An Anatomy of Games

A discussion paper

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WHAT THIS PAPER IS AND ISN'T ABOUT

There is a current interest in the value of computer games for education (see Prensky 2001); Gee 2003; Kirriemuir and MacFarlane 2004). This results in really important questions about computer games and learning theory, motivation, pedagogic practice - how people might learn from games and how they might be used in practices. This paper will not explore these issues. The paper starts from an implicit notion that games are good for humans because they have been sustained as a human activity for a long, long time, and that the introduction of computer mediated games has not materially altered an almost implicit human activity in some form of structured play. In fact this article will not specifically distinguish computer games as a particularly special case.

This paper is intended to describe the components from which games are constructed. It is prompted in the first instance by the development at Futurelab of new formats of games, and the need for advice and guidance for designing and constructing games by considering some of the affordances of previous games. This paper is based on what one finds when one begins to dissect games. The paper does not describe how games work as such in a way that the work of Juul (2003) or Crawford (1982) provide. The descriptions they valuably provide are more systemic - more in the nature of the physiology rather than the anatomy of games. The paper draws no distinction between recent concerns in the study of games between game play or what has been termed ludology and the narrative or fantasy elements of computer games (see Andrews 2004). These factors are treated similarly in the anatomy as (potential) parts of describing what games consist of. The paper also makes no attempt to describe motivation to play games, or what or why people may gain from engaging in games as described in the work of Gee (2003). The review does not constrain itself to computer games in that new formats can draw on elements that have been previously in board games, field games or card games and so on. The paper does not discuss simulation in any depth, however, many complex and rich games are some form of simulation.

There are also new emerging formats of games that we would want to address. Games using augmented reality form some new categorisation - games in which there is an element of field play where the reality of the field is augmented by the use of mobile, wearable computers that collect and deliver information about players' locations and information appropriate to their location in the game field. This has currently been implemented in the educational game Savannah, where students role play as a pride of lions on a field that has overlaid information about a virtual African environment. It is as a contribution to what we can make in these new formats that this dissection has been made.

AN ANATOMY

Anatomy is a study that arises from dissection. The anatomy is presented at this stage as an experimental tool - it is anticipated that it will facilitate design as it is explored and refined. It is based on six top-level categories of game components: game aims; game location; game pieces/players; the means of making progress in the game; game language; and the time frames of games. These are described in detail below with reference to some popular games and sports. It will be rapidly apparent to the reader that most games have multiple attributes (for instance below Risk will be described as both *battling* and *space occupying*).

EM Avedon's article 'The Structural Elements of Games' (Avedon and Sutton-Smith 1981) suggests the following elements:

- purpose of the game
- procedure for action

- rules governing action
- number of required participants
- roles of participants
- results or pay-off
- abilities and skills required for action
- interaction patterns
- physical setting and environmental requirements
- required equipment.

This classification system does not quite map onto the full set of items that are developed in the anatomy below. This classification system, although useful, does not easily map onto the work in progress at Futurelab, which will seek to develop an analysis of game activity that draws on activity systems (see Engestrom and Cole 1983), and which will need an understanding of issues like the mediation system, the goals, the rules, the community, and the division of labour. This analysis will need to be addressed in two ways, firstly those that are intrinsic to the game and derived from a game as it has been historically constructed, and also the actual activity of the game when there is an instance of game play and the ways that the historic mediation system presented by the game results in actual activity by players. Juul makes a strong case for understanding that in the case of poker, there is a set of rules - or in my terms the activity system of the game as it was historically constructed - and the actual playing of the game of poker where the activity system "revolves a lot around interpreting the signals of the other players" (Juul 2000).

Juul is critical of approaches that categorise. He questions that such analysis reveals the interaction patterns from the role of the participants, the equipment or pay-off. Juul notes "the impulse towards categorization is matched by an equally strong urge to deconstruct categories" and that weakness of current research that adopts categorisation as its methodology because "every self-respecting game magazine or website is doing the same". However this presupposes that all categorisations are uniformly useless or useful. The purpose of anatomy and dissection here is not to create a taxonomy - although that may be a side effect - but to create a parts list that identifies some key features. There is no intention to draw up a table that can be used to put particular games in their rightful places in a scheme of the world - the utility of this exercise is questionable.

Parts list may be the inappropriate title in the same way as tool or cultural artifact is often counterintuitive when looking at activity systems in general. In this parts list it is just as possible to include a description of game aim as it is to describe a form of game equipment.

