamber shows that portals can change location, giving the player access to different places. The second puzzle ads on this by letting the player see the location is changed by the direction the portalgun is pointing and the player shortly after gets control of the gun. Here after the player has control of where the blue portal is placed. The next couple of puzzles then forces the player to use this ability to solve puzzles. For most of these other mechanics are introduced and for each added mechanic, there is a puzzle that forces the player to use both the newly learned mechanic and the older ones together. In general each puzzle ads a mechanic or a new mix of mechanics, which forces the player to understand how to use each mechanic to solve the puzzles.



Picture 8: Portal where player can see herself through it. Portal

4.2. Comparing the Games

The comparison shows that the games all explain the controls by text or visual indication. Most mechanics are introduced by text and/or visual indication since the controls in most cases are linked to a mechanic. But this is only part of it, because the player needs to actually use a mechanic in the

game to properly understand and remember it. This can be confirmed by Alkan and Cagiltay (2007), who concluded that explaining how to do a mechanic does not guarantee the player understands. From the games these different ways of introducing mechanics are found.

Way A: Force the player to use one mechanic as part of game

- **Tomb raider (explicit)**
- **Uncharted (explicit)**
- **Portal (implicit)**

Way B: Force the player to use one mechanic as training/tutorial

- **Mirror's edge (explicit)**
- Star wars (explicit)

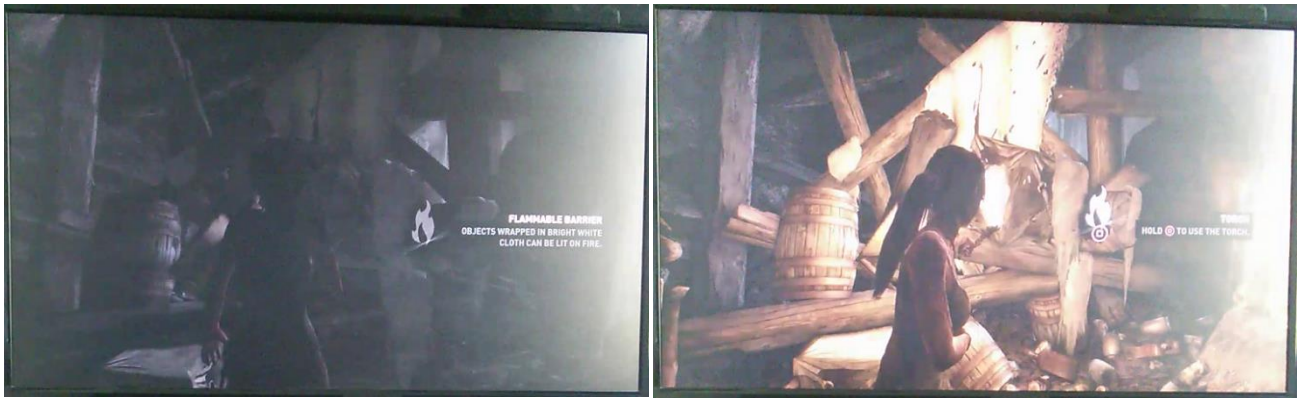
Way C: Not force player simply inform of mechanic/controls

- **Dead space (one mechanic at a time)**
- Portal (particle field, deadly floors) (one mechanic at a time)
- **Star wars (one mechanic at a time)**
- Dead Space (several mechanics introduced without chance to try each one before next one)
- **MGS4 (several mechanics introduced without chance to try each one before next one)**

Way D: Not force player, without information about mechanics/controls (no introducing mechanics)

- Star wars
- MGS4 (alert counter)
- Mirror's edge (momentum/runners' vision)

Several of the games have more than one way which they introduce mechanics. One way is used more than others and is the one the analysis focuses on. (In the list above the main way is marked by the where the game is in bold). The methods have specific parameters which makes it possible to divide the methods. The first parameter is whether or not a player is forced to use a mechanic when it is introduced. If the player is forced to use it, the next parameter is whether it happens as part of a training level/tutorial or as part of the main in-game story. If it is part of the story I document if the player is explicitly told about a mechanic and how to use it, to move on. An example of telling the player explicitly can be taken from Tomb Raider, where the player is told first that object are flammable and then when carrying a torch how to use it. An example of more implicit instruction can be found in Portal. Where the player is not informed of what the *button* does or how to use it. There



Picture 9 and 10: Explicit example. Tomb Raider (2013)

are hints available in the environment such as the dotted line connecting the *button* and the *door*, but it is not stated directly. In the games analysed it never occurred that a training level implicitly forced the player, but it is theoretically possible. It could be argued that whether a level is introduced as a training level or not, does not make a difference. I however believe it makes a difference to the player's attitude. The first two levels of Uncharted could easily have been classified as a tutorial, since they work like one, by introducing mechanics and forcing the player to try them. Instead the game incorporates it into the story and never tells the player that this part of the game teaches you the mechanics. In Mirror's Edge the training level is part of the story as the protagonist needs to recover from an accident.

Picture 11: Implicit example. Portal

In the event that the player is not forced to use a mechanic the biggest difference between the methods is whether it introduces the mechanic and controls or does not tell the player at all. The last options puts the player in a position, where they do not know which mechanics there are, and simply has to press buttons and see what happens.

It is possible for the game to introduce one mechanic and then give the player a chance play a bit before the next mechanic is introduced. Here it is likely the player tries the mechanic, but in this method it should be possible for the player to get further without, excluding mechanics such as simple

movement. It is however also possible that the game introduces several mechanics in a row and then lets the player play the game, without forcing the player to use all the mechanics at the time. It is unlikely that the player can get through the game without using the mechanics at some point.
In the analysis it does not seem to affect the way mechanics is introduced that Dead Space is not an action-adventure game. The game have several similarities with the other games. Portal is however the only game to use Method A implicitly. This might be because the game focuses more on puzzle solving than action, which gives more chances to let the player think as there are few times the player will die by not doing anything. But otherwise the way of introducing mechanics can easily be compared to the other games.
In this analysis the focus is on when the player is introduced to the mechanic and a short time after in the gameplay, as I expect the game design at some point forces the player to use most of the mechanics to get to the end of the game. But unless the game repeats the information about the mechanic, the player can have forgotten about the mechanic. Therefore the focus is on the time right after the mechanic is introduced, because I expect the game to teach the player the mechanic shortly after.

4.3. Comparison with Learning Theory

The learning theories usually focus on a teacher and the learner(s). In the scenario of introducing players to mechanics I wish to make it clear who/what I see as taking on the roles. The learner(s) is the player(s), it is the person who is playing the game and learning something by it. The role of the teacher falls to the game. The game is a system that facilitates and then the game designer is the actual teacher.
Discovery learning demands that the learner discover knowledge by themselves. The teacher's main priority should be to provide support and opportunity for the learner to investigate and thereby discover knowledge. A point to consider is that the learner need some prerequisite knowledge for them to be able to construct and test hypotheses. This analysis considers how each way of introducing mechanics from the games follows the method of discovery learning.
Advance organizer demands that a broad statement is given, which helps the student connect the new material to prior learning. Expository organizers provide new knowledge which is necessary to understand the lesson, such as concept definitions and generalizations. Comparative organizers introduce new material by drawing analogies with familiar material. For the different approaches to introducing mechanics it is discussed how advance organizers might fit.

4.3.1. Way A: Force the player to use one mechanic as part of game

Tomb Raider, Uncharted and Portal all use this way to introduce mechanics as the dominant way. A is in most of the cases, very strict in how much freedom the player gets to test hypotheses. The player is given the basic knowledge needed, to be able to test hypotheses, by the game informing the player of the mechanic and the controls for it. The player then gets to try to do the mechanic. The player is able to retry until the player succeeds in moving forward in the game. This makes it possible for discovery learning to happen. It does depend highly on the game and whether they explicitly or implicitly force the player. In the implicit cases, there is more freedom for the player to discover the knowledge behind the mechanic by themselves. Whereas in explicit cases the player is told what and how to do things and then can try until she succeeds in using the mechanic. It is possible for the game to give some room for exploration, which can make the player feel like there is several ways to advance. In the games there was in most cases only one way to use the mechanic to get further, which usually did not encourage the player to try different ways. If the game is too constricting it might hinder discovery learning.

The game informs the player of the controls and that a mechanic exists, which could be seen as a form of expository organizer. This gives the player new information, which is needed before they can start to learn. Organizers are about connecting information with previously known knowledge or presenting new concepts. When forcing the player to use a mechanic in a specific situation. It can help to make the player connect similar situations with the mechanic, and remember the mechanic and how it was used in that situation. By connecting a mechanic with situations it is possible for the player to better understand and remember the mechanic.

4.3.2. Way B: Force the player to use one mechanic as training/tutorial

Mirror's Edge have this ways as the main ways to introduce mechanics. Star Wars uses this way for some mechanics, but is not the main way unless the player actively chooses to go into the training room. In the cases of way B the games all give the basic knowledge needed for the player, such as the knowledge of which mechanic and what the controls are. This can be seen as an expository organizer. It gives the required knowledge for the student to learn by discovery, if the game further on facilitates this kind of learning.

The game lets the player try the mechanic until the player succeeds. In the cases used in this analysis the game area is usually fairly restricted and has few chances to explore other options while being introduced to mechanics. The player is told what and how to do the mechanics, but because the game tells the player almost exactly how to do the mechanic, there is little change for actual discovery

learning.

4.3.3. Way C: Not force player simply inform of mechanic/controls

Dead Space, Star Wars and MGS4 all have C as their main way to introduce mechanics. Portal also uses this way for a few mechanics. Way C gives the player the foundational knowledge needed to try the mechanic and learn how it works. A game following this way of introducing mechanics should give the player plenty of freedom to discover how the mechanics work. If the game uses this way and introduces several mechanics right after each other it is possible it would be difficult for the game to have the proper support to ensure the player learns all the mechanics properly. But it would be possible for discovery learning, if the game later on has scenarios, which propels the player to use the mechanics, while still giving them the relative freedom to choose how to use the mechanic. The method also could work as an expository organizer with the information about the mechanic given. It should be considered how the lack of forcing makes it less specific, which situations are linked to which mechanics. However one should also consider how the mechanics can be tied to other known mechanics, both in the game and in other games, and thereby become a comparative organizer.

4.3.4. Way D: Not force player, without information about mechanics/controls

Star Wars, MGS4 and Mirror's edge all introduce a few mechanics in this way, but none of the games use it as the main way. Way D gives very little support for the player but lots of freedom to discover. It is however, in the case of this way, going to depend mainly upon the player. The player has to either simply try on their own or have knowledge about games to make them able to understand the mechanics. In this method it is easily possible for the player to not have the prerequisite knowledge needed to make hypotheses properly. Therefore discovery learning might fail if the player lacks the knowledge needed to learn the mechanics.

As the way gives next to no direct information there is little of the method that is similar to organizers. The connection to previous knowledge is entirely dependent on the player's knowledge about the game. This knowledge might connect it to other games or the conventions for the genre of the game. But the way of introducing mechanics is not easily connected to the theory of advanced organizers.

The different ways to introduce mechanics can all in some way be related to the learning theories, but some are more similar than others. The toolkit is my proposal for how the learning theories can be considered as the game is designed. The toolkit evolves A to make it more based on the theory, but also incorporate elements from C. These two ways are the focus because they already support

elements of the learning theories. And since it is ways already used in games, it seems logical to further these ways of introducing mechanics instead of trying to come up with something totally new.

5. The Toolkit

The following part of the thesis goes through possible ways to use the instructional methods of the two learning theories. This is the toolkit, which does not include every way for a game to facilitate the theories but hopefully gives some ideas for how. Then examples, of how Dead Space and MGS4 could have been if made according to the toolkit, is given. The examples focus on a few mechanics from each game. In the end of this chapter the possible ways to introduce mechanics are summarized in Table 1: The Toolkit to give an overview and be a tool for designers when designing their game.

To incorporate expository organizers the most obvious ways are via text boxes or having NPC's in the game telling the player the knowledge. This would be a way to give the player the prerequisite knowledge, which is needed to learn the mechanics. It is important to be careful not to make the text boxes be too long or dense. Text boxes should contain only the absolutely necessary information, such as: push x button to do action. If the mechanic is more complex than simply jump or shoot, then consider shortly explaining the mechanic. But I would consider using another way to inform the player. Either by dialogue in the game or make sure they can learn the mechanic by discovery, after they have been informed of its existence and controls.

Incorporating comparative organizers can be done by using conventions from other games. (For example red barrels are explosive, wasd to move or left analog stick to move). Then it is possible to assume that the player understands easily. Convention are however dependent on which games (if any) the player knows, it can therefore be dangerous to assume that the player is familiar with the conventions. It is possible the player might not have played a lot of games and therefore does not have the knowledge to understand the comparative organizer, since she does not understand the reference material.
Another way to use comparative organizers is when the game informs the player of the controls for the mechanic. It can be expected that the player knows which kind of control are there, then it is possible to inform the player that button X relates to this mechanic. It should however be considered that knowing which button to press does not equal understanding how the mechanic works, but it is

a start for the player to start learning.

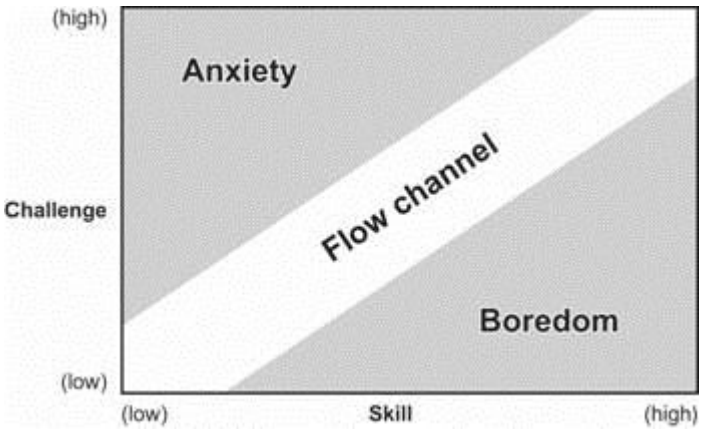


Figure 1: Flow Channel. Whitton 2014 p. 80

Discovery learning is about providing structure and setting up activities to support the learner. This should be easy to do in a game, since the game itself is a closed system which creates a structure and has limits. Discovery learning can be supported by having scenarios in the game, where a player has the chance to try a mechanic. Later in the game have similar scenarios which use that mechanic but where the challenge level is higher. The issue is to provide enough support that the player can discover how to use the mechanic herself without frustrating the player by explaining to little. It is also important not to explain too much which could make it too easy. The challenge is to keep the player in the flow channel, so they keep having fun (Whitton, 2014, pp. 79-80). The absolute minimum to tell the player is which buttons to press and which mechanics are in the game. If the player knows these the foundation for them to learn by discovery is there.

According to this toolkit the way to introduce a mechanic could be: Tell the player she can *jump* by pressing x. Then have a scenario where there is a possibility to jump to otherwise unreachable places. Depending on the game either let it be a requirement to go there or not. Further in the game have a scenario where the player has to jump several times or have it timed in some way to increase the challenge. If other mechanics have been introduced then have a scenario where the player has to both jump and use the other mechanic to get further or achieve a reward of some sort.
The overall idea with the toolkit is to make sure the player knows, which mechanics are there and which controls to press for the mechanics. A way to further facilitate the player learns the mechanics, is by creating scenarios where the player can to do the mechanics. At first, when introduced to a new mechanic, only have one mechanic at the time and let it be simple. Then have similar scenarios, where the difficulty is slightly higher for each and as other mechanics are introduced, create scenarios where several mechanics have to be used together or in sequence. In this way the game supports the practice the player may need while slowly removing what scaffolding there might have been. It is not necessary to introduce all mechanics in the first section of a game, but introduce them as needed.

Remember to give the player a chance to discover how to use the mechanic. In relation to this it is useful to consider how to support the player. A possible method is to give hints if the player does not proceed for a longer period of time.
The last point the toolkit has is that the player does not have to do it right the first time. The game should give some sort of feedback and when failing provide feedback, so the player can adjust and succeed on their second or third or later try. As Whitton (2014, p. 39) points out "in games, mistake-making is seen as an inevitable part of the gaming experience; it is by making mistakes and learning from them and trying again that players can make progress through the game. Instead of mistakes being seen as problematic, they are an integral part of game-play because they provide the opportunity for players to receive feedback, and change their game-play techniques or strategies."

The biggest difference between A and C are whether the player is forced to try a mechanic as they are introduced to them. The toolkit should hopefully support both possibilities, but might lean more towards forcing the player. The idea with the toolkit is however that the player does not consider herself forced. A possibility is to inform the player of basic mechanics such as jumping or crawling, but then not forcing them to do it at that time, while letting it be a possibility. And then to ensure the player is reminded of the mechanic and has learned it; let there be a scenario where jumping or crawling is necessary to progress.

The toolkit uses the model of events of instruction in games by Hirumi, Appelman, Rieber, and Van Eck for the examples used. The events are: 1. Gain attention, 2. Inform of objective, 3. Recall prior knowledge, 4. Present instruction, 5. provide guidance, 6. provide practice, 7. provide feedback, 8. assess performance, 9. enhance retention and transfer (Whitton, 2014, p. 40).

5.1. Dead Space and MGS4 According to the Toolkit

Dead Space falls under C. The following focuses on these mechanics: *cutter*, *melee* and *stasis* and suggests how the game could have followed the toolkit closer. The mechanic for the *stasis* is the only of these, where it is clear that the game forces the player to use it right after introducing. The other two mechanics the player does not have to use when introduced, but the player does enter combat shortly after they are introduced, and most likely has to use one of them to survive. The *cutter* mechanic is needed to exit the room the player is in when introduced to the mechanic.

Picture 12: Player can pick up Plasma Cutter. Dead Space

The *cutter* mechanic is introduced as the player gains the *plasma cutter* item. The *cutter* mechanic is a compound mechanic that contains aiming and shoot/cut and reloading. The mechanic also has an alternative mode, where the *cutter* is turned 90 degrees to cut horizontal not vertical. When the mechanic is introduced the player is in a room with no enemies, but the player can hear the sound of someone outside the room.

The *cutter* mechanic is introduced in a manner very close to ways of the toolkit. It makes sure the player have the basic information: the controls and the mechanic. The game also informs the player, that it is best to use the mechanic to cut of limbs and not shoot the head or body of enemies. After this the player has to shoot the control board of a door to move on, which gives the player a chance to try the mechanic in a safe environment. It should however be noted that the game in no way explains that the *cutter* can be used for this.[2] After this the player enters combat and can try to use the mechanic to kill an enemy. About 5 minutes later in the game the player is reminded that dismemberment is the most efficient way to kill enemies.

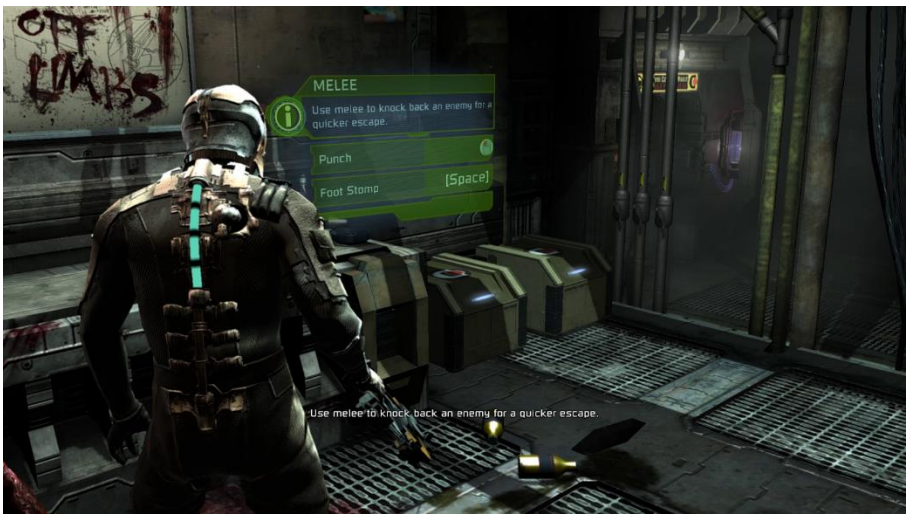
It can be argued if it would be better if the player is told that the *cutter* can be used to open the door. By not telling the player is given the chance to discover it by herself. To not frustrate a player too much and follow the toolkit a hint about this could be given if the player lingers a very long time in the room.