ANATOMICAL GAME AIMS

Game aims are the area in which debates around the nature of differences between game play and narrative emerge. In this anatomy the cases of the protagonists are inappropriate - it is recognised that in many games a strong fantasy and/or narrative are important and that in all games there is also a set of objectives that give rise to the nature of the game activity - the gameplay. In the descriptions below, fantasies and narratives are described as the aims of proponents. Fantasies could also be described by opponents who are trying to defend and avoid the proponents' actions or succeed in the same aim before the proponent.

Fantasies and narrative

Battling: the notion of overcoming an enemy in games has long been a source of mock-battling - jousting and tournaments, chess, Risk and many field team games.

Building: constructing an edifice or object. Beetle drives and hangman are primitive versions of this activity (although in hangman the actual aim is not to build). Modern games on computers like SimCity and Populus have construction as the main game aim. In the popular game Tetris progress is made by fitting shapes together to build lines. The board game Scoop involves building the front page of a newspaper page. Some games like Risk involve building by the occupation of space, which is building in the horizontal direction (as well as battling).

Destroying: destroying is the mirror image of construction. Instead of being rewarded with a piece to construct the object is to take pieces away. This is represented in a number of ways: early computer games based themselves around shooting small characters - thus eliminating them from the game - like Space Invaders. Other early games involved knocking walls down, brick by brick etc (eg Arcadians). Draughts and a number of similar simple board games are also about the removal of opposing pieces.

Journeying: getting to a particular location is an important game aim. Ludo and snakes and ladders are examples. This paradigm is typical of many quest games.

Racing: in addition to getting to a location, in many games the narrative is shared by competing with others to arrive at the destination first. All sports games involving a journey are of this sort, from the 50m dash to triathlons. Most games in this format are based on steps forward - although some games (eg darts) are based on counting downwards.

Hunting, catching or trapping: some games are based on catching or trapping opponents or opponents players. Simple examples include ludo, the Japanese game GO and backgammon. There are a number of hide-and-seek games in the form of battle simulations which have the catching/trapping fantasy as part of the game.

Placing: many games involve the placing of objects in specific places - almost every game involving a ball comes into this category. Getting things into the right locations (eg missions in flight simulators) is often about dynamic placing. However some quests and narrative stories are based on the concept of finding items and placing them in particular locations as the motive and progress making within the game.

Collecting: many stories and fantasies are based on the notion of collecting objects or sets of objects (maybe money, property and houses as in Monopoly, or gold coins as in Sonic the Hedgehog). Collecting has its inverse in that some games require the winner to be the first to discard all of a collection (some card games and dominoes).

Simulation: in addition to the typical games described above many games are also simulations of events - this includes many computer games and board games like Monopoly. A fuller description of simulation is beyond the direct purpose of this paper.

Objectives

Alongside the fantasy, the aim of a game is to fulfill some aspects of gaming in itself and the pleasure of engagement. This is often in the form of displaying players' abilities: specific physical prowess - as in sport - where strength, accuracy and muscular control are significant; quickness in thinking - in being able to think more quickly, wisely or wittily than the opponent.

There are a number of specific aspects of game play. These can often be described in mathematical terms belonging to set theory. We have to create equalities or inequalities (greater than, less than), find or collect other members of defined sets, match on the

intersection of sets (if a Queen of Hearts is in play, the next card played must be another Queen or another Heart), or there needs to be a specific sequence or series developed (number and word games). These games have many criteria for scoring:

Collecting: having the most or a given amount of something - this may be points, cash or sets of objects. In Sonic rings are collected, for instance.

Forming sequences: in some collection games specific sequences (numeric or word/concept chains) are needed to win. In a number of card games a sequence that adds to (say) 21 is required. In many word games forming a sequence that makes semantic or syntactic sense is needed - like in Scrabble.

Matching: many games are predicated upon matching an attribute of a previous player's (or own) move: dominoes, bridge, patience. Pelmanism is the simplest. Construction games often require the right shape to be placed to continue the construction. There is also the notion of non-matching, such as finding something with a different value in order to score (especially values greater than).

Placing: as already stated, all ball games and their simulation require placing of the ball in a particular location. There are other aiming games like Tetris and Snake that also require the careful placing of pieces to make a score.

Trading: sometimes game artifacts have greater value to some players than others finding, thus an element of game scoring is accomplished by finding and trading game artifacts. Happy Families, Monopoly, Elite and Animal Crossing have these elements.

Creating sets: a significant part of card games is the creation of a set or the winning of a set - bridge and gin rummy are particular examples. However there are a number of games where there is a need to have a complete set of attributes to succeed - in SimCity or similar games (ThemeParkManager) a necessary set of attributes is required for the simulation to continue positively. In Monopoly and Risk there is a need to create sets.