Picture 13: Enemy coming through door. Dead Space

So no changes would be needed, other than the consideration about opening the door. One other point is that the controls for how to turn the

[2] See Dead Space video A where it takes the player a long time to figure this out.

cutter to shooting horizontal is never given to the player. In the play-through the player turns it in video D, which was because the player was informed of this option by a friend. The player could have been informed of this when the game repeats information about dismemberment. If given when the player first is introduced to the mechanic it might be too much information at once. But giving it when the player is reminded of dismemberment it can fit in without being too much information as the other information is already known.



Picture 14: Melee mechanic is introduced. Dead Space

The *melee* mechanic is a compound mechanic that consists of a *punch* and a *stomp*. The mechanic is introduced as a way to escape enemies by knocking them back. The stomp can also be used to open crates on the floor, this is however not explicitly told. It is possible to consider it a convention in games, that boxes or crates might be opened by melee actions.

The mechanic is introduced in the same room as the *cutter* mechanic. It is introduced just after the *cutter* mechanic without a chance to have tried the mechanic first. After the player has opened the door it is possible for the player to use melee to kill the first enemy. In theory the player could get through the game without ever using melee. It is however unlikely, as ammunition for the *cutter* is sparse throughout the game.

The introduction of the mechanic gives the basic information needed and then makes it a possibility to try the mechanic. However an idea could have been to repeat the use of *melee* at a point later in the game as it is possible to get a lot further in the game without using the mechanic.

The *stasis* mechanic is a mechanic, which can slow down objects and enemies. Like the cutter the *stasis* mechanic is introduced when the player picks up the item *stasis module*. The player has to use the mechanic right away to slow down a mal-functioning door. About 2-3 minutes later the player is informed by a NPC to use the *stasis* mechanic on a mechanism, which is part of a simple puzzle to

repair a tram.

Picture 15: Stasis Module is introduced. Dead Space

Again the game in most ways follows the toolkit. The game informs of the basic knowledge required. It then gives a few challenges where the mechanic is used and the challenges are not too similar. This mechanic the player has to use. The player is never forced to use it on an enemy, but is informed of this possibility.

To conclude, Dead Space is already very close to introducing mechanics like the toolkit suggests to do it. The possible changes are to make sure to inform of all aspects of the mechanic (*cutter*), to repeat information about mechanic (*melee*), especially when not forced at any time to actually use the mechanic. And to possible insert hints in the game when the player gets stuck. The hints are however something that should be done delicately as not to make it too easy.

MGS4 falls under the same ways of introducing mechanics as Dead Space. The focus is on these mechanics; *shooting*, *cameo*, *alert counter*, *barrel drum*, to see how it could have been done according to the toolkit. The *alert counter* is the only of the mechanics that is not introduced by a text box like the other mechanics are.

The information about the shooting mechanic shows up after the player picks up a weapon. All the information is given by the text box, which describes the weapon and controls for it. The mechanic is a compound mechanic including aim, shoot and sight. After the text box the player is free to use the mechanic whenever possible or avoid it if possible. As the player gets different weapons a text box each time tells a bit about the weapon and controls for example when receiving the *tranq gun*.[3] During the play-through the player realises it is possible to sneak up behind enemies and get them to

[3] See MGS4 video B: 29:00

Picture 16: Enemy puts hands up. MGS4

Picture-17: Enemy lies on the ground. MGS4

put their hands up and lie down on the ground.[4] This mechanic is not explained to the player. The game does provide the player with the requisite knowledge and then just lets the player try. There is plenty of scenarios where the player has the chance to use the mechanic, but the scenarios are not so controlled as to let the player slowly learn the mechanic. The player is mostly just thrown into the situation and can by trial and error learn how to best survive dangerous enemies. The game is a game that relies on stealth which means the player can possibly have an easier chance of success by using stealth. This might be a reason for not making the scenarios for combat too simple as it can force the player to use more stealthy tactics.

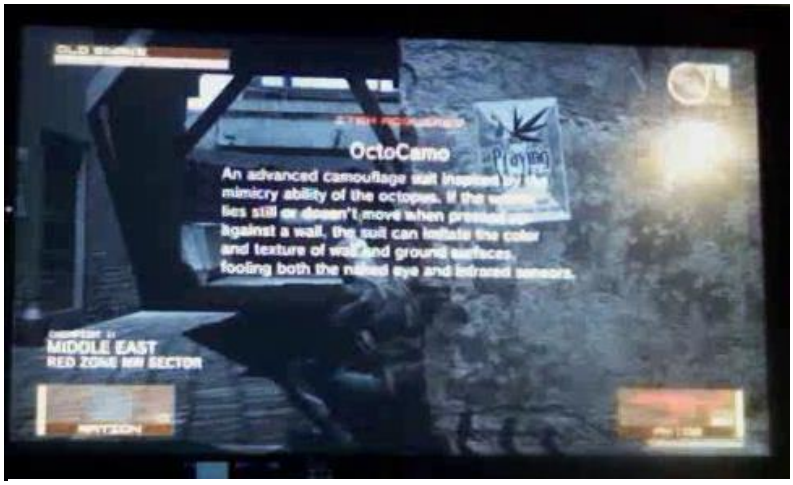
The toolkit proposes to make sure the player meets scenarios where the player gradually gets to use the mechanic in more difficult challenges. An idea can be to have made the initial scenarios with shooting easier and gradually more difficult. The other issue is that the text boxes have a lot of text, which is possible for the player to easily skip and then not get the important information.

The *cameo* mechanic is related to the *cameo suit* which the character wears. A cinematic[5] shows the player how the suit helps camouflage the player. After the cinematic a text box explains the mechanic more in detail. The player is free to use the mechanic whenever they feel it is needed.

The game makes sure the player have information about the mechanic. The game then give chances for the player to use the *cameo* mechanic. Again the player is free to use it as she wish. The mechanic

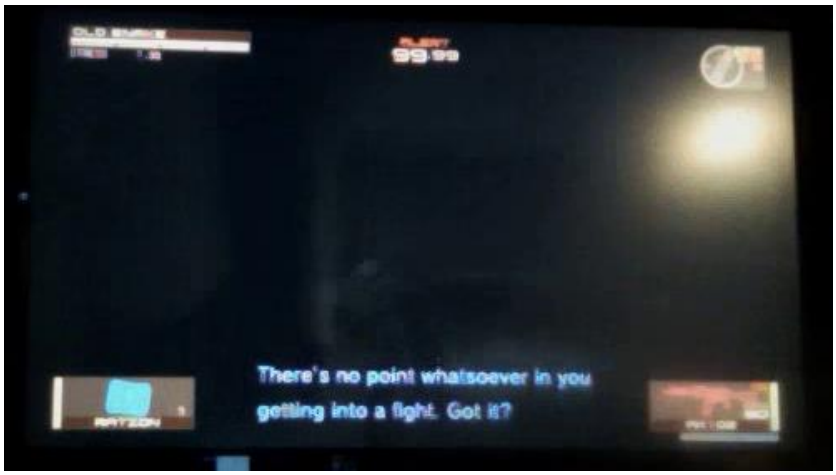
[4] See MGS4 video B: 33:36
[5] See MGS4 video A: 15:25

is simple enough that several scenarios, to make sure the player knows how to use the mechanic, might not be needed. The game could have made sure the player have to use it right after learning it.



Picture 18: Introduction of cameo mechanic. MGS4

The mechanic for the *alert counter* affects how the enemies behave. The counter can be in different states, which affects if the enemies look for the player or not. The counter is displayed after about 20-30 minutes into the game. It shows up together with a warning from a NPC to try to avoid fights. The mechanic is not explained to the player. It is up to the player to understand the counter on her own. By entering combat it becomes clear that the states depend on, if the enemy can see the player or if the player is hiding, as the enemies then after a while stops actively looking for the player. The first time the counter reaches 0 the player hears NPCs being told the state of alert has been lifted.[6] This informs the player that the enemies' behaviour will go back to normal. The game could have given more information about how the mechanic works. It should be considered, that it is a game in a series and the developers simply expect the player to understand the mechanic from previous games in the series. To better follow the toolkit some basic knowledge about the counter could be given to the player via text or a NPC explaining. The mechanic might not need specific scenarios to be explained as most of the gameplay will involve the mechanic already, but a short explanation of what the counter does could help players new to the series.



Picture-19: First time Alert Counter shows up. MGS4

The *barrel drum* mechanic is a stealth tactic, which makes it possible for the player to hide in a barrel drum and roll to positions

[6] See MGS4 video B: 25:10

otherwise surveyed by enemies. The mechanic is introduced first by a cinematic, where a NPC hides in it. After the cinematic a text box explains the item and controls for the mechanic. After this the player has good opportunity to try the mechanic as the player has to get past a lot of enemies. The mechanic is very simple and the game informs the player of the things needed to know and gives the player a chance to try it. The game therefore is already close to how the toolkit advices. In the rest of the play-through the game does not remind the player of the mechanic, but it is possible for the player to use the mechanic to get past other scenarios. The player is not forced to use the mechanic. It could be a good idea to have other scenarios where the player is reminded of the possibility to use this mechanic. Otherwise the player might forget it, but that is the only change regarding this mechanic the thesis proposes.

Picture-20: Text explains mechanic for Barrel Drum

To conclude MGS4 is a game that could have introduced mechanics differently if the toolkit is used as a design toolkit. The game gives a lot of information via the text boxes, and several times does it with several mechanics in a row. This might cause the player to not understand or not read all the information. As the game never forces the player to use mechanics, an idea could be to make sure different scenarios encourage the use of the mechanics. The scenarios should preferably be shortly after introducing the mechanic, so the mechanic is still fresh in the player's memory. In general the game could have spread the mechanics out a bit more to give the player the chance to try the mechanics a few times before the next one(s) are introduced. Possible changes could be; make sure to inform players of the basics behind mechanic (*alert counter*), give simple scenarios after introduction (*shooting* and *cameo*), remind player of possibility to use mechanic (*barrel drum*).
All the possible changes should be considered in relation to the genre of the game which also classifies as a stealth game. The game is the fourth in a series so it is up to the designer to consider how much to explain. This affects how easily new players to the series understand the mechanics compared to players familiar with the series who might not need as much explained.