In many games however it is actually limiting one's opponent that is required. This requires players to exceed the opponent's physical or mental prowess; this can be achieved by being faster, more accurate, blocking the opponent or straightforward removal of opponent from a game. Most games involve more than one. In cricket speed and accuracy are required. Play can be made by blocking (both in batting and fielding) - and the removal of the opponent from the field is an important part of game progress. Specifically:

Faster: racing games are the obvious example, although many activities may be performed against a clock or at an increasing pace (many games change the pace as the player becomes more expert, eg Tetris).

More accurate: games that require placing depend on accuracy - ball games and shooting/aiming games.

Blocking: in some games the placing of objects that block the opponent's progress is a significant part of game play - in American football different players are used at different points in game play. In chess success is achieved by making it impossible for the King to move, however a lot of play is also concerned with preventing opponents from occupying specific space.

Removing opponents from game: the notion of 'taking' is important in game play - particularly in battle scenarios like war-based simulations and chess. Depleting an opponent's reserves - in many games there are health points or lives that deplete until the player is removed from the game.

PIECES

The notion of a piece is intended to include everything from a simple counter or a human team member. It is the item that is engaged in the game narrative or scenario - thus it can be a proxy item like an avatar, or an identifiable token (eg the smoothing iron in Monopoly), or it may be a human participant.

The deployment of pieces can be as solo efforts - as in golf (one person and one token - ball - per side) or snakes and ladders, or in other games the pieces may be multiple (52 cards in a pack distributed in groups of 13 as in bridge), or they may be in teams - like chess or draughts/chequers pieces.

Teams form very interesting cases. There are two dichotomies in considering teams in games: uniform and differentiated pieces; and singular or distributed control.

In some team or multiplayer games the players/pieces in the team all have a uniform ability: chequers/draughts pieces all have the same kind of move capability and function in a game. In some sports such as doubles match-play in golf, all players have the same instruments and goals. Sometimes a sense of uniformity is enforced on pieces to ensure fair competition - the engine capacity in motor racing, weight classification in boxing and so on - however other things are left to other factors. In some cases there are attempts to impose uniformity as in handicapping in horse racing. Imposing a handicap on some features determines what other differences are to be tested.

In many games players are differentiated. This differentiation can be a result of application of a rule, the piece's prowess or the strategy employed. Rules differentiate behaviour in a number of ways. Different chess pieces are allowed to move in only specified ways. In soccer, only the goal keeper is allowed to use his hands in game play.

The prowess of a piece can either be fixed or acquired. Prowess in sports is a function of physical and cognitive ability that has different distribution for different sports. Height is a clear advantage in basketball, fine motor control over arm and hand is an advantage in small-bore pistol shooting. Less used letters like 'X' or 'Z' carry higher scoring values in English versions of Scrabble. These factors are usually fixed for any given 'play' of the game although clearly performance can be improved. Sometimes prowess is randomly distributed at the start of the game - for instance as part of the random deal of cards in most card games.

In many games prowess is acquired during gameplay. The better you play the game, the more capability is given to you. The more resources acquired during the play of Monopoly, the better the gameplay position of the player to acquire more resources. In many computer games, as the game progresses more information about the game is revealed to the player by the gameplay. Objects are found, giving the player more power such as weaponry in many battle games or health, stamina or lives in many games. In addition to being found these increased elements of game prowess are a reward for gameplay, eg 'queening a pawn' in chess. In some games there are specific features that may temporarily increase the prowess of a given player - these are known as power-ups. Power-ups may give temporary immunity, increased strength, invisibility or whatever other factor may make gameplay either easier or more effective.

The increase in prowess per se is a very important element in many games. In sport it is a major motivational and success factor, and in many computer games it is the revelatory process - a player acquiring more power or knowledge is in fact both the gameplay and its narrative theme (eg Anarchy Online).

The other major issue about player/pieces arising in team or multiplayer games is the autonomy and collaboration of players. In some games there is a clear rationale of division of labour. In most field sports there is a notion of defence, offence and maybe some territorial assignment of responsibility (eg the left back in soccer or silly-mid-off in cricket). Different

forms of prowess are needed for different tasks within a game. Games requiring quiz knowledge may be made up of teams of different expertise. In some games there are specific roles but they become interchangeable among players for tactical reasons (eg team pursuit cycling where lead position is shared). In field games communication and collaboration is a function of team building, team practice and team experience. The players know their roles and just as importantly they know the roles of other players - this may be developed over time. In the actual gameplay itself there may be short-term tactical communication between players. In other games the division of labour might be quite arbitrary. In some games there may be restrictions on communication between players on the same side during game play. In some cases - such as contract bridge - the art of determining partner's knowledge, strength and intentions from minimal clues is in effect a significant part of the gameplay. In these cases knowledge of the complex clues is knowing the game. In some games the gameplay is not directly effected by the presence of other players at all - there is little game play interaction - in golf or running in races where there is strongly enforced lane discipline for example (although I suspect there may be strong motivational factors which are beyond this analysis).