5.2. Table of toolkit

Theory	**How theory helps learning**	**Events of Instruction related**	**How to use in games**	**Considerations**	**Examples**
Expository Organizer	Provide new knowledge, definitions and generalizations	Inform of objective Present Instruction	Text boxes or UI pictures NPCs talking to player	Length of text in text boxes. Only the necessary information Can be used to give the prerequisite knowledge needed for discovery learning	"press x button to *jump*" NPC explains mechanic
Comparative Organizers	Draw analogies with familiar material	Recall prior knowledge Enhance retention and transfer	Connect mechanic to controls Use conventions Use similar scenarios which connects to a mechanic	Knowing the controls does not equal understanding the mechanic. But can be a starting point If the player knows the convention	Red Barrels are explosive (convention) X button to jump Area with cover reminds player of shooting and cover mechanics
Discovery Learning	Provide structure, by posing questions and giving suggestions, set up activities (learner might need prerequisite knowledge)	Gain attention Provide guidance Provide practice Provide feedback	Inform of mechanics existence and the basis controls. Set up scenarios, to try the mechanic. Have different challenges for a mechanic and increasing difficulty	Balance not explaining enough vs explaining too much (too hard vs too easy) to keep it fun.	Combat: first one enemy, then several, then more difficult enemies Introduce mechanic A, then use mechanic A, introduce mechanic B, Then use mechanic B, then use mechanic A and B together

Table 1: The Toolkit

5.2.1. Main Points from the Toolkit

- Make sure player knows which mechanics are there and the controls for them.
- Create scenarios to use the mechanics. Start with one at a time, then similar scenarios with increasing difficulty
- Introduce mechanics when needed not all at start of game
- Give hints if player is stuck for longer periods
- Player does not have to do it right the first time.
- Provide feedback

6. Discussion

This discussion starts by looking at the method of the thesis and criticizes it. Then it discusses how other theories could have influenced, such as player types, learning styles, and other learning theories. Then the design related questions such as balancing fun and learning are discussed. The discussion then focuses on the relevance of this thesis before finally considering if it can work with other genres of games.

The method behind the analysis has several points which can affect the validity. First of all the games chosen are not a large enough group to be sure they are representative. It is entirely possible that other games might have generated different results. The game sample can only give a possible idea, that there might be these ways of introducing mechanics. But more games would need to be analysed to establish how games introduce mechanics in general.
The next point to criticize is that the play-throughs have not considered if the games introduce mechanics in later parts of the game. It might be done differently later in the game. It would have been a strength if all the games had been played all the way through to be sure if anything changes later in the game or if mechanics are evolved or repeated. Here it was an issue of the scope and timeframe of this project. There simply was not time to play all the games to the finish and analyse it all. But it is worth noting that further research can look into this.
In the methods chapter it is already discussed how having the play-throughs done by one player might have affected the analysis. To expand on this it should be considered that the results could have been fairly different depending on if the player is a ‘gamer’ or a ‘newbie’. The toolkit needs to be further evolved and tested to figure out if the ways of the toolkit works for both types of players. The toolkit

as it is does not in any way take player types into account. It is entirely possible that some types would prefer some ways over others. It should be possible for the designer to consider if their game need to include ways which work for several types or if the game's target audience is only one type.
The play-throughs, and therefore the analysis, are all of one play-through by one person. To make sure certain things are not missed another way to do the analysis, could have been to have had several play-throughs preferably by different players and then inquire if some players notice different things. To expand on this inquiries could have been done, which questioned the player about their understanding of the mechanics and their experience of learning them. Again this would have demanded more time and work which was not possible in this project.

The toolkit and this thesis focuses on two specific theories. First off, these theories have certain things which people critique them for. Discovery learning is critiqued for not working when too little structure and guidance is given (Clark & Mayer, 2008, p. 386). Especially in regards to teaching novices. In regards to games and simulations Clark and Mayer (ibid) even argues to avoid discovery learning. This is done in regards to E-learning. But it should always be considered that some guidance is needed. Advance organizers can be criticized for being vague, that no clear definition of them is given. It is hard to know how an organizer should be. Another issue with advance organizers is that one organizer might not work for all learners, as different learners might have different skill levels.
Secondly it is possible that other theories can give a different toolkit. Adapting other theories can expand the toolkit and can be a point to research further.

The toolkit gives certain ways of introducing mechanics for designers to use when designing games. The ways have not been properly tested. To be sure that the ways of the toolkit work it is needed to have games that follows these ways of introducing mechanics and then have players play them and assess how well they understand and learn the mechanics of the games. This would take a larger inquiry and would need a way to categorise and measure the level of learning that has happened. Because the toolkit has not been actually tested I cannot say with certainty that these ways make sure the players learn the mechanics properly. The toolkit can only suggest ways, which are based on learning theory. Each of these theories have reasons for why they enhance learning.
A related field to learning theory is theory about learning styles. In this thesis theory about learning styles was judged as out of scope. However in further development of the toolkit learning styles should be considered to understand if certain styles are catered to more and how the different styles can be supported.

The last points of this discussion relate to challenges the designer might face with game design. Whitton (2014, p. 84) points out that one of the main difficulties with game design is to ensure that the levels of challenge is appropriate for players so that the game is fun to play. When designing a game it is important to make sure the player has fun. Flow theory is used to explain the way players engage with games (Whitton, 2014, p. 79). The flow channel sets the challenge level against the skill level of the player. The idea is to try to stay in the channel where the challenge and skill levels match. As introducing the mechanics is part of the game keeping the player in the flow channel should also be considered. While learning the mechanics the player should not be guided so much that it becomes boring, but neither should it be too hard as to frustrate the player. This balance is difficult to achieve. Koster (2005, p. 98) argues that fun isn't flow, as flow typically relate to exercising mastery, not learning.

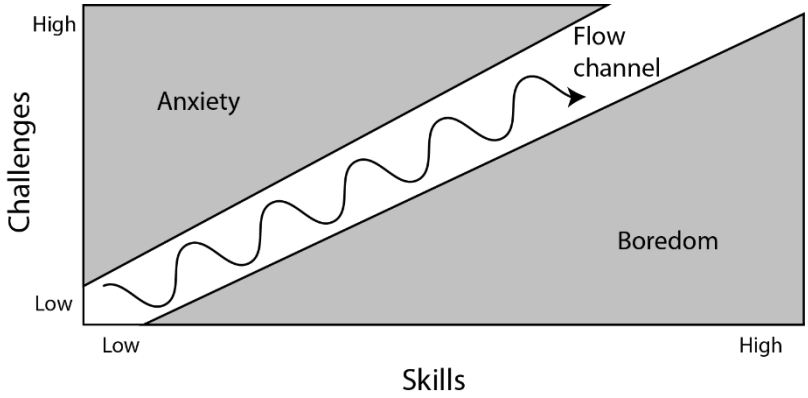


Figure 2: Cyclical progression through flow channel. Whitton 2013, p. 96

Which relates to the next thing which is discussed: if mechanics should only be introduced in the early parts of a game. Koster (2005, p. 40) argues that the fun in games arises out of mastery. "In other words, with games, learning is the drug" (ibid). Following Koster's argument means that the player should continue to learn throughout the game. This does not necessarily mean that new mechanics should be introduced all the way through the game, but maybe let the player learn new ways to use the mechanics. This could be done by new and more advanced version of previous challenges. Another reason to spread the learning out is as not to overwhelm the player. As Extra Credit (2012) advices information and gameplay elements should not be provided until needed. The reason to bring up this discussion is that it should be considered by the designer when developing games and in that way hopefully lead to more fun game experiences for the players.

6.1. Relevance

After having read all of this you are hopefully not asking the question; why this thesis and the toolkit is relevant. But I will answer the question anyway. The toolkit is relevant for people developing games, who wish to increase the chances of their players understanding the mechanics and hopefully

have a pleasant game experience. Koster (2005, p. 140) claims that game designers are evolving game design into a discipline. The expectation for this toolkit is that it can help further the discipline and contribute by considering how to introduce mechanics. The toolkit is a tool that needs further work and will probably never reach a final version as the fields of learning and games are continually evolving. Because of this, the toolkit and field of this thesis are also relevant for people who have an interest in learning in games. The toolkit looks into understanding how games work. The thesis looks into learning, and games, but does not wish to figure out how to teach things for education, only for the game experience.

In my research of how to introduce mechanics few specifics were found to guide a designer. Therefore the toolkit is needed to contribute by giving specifics, which are based on theory and not just based on what have been done before in games or the designer's personal idea of what works.

6.2. Other Types of Games

The toolkit focuses on a specific type of game. For the toolkit to be truly useful it should be expanded to work on different types of games. First of all more research into other genres should be made to expand it. Currently the toolkit mainly works for the specific type of game. However some of the ways to introduce mechanics are general enough that they can be used on other types also. In the sample of games, Portal is included and while the game differs from the others a bit in type, it can still be compared and because of that it can indicate that other types of games can use the toolkit. Games that are mostly linear are easily able to use the toolkit as it is based on mostly linear games. Different types of games will always have some things that might affect which ways are best suited for the type. For example sandbox games have the difficulty that the player can somewhat choose the sequence of missions, which means the player might learn mechanics in a different order. As mentioned research and testing is needed to evolve the toolkit to best include more types of games.

7. Conclusion

This thesis started as a way to research if and how learning theory can help game designers make games, where the player has excellent opportunities to learn and understand the mechanics. The thesis proposes a toolkit, which uses a constructivist approach to learning theory. Using Bruner's Discovery Learning and Ausubel's Advance Organizers, as the more specific theories to focus on as the toolkit was designed. The main question to answer was: *How to create a toolkit, which uses constructivist learning theory as a basis for how to introduce mechanics to players in single player action-adventure games?*

To answer this question a sample of games were analysed to map out how games introduces mechanics. The games are single-player action-adventure games. The sample of games were analysed on the basis of play-throughs, which were recorded and analysed. The analysis examined how the games are similar and different in their ways to introduce mechanics.

The analysis came up with four ways to introduce mechanics:

- Way A: Force the player to use one mechanic as part of game
- Way B: Force the player to use one mechanic as training/tutorial
- Way C: Not force player simply inform of mechanic/controls
- Way D: Not force player, without information about mechanics/controls (no introducing mechanics)

The results of this were compared with the instruction methods of the learning theories. Finally ways for how to introduce mechanics were proposed as part of the toolkit. The toolkit evolved on way A and incorporated way C, while focused on how to use the learning theories to support the best opportunities for learning. Advanced organizers help to make sure the player has the basic information needed to be able to learn and then the game should present scenarios that allow the player to learn via discovery learning.

The main thing the toolkit demands is that the player knows, which mechanics are there and which buttons to press to do the mechanics. To learn the mechanics the toolkit says to create scenarios, where the player can try the mechanics. At first, when introduced to a new mechanic, only have one mechanic at the time and let it be simple. Further in the game have similar scenarios, where the difficulty is slightly higher for each scenario and as other mechanics are introduced, create scenarios where several mechanics have to be used together or in sequence. In this way the game supports the practice the player may need, while slowly increasing the difficulty. It is not necessary to introduce all mechanics in the first section of a game, but introduce them as needed for the gameplay. But

remember to give the player a chance to discover how to use the mechanic. In relation to this it is useful to consider how to support the player. The last point the toolkit gave is that the player does not have to do it right the first time. The game should give some sort of feedback and when the player fails provide feedback so the player can adjust and succeed on their second or third or later try.

The toolkit point to a useful application of advance organizer and discovery learning in games. Using the toolkit can help support the player in learning the mechanics. The toolkit does need testing to be verified. Testing could be done by creating a game that follows the toolkit and then having several people play it. It would be needed to document how the players would learn the mechanics. This could hopefully determine the value of the toolkit. The toolkit also needs to be evolved in order to be used when designing other types of games.

7.1. Further Research

The next step would be testing the toolkit and doing more research into how players learn mechanics and how to make sure the player is entertained while learning the mechanics. As mentioned research with several people playing the games could be used and a larger sample of games could also prove useful. With several different players research could also focus on considering different player styles as well as learning styles. Researching with different players could also look at the differences between players who play a lot of games compared to players who do not. Research into how players learn mechanics might provide a starting ground to consider other learning theories. It could be that other theories are better fitted with the medium of games.

An interesting study would be to look at different types of games and analyse if there are large differences in how mechanics are introduced. This would need a large sample and a good categorisation framework to compare the types.

Finally more research could be done to look at not only how mechanics are introduced but how the players master them throughout the gameplay. This could reweal how gameplay can support practice and the process of going from novice to expert.

As Whitton (2014, p. 38) argues “games are designed to support practice, as players move from level to level. They have a variety of inbuilt ways in which to support learning, such as the use of hints and tips, scaffolding, training levels and progress indications. They provide immediate and relevant feedback on progress to facilitate learning and movement through the game”. Hopefully research can help designers use these methods in the best way to create entertaining experiences for their players.

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List of Videos:

- Dead Space_A
- Dead Space_B
- Dead Space_C
- Dead Space_D
- MGS4_A
- MGS4_B
- MGS4_C
- Mirror’s Edge_A
- Mirror’s Edge_B
- Portal_A
- Portal_B
- Portal_C
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- Star Wars_A
- Star Wars_B
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- Uncharted_A
- Uncharted_B
- Uncharted_C

Link to videos of the play-throughs: http://katjalindskrone.dk/thesis/

Appendix

Contents of Appendix

Appendix A: Template for analysis

GAME: (insert game title)

How controls are introduced

- what controls
- how introduced
- any controls that are not explained

New mechanic is introduced: (reuse for each mechanic looked at)

- which mechanic
- how is it introduced
- controls for mechanic:
- is the player forced to use it when introduced

  (below might not apply to every mechanic)
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

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Goals of the level: (reuse if several different ways are there)

- how presented
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Appendix B: Dead Space Analysis

Notes for Dead Space

starts with a cinematic to give context to the story

first 15 min of C is the same as A and B

Controls are shown as text in projection boxes, these inform of the controls and other simple information about the mechanic which the control belongs to.

Goals for the level are usually said by characters in the game. A pop up enters everytime a new objective is added or an objective is completed. Full descriptions of the objectives are found in the objectives screen.

- locator
- shooting/cutter
- melee
- stasis module

GAME: Dead Space
C, D are from the start again, since missing save after A,B At C:14:53 gets to where B ends
starts with cinematic.
How controls are introduced

- what controls
- how introduced
- any controls that are not explained

A:04:58 C:04:56 basic movement controls: text on screen (stays till player closes the UI) (player has to move a bit before these show up A:09:00 C:08:32 has to run
A:06:01 C:05:48 action button controls + look for blue holograms (voice)
A:07:23 C:06:58 objectives and the locator system, map screen, objective screen
A:10:22 C:09:32 weapon control + voice informs to shoot limbs off for extra damage
A:10:48 C:09:42 melee controls
A:13:45 C:11:36 health bar controls: tells that your health bar is on your back and how to use health packs
A:15:38 C:13:20 map controls
C:16:08 stasis module controls
D:01:57 switches between vertical and horizontal cutting/shooting (never indicated how at this point)
D:03:20 shoots barrel/canister which blows up
D:07:01 upgrade bench: use power nodes to upgrade weapon and rig

---

New mechanic is introduced: Locator

- how is it introduced: text + voice on screen
- controls for mechanic: [B]
- is the player forced to use it when introduced
    - no, but helpful

New mechanic is introduced:weapon/shooting A:10:22 C:09:32

- how is it introduced: as you pickup weapon controls are shown and you are informed to shoot the limbs off of enemies for extra damage
    - around A:11:36 can't open door, no direct hint that you can shoot the control panel (it is however flashing and blinking) A:12:46 tries to shoot the panel and it workes (in C just does it at C:10:19) right after first shooting of enemy
    - C:15:10 friendly npc reminds player to dismember enemies
    - C:15:15 text box about dismemberment
- controls for mechanic: mousebuttons

- is the player forced to use it when introduced
    - not right away. but as it is a survival game so soon after
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
        - shoot limbs off for best results
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: melee C:09:42

- how is it introduced: text on screen + voice says: use melee to knock back an enemy for a quicker escape
    - B:02:24 stomps on crate which opens (not informed of this option by the game)
    - C:18:51 killed enemy mostly by melee
- controls for mechanic: mouse and space
- is the player forced to use it when introduced
    - no
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
        - melee is not that effective
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: stasis module C:16:08

- how is it introduced: picks it up: then text on screen and voice
    - C:16:24 friendly npcs says to use stasis on malfunctioning door
    - C:17:50 friend npc informs stasis can help with arm mechanism (puzzle)
- controls for mechanic:
- is the player forced to use it when introduced
    - yes, has to slow down door to get past
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

---

Goals of the level:

- how presented: box says objective added or objective complete. what the objective is player need to check in menu, or some will be told in cinematics or by npcs. at A:07:24 C:06:58 told how to access objectives screen
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Appendix C: MGS4 Analysis

Notes for MGS4

Controls are either given by a UI button that shows up when near objects, such as items which can be picked up or a wall which one can use as cover. The other way is that the game pauses shortly while a text box, explains about the controls and other information about the object it relates to and thereby the mechanic.

The goals of the levels are given in the cinematics or by npcs telling the protagonist. The map also has an indicator of where to go.

- cover/slide along cover/wall
- shooting
- cameo
- move body
- evasion/alert counter
- solid eye/special googles
- melee moves
- barrel drum

GAME: MGS 4
difficulty options available
starts with cinematic. slightly confused as not totally up to date with the universe
How controls are introduced

- what controls
- how introduced
- any controls that are not explained

A:07:50 from cinematic to gameplay
No information about movement or other controls at first
Voice tells you to get out of there and a bit other guiding
A:09:34 UI picture for how to use cover
B:09:30 encurages to avoid combat when possible
B:32:28 kills myself by explosive barrel.noone hintet it would explode if hit

---

New mechanic is introduced: Cover /slide along wall/cover

- how is it introduced: UI button when near cover
- controls for mechanic: triangle. the UI is shown several times when player gets near cover
- is the player forced to use it when introduced
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
    - player is in cover mode, so just have to leave it
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
    - no but keeps showing the control UI while close to the wall

New mechanic is introduced: weapon/shooting

- how is it introduced: when picking up a weapon: text box, which pauses game
    - B:22:19 sneaking up behind an enemy makes snake say hands up and emeny follow instructions. At B:33:36 shows enemy will lie on floor untill player moves away
    - B:29:00 get the tranqgun and gun with silencer
- controls for mechanic: L1 and R1. triangle to use the sight. how to switch between semi and full auto mode

- is the player forced to use it when introduced
    - not right away (depends a bit on when you find weapon), but can choose not to
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way

New mechanic is introduced: cameo suit
- how is it introduced:
    - seen in cinematic how is blends in first. ca A:15:00
    - B:07:38 text box which explains the mechanic
- controls for mechanic:
- is the player forced to use it when introduced
  (below might not apply to every mechanic)
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: move body B:08:22
- how is it introduced: when near body UI shows controls
- controls for mechanic:
- is the player forced to use it when introduced
  no

New mechanic is introduced: evasion/alert counter
- how is it introduced: when enters combat it starts counting. no further explanations (might be because it is a classic mgs thing)
- controls for mechanic:
- is the player forced to use it when introduced
    - mechanic is not for player directly. it is more something that affects the AI and thereby the player

New mechanic is introduced: special googles/solid eye
- how is it introduced: talked about in cinematic B:28:00
    - B:30:45 text box with information
    - B:35:40 told by voice to use night vision mode. has to but can turn it off
    - B:40:22 runs out of power for night mode
- controls for mechanic:
- is the player forced to use it when introduced
    - it is automatically equipped, but the different modes are up to the player
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: melee moves
- how is it introduced: not sure if introduced at B:40:00 have been used a few times in playthrough.
- controls for mechanic:
- is the player forced to use it when introduced
  does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced:Barrel drum
- how is it introduced: after cinematic: text box C:06:34
- controls for mechanic:
- is the player forced to use it when introduced
    - I do not think so, but makes the level easier

- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

---

Goals of the level: get out of there

- how presented: voice over comms informs you and guides from time to time
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Goals of the level: get to informant

- how presented; told in cinematic and voice over comms
- are there any subgoals?
- any indication of where to go? map point
- of how to get there? follow the map

Appendix D: Mirror's Edge Analysis

Mirror's edge notes

The game starts with a cinematic to shortly explain the world. And then player gets to the training ground

The controls of the game are shown by text on the screen. walking/running and camera is not given.

The goals of the levels are given in the cinematics or by the npc (merc) talking to you. To help a player of where to go a mechanic makes you look to where you need to go. Runner vision indicates where to go to get there safely.