In some games there are other important pieces: the referees. Normally a referee is a non-playing participant whose function is to ensure that the rules of the game are observed. In some games the referee is also a nominated player (eg the Banker in Monopoly). In many computer games the program itself functions as referee and programming sets the limits on player action - including cheating (see below).

LOCATION

In many games the location, and the design of the location, is an important component. Games can take place in real spaces, virtual spaces and some games do not involve any particular space at all. Spaces are marked to imbue new meaning to the space relative to the needs of the game.

In real spaces the spaces may be bound, unbound or augmented. Typically bound spaces are used in field sports where placing is important - location of goal areas (nets, baskets or holes) and the starting positions of players are significant. There are in the main two specific types of bound space: a delineated grid like a football pitch or tennis court, and tracks. The spaces may also be marked in other ways to mark off limits of play. These may be absolute - beyond which the game cannot take place (the limits of a court or green) and/or internal to the game - the location and purpose of the net in tennis-like games or the penalty box in field hockey - this limits an area from which goals can be scored. Forcing the gameplay to be out of bounds can be a significant part of gameplay - especially in tennis-like games. Position and positioning in relationship to the bounds is important in many track-based sports. The game space is intrinsic to the notion of success or failure in the objective of the game and constitutes a significant part of the rules system. In some games players are relatively static, but their position is significant - as in contract bridge.

Some games take place in unbounded space. Games involving hunting in general take place in less bound spaces. This lack of bounds may be relative (eg within a reasonable area - as in hide and seek) or in continually rendered virtual spaces. Childhood role-playing games are very much part of this notion. Augmenting space is a new development - either bound or unbound. The concept here is that wireless digital technology can be used to superimpose additional information into the space (as opposed to physical marks). This may provide new players/pieces and obstacles as well as delimit the game itself. Most current examples (Savannah, Uncle Roy) use the aural channel of communication to augment the space.

In some spaces there is little movement but relative position is important for turn taking (see *timing* below).

Virtual spaces include audiovisual screens, boards and mazes. Mazes are a specific subset and can either be computer models of mazes or may be mazes drawn on boards. When mazes are

used, exploration and memory of location is a significant factor in gameplay. Boards and computer screens are interchangeable in concept in that they transport a player to a virtual location. They not only serve to provide the gameplay but they have a significant role in developing game narrative and fantasy.

Computer screens have the clear distinction that they can illustrate sectors of the board selectively and change their nature as a result of interaction within the game, and at a later stage this section on the design of spaces in computer games will be considerably expanded.

Boards often are simulations of real spaces and therefore have many of the elements of bound game spaces. They can be grids - like chessboards and GO boards or tracks - as in Trivial Pursuit, backgammon or snakes and ladders. Some games - notably Monopoly -have elements of tracks where pieces move around a specific circuit repeatedly and they are also a grid space that represents specific bounded spaces where particular actions (set building, property developing) can take place. Computer games also have this hybrid notion - and may be simultaneously a grid, a track and a maze - and have two- and represented three-dimensional form.

Some games have a strong element of occupation of the virtual space as an important aspect of their gameplay and narrative: the enclosure of space is one aspect, as in GO or Risk. Some boards are implicit rather than real - a card table is clearly needed to lay down playing cards in particular order or configuration, for instance dominoes involve an invisible grid.

There are games that are non-location specific. These can be played anywhere without recourse to a board or pieces: in the pub, the car, the school playground or wherever. These are word games, brain teasers, pub and party games etc. They fit into models of hunting, matching, sequencing and so on. I-spy, 20 questions, British rivers (an alphabet ordering game) are all examples of this diverse group.

OBSTACLES, HAZARDS AND ATTRITION

An important element in games can come from both the location or the nature of pieces/players - things that can impede the progress or success in gameplay. The presence of an opposition piece or player is a significant part of team or multipiece games. In field sports like football the major part of the difficulty of the game is the prowess and oppositional strength of your co-players. In many computer games the presence of others who are willing to inflict damage on your pieces is a major source of gameplay. This is in two forms - tasks may involve taking out the opposition as the task itself, and/or achieving some task despite the opposition trying to impede your progress.