Mechanics:
- flow/momentum
- movement: jumping, crouching and much more
- combat

GAME: Mirror's edge
starts with cinematic to shortly explain the world
hint are off in this playthrough
How controls are introduced
- what controls
- how introduced
- any controls that are not explained

A:01:45 L1 text on screen movement upwards
A:01:52 L2 text on screen movement down
A:01:54 select: open objectives screen
Never told to use analog sticks for camera and movement
A:02:34 Hold Circle to look at goal
A:03:25 R2 get you through red doors
A:03:34 left stick to balance on beam
A:04:22 L1 to jump from the swing to the red pipe ahead. Use left stick to control your movement on the swing and R1 to turn around
A:04:24 right stick to look around while on the pipe. look at the pipe to the left and use L1 to jump
A:04:29 left stick in combination with L1 can also be used to jump left and right between pipes
A:04:40 left stick (hold) to shimmy left or right.
R2 to punch A:07:09

B:11:58 Warning. High voltage no other thing explains that it is dangerous, but very clear if you touch it anyway. and you see rat die from fence: B:12:24
B:15:03 because hints are of I am not told how to interact with elevator.

New mechanic is introduced: Flow/momentum
- how is it introduced: indirectly at first. told speed vaulting builds momentum
  - if game hints had been on some hint about momemtum would have been given
- controls for mechanic:
- is the player forced to use it when introduced
  (below might not apply to every mechanic)
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: Movement: jumping/crouching and much more

- how is it introduced: text on screen says controls A:02:21
  - A:03:09 vaulting (upwards move)
  - A:03:15 wallrun (upwards move)
  - A:03:19 speed vault (upwards move)
  - A:03:44 wallclimb (upwards move)
  - A:04:03 bar swinging (upwards move) and pipe crawling/jumping
  - A:04:40 shimmy
  - A:05:04 combination of moves; wallrun, turn, jump L1,R1,L1
  - A:05:17 ledge walking leftstick
  - A:05:42 zip line (L1 jump to) L2 to dismount A:05:47 try to land on the soft red object below
  - A:06:21 L2 (hold) to coil up
  - A:06:27 L2 (hold) to skill roll when close to ground after a high fall.
  - A:06:39 L1 to use objects as springboards for high jumps
- controls for mechanic: L1 and L2
- is the player forced to use it when introduced
  - yes it is part of the goal
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: combat

- how is it introduced: celeste spars with you
  - R2 to punch A:07:09
  - L2 (hold) R2 to do a low punch A:07:15
  - L1, R2 to jump kick. damage depends on momentum A:07:19
  - A:07:24 L2 (hold), R2 while running to slide kick
  - A:07:37 triangle to disarm hostiles from the back
  - A:07:44 triangle will drop/pick weapon. R2 to fire
  - A:07:51 triangle to perfom frontal disarm when weapon turns red.
  - A:08:05 square enters slow motion when reaction time is available. running generates reaction time
- controls for mechanic:
- is the player forced to use it when introduced
  (below might not apply to every mechanic)
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way
  - No, but is encuraged to avaid fighting or try to only do one on one fighting :A:07:51
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: (reuse for each mechanic looked at)

- which mechanic
- how is it introduced
- controls for mechanic:
- is the player forced to use it when introduced
  (below might not apply to every mechanic)
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

---

Goals of the level: training ground

- how presented: told by voice to get to celeste and then taught to use the objectives screen
- are there any subgoals? learning each basic movement, follow celeste
- any indication of where to go? holding circle makes you look at goal

- of how to get there? Runner vision indicates where to go safely. and you get to see celeste do each thing first

Goals of the level: deliver package it to celeste

- how presented: told by voice
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Goals of the level: get to kate

- how presented: via cinematic and talking
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Appendix E: Portal Analysis

Notes for portal
Game start almost immediately with character waking up in room in some industrial building

The controls of the game are told by text on the screen.
The goal of each level is to solve the puzzle and get out of the room. Usually an arrow points at the exit door.
Each chamber has a sign at the start that says which chamber it is and which elements it contains. This can give a hint to what to consider. or what to look out for.

Mechanics:
- portals
- cubes and buttons
- particle field
- energy ball
- moving platforms
- deadly floors/consequences for failure
- momentum

GAME: Portal
Game start almost immediately with character waking up in room in some industrial building
How controls are introduced
- what controls
- how introduced
- any controls that are not explained

A:01:19 movement: text on screen WASD
A:01:30 jump: text on screen SPACE
A:02:50 pickup object; text on screen E
C:00:43 ctrl to crouch
D:02:33 mouse2 to place the orange portal

New mechanic is introduced: Portals
- how is it introduced: a portal opens, following the voice telling you 'welcome'. the portals are placed so you can see yourself through them, which can help the player understand what the portals do
    - puzzle 01: A:03:50 the orange portal changes what it shows as destination. And player can see/hear that the blue portal moves around to specific locations
    - puzzle 02: A:06:10 blue portal again changes location, this time it is possible for the player to see that it depends on the direction the portalgun is pointing. Here after the player can pick up the gun and control the placement of the blue portals herself. The voice also tells the player that the portalgun makes you able to create your own portals
    - puzzle 03: no new development, just chance to use the portalgun
    - puzzle 04: mixing portals and cubes
    - puzzle 05: with several buttons/cubes
    - B:02:20 need to use portalgun outside an actual chamber, to get past glass
    - puzzle 11: D:00:13: has orange portalgun on rotating platform. which player picks up during the puzzle: voice explains that portalgun can make linked portals. to finish puzzle need to place both orange and blue portals
    - puzzle 13: combining cubes, both portals, moving platforms and energy ball
    - puzzle 14: more advancement with several mechanics
    - puzzle 15: more advancement with momemtum, fields, portals,energy balls, moving platform, time buttons
- controls for mechanic: none
- is the player forced to use it when introduced: to move forward yes.
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way

    - at first the player can only go through the portals that are placed, player has no control over them otherwise
    - after the player can control the blue portal herself, the game only constrains where you can place the portal and that the placement of the orange one affects where placing the blue one makes sense to solve the puzzle.
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
    - no

New mechanic is introduced: cubes and buttons A:02:40

- how is it introduced: player enters the first puzzle chamber, which only has a button, a cube and a locked door connected with the button. player can then walk on button and see that door opens while on it.
    - in puzzle 01 A:03:56 the voice asks you to place the cube on the button
    - puzzle 05: possible for several buttons needed to be activated for one door to open
    - puzzle 11:D:00:31 push buttons introduced which are timed
- controls for mechanic: pickup objects, stand on buttons
- is the player forced to use it when introduced: to solve the puzzle yes.
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
    - The chamber is so simple there only is one solution
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
    - no

New mechanic is introduced: particle field A:03:08

- how is it introduced: voice in game tells you to notice it after first text solved.
    - puzzle 09 ("impossible" test) where the player has to get a cube past the field.
- controls for mechanic:
- is the player forced to use it when introduced: at the point the field does not do anything that the player can use. player is simply informed about it.
  does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
    - not at first
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
    - no

New mechanic is introduced: energy ball B:03:10 puzzle 06

- how is it introduced: enter room where you can see it. Voice tells that it can cause vaporisation. what to do is not explained but since the only new things are the ball and the 'switch' it is up to the player to understand the mechanic. The orange portal is also placed so it is clear you need to get the ball through the portals
    - puzzle 07: slightly more advanced energy ball puzzle (not much)
    - puzzle 08: advanced mix of energy ball, moving platforms, portals and death
- controls for mechanic: None
- is the player forced to use it when introduced
    - yes to solve the puzzle
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
        - the ball has to go to the switch to advance
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
    - no

New mechanic is introduced: platforms that move B:03:44

- how is it introduced: there is a platform and as the energy ball is in the switch it starts moving (with sounds)

    - puzzle 07: B:04:46 understanding that platforms can continually move and therefore be more difficult to land on
- controls for mechanic: none
- is the player forced to use it when introduced
    - yes it is the only way to out of the room
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
        - there is only one way to use a platform
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
    - no

New mechanic is introduced: consequence for failure= death. deadly floor
- how is it introduced: voice tells you
- controls for mechanic: none
- is the player forced to use it when introduced
    - no it should be avoided
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
    - no
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
    - no

New mechanic is introduced: Momentum puzzle 10: C:03:52
- how is it introduced: voice says something, puzzle invovle first a small momemtum jump then a bigger, then voice explains that player clearly understand how portals have no effect on momentum. then two more jumps
    - puzzle 12: D:03:56 place both portals to make jumps, one with tilted wall
- controls for mechanic: none specific
- is the player forced to use it when introduced
    - yes to complete the puzzle
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
    - you have to jump from higher and higher, the puzzle does not give many different possibilities.
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
    - nope

Goals of the level: each chamber is a puzzle, where the player needs to get out the exit
- how presented: an arrow can usually be seen above the exit door.
- are there any subgoals?
- any indication of where to go?
    - the arrow above the exit door.
- of how to get there? each chamber has a sign at the start that says which chamber it is and which elements it contains. This can give a hint to what to consider. or what to look out for.
    - if buttons are in the chamber a dotted line shows what is connects with.

Appendix F: Star Wars Analysis

Notes for star wars

cinematic to start the game with classic star wars scrolling text.

Controls very little information at first. when informed text on screen.

Goals are told by text on the screen and a marker on the map shows where to go.

- force push
- grip
- holocron
- force upgrades
- force lightning
- dash

GAME: star wars force unleashed
different difficulties available
starts with star wars classic floating text to explain context.
First part played as Darth Vader A:03:30 (has next to no instructions, but vader is so strong dying is difficult.
(missing video of vader boss fight (with few QTE) and following cinematic)
(missing maybe 20 minutes between C and D - missing double jump text and force upgrades)
Then as protagonist starkiller. first in training room
How controls are introduced

- what controls
- how introduced
- any controls that are not explained

As vader no information about controls given
A:04:22 text about how to charge force push (hold circle) (first intruction)
A:04:45 just tried buttons and found attack, jump and more
A:09:38 through menu get to control overview. again at C:01:46
B:01:28 Enter the training room
B:01:50 Grip: text on screen to pick up an object press and hold R2
C:01:25 tries most buttons (no new information given)
C:02:25 text on screen: you can blast through doors by using force push (circle)
D: 05:54 QTE to finish off boss
E:02:16: forced lightning
E:02:53 Dash
E:04:37 infuse lightsaber with lightning square then triangle
E:11:15 goes to training room:

force push: text on screen with full details on mechanic
use force push against one opponent, then several (3)
use on environment objects (glass plane, door and tree?)
training room complete
lightsaber flurry technique E:14:10
text on screen/voice
use combo against one opponent, complete
E:15:45 force lightning
text on screen/voice.
use on several opponents
use on specific objects
complete

New mechanic is introduced: Force push (introduced shortly while vader)

- which mechanic

- how is it introduced
    - again at C:02:25 text on screen: you can blast through doors by using force push (circle)
    - but at this point has already been using it in the playthrough
- controls for mechanic:
- is the player forced to use it when introduced
  (below might not apply to every mechanic)
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: Grip (training room) B:01:50

- how is it introduced: in training room
- controls for mechanic: press and hold R2
    - B:01:58 move left stick to move the object in the air
    - B:02:11 move right stick to move object in the air (up,down)
    - B:02:30 use grip as you just learned to smash glass panels
    - B:02:45 use grip to knock over stormtroopers with object by throwing the object
    - C:03:40 use grip to open door. only instruction is to find a way to open door and sees it has grip target
    - C:07:29 refresh of grip controls
    - E:03:00 lift heavy objects out of toxic sludge
- is the player forced to use it when introduced
  Yes
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
    - have to do each thing learned to move on to the next one
    - text stays till succeeded

New mechanic is introduced: holocron (sith and jedi)

- which mechanic
- how is it introduced: player picks up and then text on screen
- controls for mechanic:
- is the player forced to use it when introduced
  (below might not apply to every mechanic)
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: force upgrades D:00:25

- how is it introduced. text on screen at end C, tells you have leveled up
- controls for mechanic: told by text when in the menu, which is accessed by pressing select. New moves are then unlocked and text explains how to use them
- is the player forced to use it when introduced: no

New mechanic is introduced: Force lightning E:02:16

- how is it introduced: text on screen
- controls for mechanic: triangle
- is the player forced to use it when introduced
    - shortly after: have to use on objects to move forward

New mechanic is introduced: Dash E:02:53

- how is it introduced: text on screen
- controls for mechanic: L1

- is the player forced to use it when introduced
  (below might not apply to every mechanic)
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

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Goals of the level: As vader

- how presented: map has an arrow which points to the direction the goal is in
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Goals of the level: as starkiller C:06:17

- how presented: text on screen
- are there any subgoals? the level has an overall mission (kill someone)
  - but then there are sub goals for reaching different parts of the level
- any indication of where to go? marker on map
- of how to get there? sometimes the pilot will inform you of things (such as there is a lift nearby)

Appendix G: Tomb Raider Analysis

Notes of Tomb Raider:

Tomb Raider starts with a cinematic that explains how Lara Croft stranded on the Island. The cinematic ends by a seamless shift over to gameplay.

The controls of the game are generally explained by a text box on the screen, sometimes accompanied by pictures. The game does not explicitly tell how to walk, but the first interaction the player does does however show that moving the left stick moves Lara.

Generally goal of the levels are given by the objective being shown on the screen as text. The first objectives are fairly strait forward, atleast when the player has to figure out where to go

The mechanics

- set stuff on fire

The very first mechanic the player gets to do is to set stuff on fire. (A:05:07) The only way to move forward in the game is to set fire to stuff and the player is forced to use the mechanic. The player has limited options at the time to do anything else. And this way of setting stuff on fire is not the most common one, but the mechanic is a core mechanic as the player has to do it many times over the course of the game, in different ways.

Torches and flammable objects are items not mechanics, but both are part of the set stuff on fire mechanic. In most cases a torch and a flammable object are both needed to use the mechanic.

  - Forced to use: yes
  - UI show how to move, no specific telling of what to do. A hint by Lara fidgeting and fire never dying out and after the other cocoon burned.
  - Torches are introduced: as lara comes near it she says: a torch and UI shows which button to press to pick it up A:07:55.
  - Flammable objects: as lara comes near, text on screen tell the player that white cloth can be lit A:07:44

- Quick time events

In this analysis the Quick Time Events which are in the game. The events all differ somewhat but are basically the same mechanic: push button in time to make Lara act. The button(s) are shown on the screen. If the player fails to do as the UI shows, either Lara doesn't get out of the event or in most cases she dies.

  - Forced to use: yes
  - UI shows what to do and repeats the event until player gets it right.

- Survival Instinct

Survival Instinct is a mechanic that helps the player know what can be interacted with and where the objective beacon is. The mechanic is introduced by a text box on the screen. This mechanic is not something the game forces the player to use, it is entirely possible to move forward in the game without it.

  - Forced to use: No

- Jumping and climbing ledges (compound mechanic)

Jumping and climbing ledges is a compound mechanic (evt call it platforming). The player as to jump and climb to move forward in the game. The compound mechanic is expanded upon a bit later in the game, where the player has to use several of the mechanics to get further.

  - Forced to use: yes
  - Text on screen shows when near the ledge

- Camps (skills/weapon upgrading + fast travel)
- Shooting

The shooting mechanic is introduced by Lara getting a bow and having to collect meat to survive. The mechanic is introduced via text boxes on the screen. This mechanic is later expanded upon by different weapons and more advanced options for the bow, such as silent kills, charged shots and ability to distract.

  - Forced to use: yes

- Pry axe (open things)

The mechanic is used to open doors or chests. The mechanic is introduced by a locked door, when getting to it the player has either found the pry axe or is told they need gear to open the door. The player has to open the door to move forward.

  - Forced to use: yes
  - Intructions stay on screen while near the door

- Combat moves (melee)

I have collected a few mechanics under the common title of combat moves. The underlying mechanics are all stand-alone ones that in no way has to be used. They are however all part of melee combat. The two mechanics encountered are scramble and stealth kill. Both are introduced by a text box with a picture on the screen. Neither mechanic is something the player has to use, but it makes the game easier and is fairly hard to get further without using them.

  - Forced to use: no (but helps)
  - scramble: the text is shown several times on the screen while the wolves attack, but otherwise not

- Cover

Cover is a mechanic which is contextual as there needs to be something to take cover behind to use the mechanic. The first time the mechanic is introduced, the player has to use it as Lara at the time has no weapons and need to escape.

  - Forced to use: yes
  - The player has to hide to not be seen by the guard, if not you lose/die. So has to avoid the guards. but there is a few ways to get there, but it is mostly just differences in timing

GAME: Tomb Raider (2013)

Game starts with cinematic of the shipwreak and stranding on the island, up till hanging in the cave. Slides over into gameplay mostly seamlessly
How controls are introduced

- what controls and how introduced
- any controls that are not explained

A:03:10 there is in menu overview of controls
A:05:07: Movement with left analog stick. UI overlay with analog stick shown, with arrows and movement to indicate how to move. (this is for the start where lara is hung upside down.)
A:06:55: how to move/walk is not explained
A:08:49: how to jump and grab ledges: text on screen: press x to jump and grab onto ledges
A:12:02: push/interact with object: UI picture and button on screen
C:00:20: press square to collect ammo
C:10:10: press circle to drop down (here to and from a ladder) text on screen
D:06:42 scramble: L stick + circle to dodge enemy attacks

New mechanic is introduced: affect environment with fire from A:05:07-06:20

- how is it introduced
  - Only way to get down from hanging in the cave
- controls for mechanic: no specific ones for this at the time.
- is the player forced to use it when introduced: yes
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way:
  - Player has to get the rope to burn to get down. by sending the corpse into the fire some cloth is lit and player has to swing lara into it to get the rope to burn and get down.
- if a player does not use the right mechanic is the player then made aware of which mechanic to use: Not specifically, but Lara starts to fidget and thereby hint to get her to move and the fire never dies out.

New mechanic is introduced: Torches (is an object for the set stuff on fire mechanic

- how is it introduced: as lara comes near it she says: a torch and UI shows which button to press to pick it up A:07:55
- controls for mechanic: square button to pick up.
  - Stow torch: hold circle to extinguish torch C:14:12
- is the player forced to use it when introduced: yes

does the game 'force' the player to use mechanics in a certain way,

- if yes is the player told in which way: player has to pick up torch to move forward, cannot lit cloth on fire without it
- if a player does not use the right mechanic is the player then made aware of which mechanic to use: not specifically but the area is fairly small and information about the torch and the cloth(see below) are the only interactable items

New mechanic is introduced: flammable objects
- how is it introduced: as lara comes near, text on screen tell the player that white cloth can be lit A:07:44
- controls for mechanic: when having a torch on screen text tell player to hold square to use the torch
- is the player forced to use it when introduced: yes
  does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way: player has to lit cloth to move forward
- if a player does not use the right mechanic is the player then made aware of which mechanic to use: it just keeps showing the control information while near.
- D:05:37 burning bundles for salvage(the square button is shown if torch is carried)
- D:27:32 text on screen: glass lanterns, can be shot to create fire

New mechanic is introduced: quick time event (here pulling spike out of side)
- which mechanic: quick time event (button press to do something)
- how is it introduced: UI showing button being pressed. A:06:40
- controls for mechanic: specific button shown on screen
- is the player forced to use it when introduced: yes overwise the qtc doesn't end and you can't move forward.
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way: see above
- if a player does not use the right mechanic is the player then made aware of which mechanic to use: UI continues to shown the button to press. In other QTE lara dies if the player fails to follow the controls shown on screen (eg A:14:30)

New mechanic is introduced: Survival instinct (shows interactable objects and objective beacons)
- how is it introduced: A:08:39 text on screen
- controls for mechanic: L2, press L2 to examine the environment
- is the player forced to use it when introduced: NO, but it helps

New mechanic is introduced: Jumping and climbing ledges
- how is it introduced: text on screen
- controls for mechanic: x to jump
- is the player forced to use it when introduced.
  - yes cannot move forward without doing it
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way
    Player have to crawl up on a ledge to get further in the game.
- if a player does not use the right mechanic is the player then made aware of which mechanic to use: no it just displays the how to jump text every time player is near and the room is otherwise a dead end

at A:20:18 this mechanic is then expanded upon: grabbing when only have one hand on ledge, jumping from ledge to ledge. player has to do the different moves to get past the area and move further (crawling on aeroplane). Wall scramble text on screen at A:21:27 (text only shown once)

New mechanic is introduced: Camps and skills/weapon upgrading + fast travel
- how is it introduced: text on screen about new camp discovered after cinematic A:28:00.
  - C:05:55 as player returns to camp text box explains about skill points, when entering the camp menu
  - D:09:10 quest to upgrade pry axe

    - D:24:15 fast travel is unlocked as player camps
- controls for mechanic: press square near a camp fire to camp.
- is the player forced to use it when introduced,
    - No.
    - have to upgrade to continue D:09:49

  does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
        - there is only one way to use the upgrading
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: Shooting (bow)

- how is it introduced: C:01:59 after collecting the bow. text on screen tells controls
    - D:17:28 Lara gets a gun, but same controls as bow
    - D:21:25 **silent kill**: player is informed by text + picture that bows can be used for silent kills. Player is no forced to use it
    - D:21:55 **charged shot**: text on screen explains charged shots by bow, which does extra damage (again not forced to use them)
    - D:26:06 **distract:** text on screen to explain that shooting arrows at walls near enemies distract them. (not forced to use)
- controls for mechanic: hold L1 to draw the bow then hold and release R1 to shoot
- is the player forced to use it when introduced. yes it is the only way to complete the current goal (hunt deer)
- does the game 'force' the player to use mechanics in a certain way. No, but player has to shoot deer to collect meat. and D:01:47 player can only shoot the wolves while in the beartrap or die, which is the second time the player has to use the bow/shooting
    - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: pry axe

- how is it introduced: depending on the player either told you are missing gear or simply find the axe
- controls for mechanic: text on screen, when near door: tap square repeatedly to pry
- is the player forced to use it when introduced: yes it is the only way forward
- does the game 'force' the player to use mechanics in a certain way, at the time there is only one way to use the mechanics and it has to be this way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use. instructions stay on screen while near door

New mechanic is introduced: Combat moves

- how is it introduced:
    - **scramble** is introduced by text on screen + picture: D:06:42
    - **stealth kill:** text + picture on screen: pressing triangle D:28:07 (best way but not forced to use)
- controls for mechanic: L stick + circle
- is the player forced to use it when introduced:
    - scramble: sort of, the player can survive without it, but several opportunities to do it is presented by the attacking wolves
- does the game 'force' the player to use mechanics in a certain way,
    - scramble: no
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
    - scramble: the text is shown several times on the screen while the wolves attack, but otherwise not

New mechanic is introduced: Cover D:12:28

- how is it introduced: text + picture on screen
- controls for mechanic:
- is the player forced to use it when introduced

    - yes the only way to move on is to take cover and stealthily get past the guards, (lara's hands are tied at the moment)
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way: The player has to hide to not be seen by the guard, if not you lose/die. So has to avoid the guards. but there is a few ways to get there, but it is mostly just differences in timing
- if a player does not use the right mechanic is the player then made aware of which mechanic to use: no

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Goals of the level: find a way out
- how presented: text on screen A:10:28
- are there any subgoals? not specifically said
- any indication of where to go? if using the survival instinct a direction is shown with the objective beacon.
- of how to get there?
    - Lara does start talking when near items of note

Goals of the level: search for traces of other survivors A:18:57
- how presented: text on screen
- are there any subgoals?
- any indication of where to go? no (other than survival instinct)
- of how to get there? there is only one way to go in the level

Goals of the level: Follow the survivors' trail
- how presented: text on screen
- are there any subgoals?
- any indication of where to go? the environment has their trail and there is only one way to go in the level
- of how to get there?

Goals of the level: Take shelter from the storm A:22:42
- how presented: text on screen
- are there any subgoals?
- any indication of where to go? only one way in level
- of how to get there?

Goals of the level: search for food A:27:58
- how presented: text on screen
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Goals of the level: find a weapon to hunt deer C:00:19
- how presented: text on screen
- are there any subgoals?
- any indication of where to go? Lara talks about a bow just before the goal is given, which gives a clue to where to go. If not going for the bow lara starts talking about how she needs a weapon
- of how to get there?

Goals of the level: collect meat from the deer C:02:05
- how presented: text on screen
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Goals of the level: return to camp with the meat C:04:16

- how presented: text on screen
- are there any subgoals?
- any indication of where to go? it remind the player of how to used survival instincts which shows the direction to go
- of how to get there?

Goals of the level: meet up with the others C:07:00

- how presented: during cinematic it is told
- are there any subgoals?
- any indication of where to go? music is playing and Lara keeps talking about it
- of how to get there?

Goals of the level: catch up with whitman D:05:15

- how presented: text on screen
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Goals of the level: follow dr. whitman up the mountain D:10:25

- how presented: text on screen
- are there any subgoals?
- any indication of where to go? only really one way to follow
- of how to get there?

Goals of the level: continue up the mountain to regroup with roth D:22:37

- how presented: text on screen
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Appendix H: Uncharted Analysis

Notes for Uncharted

Urcharted starts with a cinematic to set up the context and then switches to gameplay.
Controls for the game is generally explained by text on screen. The controls for movement/walking and the camera is not at anytime explained.
Goals for the game a generally told by the cinematics or the NPC's and drake having conversations. The first levels are fairly linier with the characters talking when near something of interest.
mechanic

- Shooting

The first mechanic introduced in uncharted is shooting. The text on the screen explains the controls and then the player has to shoot enemies.
forced to use: yes

- cover

forced to use no

- melee combo
- platforming
- explosive barrels and fire lamps
- puzzles

GAME: Uncharted

In many cases characters will start talking to hint at what to do, if player does not do as needed to progress
How controls are introduced

- how introduced
- any controls that are not explained

Shooting: text on screen A:03:11 Press L1 to aim, press R1 to shoot
Cover: text on screen A:03:24 Press circle to take cover when next to an object
Pick up object: UI button on screen: A:03:27
Look at: UI button L2: A:05:26
Jump: text on screen B:01:07 press x to jump
Climb ledge: B:03:14 press x to climb up onto a ledge
drop down: B:04:34 press circle above an edge to drop down and grab it
edge to edge jump: B:04:43 push analog left and press x to jump from edge to edge (text)
B:05:02 push analog away from wall and press x to jump to the opposite edge (text)
interact with object: UI Button B:05:15
look in journal: B:09:08 UI image: Select
Swim: press analog in the direction you want to swim C:00:10 (text)
swinging vine: Move analog from side to side to swing on a vine (text) C:00:46
change weapons: C:16:26 pres D-pad to change weapons (text)
hanging shot: C;16:38 while hanging, press L1 to aim, press R1 to shoot (text)
C:18:17 press analog forward and x or circle to run around cover
C:18:53 press R2 to reload
C:19:07 press forward and x to vault over cover

New mechanic is introduced: shooting A:03:14

- how is it introduced: text on screen
  - c:16:38 shooting while hanging from ledge introduced
  - C:18:53 press R2 to reload
- controls for mechanic: L1 and R1
- is the player forced to use it when introduced
  - yes
- does the game ‘force’ the player to use mechanics in a certain way,
  - if yes is the player told in which way
  - no
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: Cover A:03:24

- how is it introduced: text on screen
  - C:18:17 (text) about running around cover
  - C:19:07 press forward and x to vault over cover
- controls for mechanic: circle next to object
- is the player forced to use it when introduced
  - no
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: Melee comboes A:03:55

- how is it introduced
  - A:03:55 text on screen: press 5x square for a fast and furious combo
  - A:04:20 text on screen: press square, triangle, square for a brutal combo
- controls for mechanic:
- is the player forced to use it when introduced
  - do not think so
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way
  - the brutal combo enters a slowed down mode so the player can hit the button in correct sequence
- if a player does not use the right mechanic is the player then made aware of which mechanic to use

New mechanic is introduced: compound mechanic: platforming

- which mechanic: jump, climb ledge, drop down, jump edge to edge, vine swings
- how is it introduced: text on screen for each mechanic. and then areas where you get to do each one at a time before adding the next one
  - B:12:00 another area with platforming, without anyhelp
- controls for mechanic:
- is the player forced to use it when introduced
  - yes to move forward in game
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
  - keeps showing the controls while in the place till player moves on

New mechanic is introduced: explosive barrels and fire lamps

- how is it introduced: the only way to get further is to realise you can shoot the barrel.
  - one hint is the how to shoot text is shown again
  - characters start talking about it (lamp) if player take too long to do thing
  - there are several times where sully will start talking to hint at what to do, and get more specific the longer you wait
- controls for mechanic:
- is the player forced to use it when introduced
  - yes
- does the game 'force' the player to use mechanics in a certain way,
  - if yes is the player told in which way
  -
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
  - not imediately (possible the characters will start hinting)

New mechanic is introduced: puzzles (compound mechanics) B:16:00 the four buttons puzzle for door in floor

- how is it introduced: UI to look in journal, then there is a puzzle
- controls for mechanic:

- is the player forced to use it when introduced
    - yes
- does the game 'force' the player to use mechanics in a certain way,
    - if yes is the player told in which way
    - it is a puzzle with only one solution
- if a player does not use the right mechanic is the player then made aware of which mechanic to use
    - no it just tells you wrong one (Drake says it) and resets the puzzle

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Goals of the level: The search for el dorado B:00:00

- how presented: not specifically: mostly through conversation of the characters.
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Goals of the level: C:00:00 A surprising find

- how presented: cinematic and talks between the characters
- are there any subgoals?
- any indication of where to go?
- of how to get there?

Appendix I: Comparison Table

Tomb raider:	**Uncharted**	**Mirror's edge**	**Dead space**	**Star wars**	**MGS4**	**Portal**
controls usually by text box. (mechanic might also be explained) possible picture also	Controls text on screen or UI button	Controls text on screen	Control: text on screen	Controls: text on screen	Controls: text or UI button	Controls: text on screen
forces into situations where player have to use a mechanic which is introduced	mechanic introduced, player uses mechanic and then next mechanic introduced.	Introduce mechanic then force player to do it.	Introduces mechanics one by one.	First level not protagonist and almost no information about controls or mechanics	Mechanics explained by text box.	Mechanics introduced one by one
mechanics introduced then player do mechanic, succeeds and get further then new mechanic	First levels focuses on certain mechanics	First level is explicitly said to be training.	Not forced to use mechanics (but often helpful to use)	Training room: forced to use mechanic as instructed (only forced there at start afterwards player chooses)	Not forced to use, player needs to discover the mechanics by themselves.	Player needs to figure out how to use mechanics to solve the puzzles
		(runner's vision and momemtum)	Shooting and stasis hard to not use	Mechanics introduced by text (can be used before if unlocked) often helpful to use that shortly after	Mechanics are often tied to a object and the text box comes as player picks put the object.	Each puzzle introduced a mechanic or a new mix of mechanics
			Information by text box, further might be given by npcs			