Another restricting method in games is to increase the impediment to game success. This is easy to illustrate in card games where the aim is to discard all cards (in sets or sequences or whatever). If the player is unable to make a positive move then they are required to pick up further cards, thus making completion of the task more difficult.

Physical or virtual barriers play an important part of some games. The barriers in a location are important in the play of any game of golf; National Hunt horse racing involves jumping over fences and ditches on the track. In computer games there may be significant barriers that impede progress (a particularly good example is Arkanoids). Pieces or players themselves, if inappropriately sited, can become significant barriers - as in Tetris.

Hazard encounters are the inverse of power-ups. In Monopoly there are the contents of Chance and Community Chest cards. There are snakes in snakes and ladders, and court cards in beggar-my-neighbour. In some computer games the power-up does not help, for example in Arkanoids a hazard temporarily reduces the size of the bat.

Attrition and mechanisms of reducing the capability form another hazard in games. When rules

are transgressed in solo games, the player may lose points, or be excluded from the game. Exclusion is more typical in team games - this may be for a given piece or player for the duration of the game or more, or for a fixed time interval as in ice hockey. In other games it is a straightforward elimination of a team member like chess or in Doom. This is sometimes represented as losing a life in situations when only one player/piece is in action at any time. The attrition may not be absolute - it may be that it is represented as some loss of prowess. Some games represent this as health levels or levels of supply (energy, food, ammunition).

Forfeits are a specific form of hazard, which maybe really are inverse parts of progress making below. Forfeits may give your opponent temporary or specific advantage as a result of an infringement or mistake on the part of the player. Penalties, throw-ins and scrums in rugby result from mis-play by one side and give advantage to another side. Foul shots in snooker mean that the opponent potentially has two shots in sequence.

LANGUAGE

Some games specifically disallow players to use any verbal communication between actors - touchline coaching is specifically ruled out in many games. In some games it is not 'good form' to talk too much in the process - talking while an opponent is thinking for instance. However language is critical to the play of some games. All games have specific language associated with them. The simplest example is "snap!" in the eponymous game, however other games have rich vocabulary to communicate to players the workings and actions of the game (old games like cricket seem to have a rich and interesting vocabulary - *googlies*, *silly mid-off*, *maiden-over*, and *long-stop*). In some games the restriction in vocabulary actually constitutes a significant part of the game. A major example is contract bridge. The players, through entering into a conversation about how many 'tricks' they think they can make, are not allowed to reveal directly their strength. A partner cannot say "I have got a very strong hand with lots of Aces". If, however, the player in the contract says as their first utterance in a particular round "two clubs", then it is tantamount to saying "I have a very strong hand". If a player does not have access to this coded speech then their performance in the game is greatly hindered.

In the absence of good natural language processing, early interaction in language with computer games was restricted - and the existence of this restriction in dialogue became a key part of the game. Text-based adventures were predicated on the player finding the right pattern of language to make progress in the game. Whereas there were defaults like Go North (or some other direction), in other cases it wais important to find the correct language in context. Thus an old Infocom game 'Hitch Hikers Guide to the Galaxy' (available on www.bbc.co.uk/radio4/hitchhikers/game.shtml) required highly specific speech derived from context to make any progress at all. The authors of this game subsequently went on to produce Starship Titanic which had major natural language capability (www.starshiptitanic.com), and in 2004 the Sony PlayStation has a game with natural language voice input (although the need to match patterns is clearly necessary).

Some games are clearly about language - in Wales there is a contest 'Talwrn y Beirdd' or cockpit of poets - where there are challenges to write poems within a restricted timescale on a specific subject with a specific poetic form: limericks about the location, haikus about a particular news item for example.

Although in socio-cultural and other human science approaches there is considerable interest in the use of language, the use of language and codes in particular in games would seem to be an interesting and under-researched area.

TIME

The timescales in which games take place is a key aspect and has three distinct factors. Some games take place in real time and in other games time is temporarily suspended in succession as players take turns to make their moves. In most field sports and computer games the competition takes place in real time and there is a simultaneousness about the activity - in football both sides move about at the same time until there is a specific set piece - usually caused by an opponent's infringement. However in chess, golf or billiards there is a clear turn-taking convention - players move in response to other people's moves.

The real-timeness of events varies from game to game. This is most significant in computer games and games involving athletic prowess. In some computer games timing and speed are used as a significant part of determining gameplay. Reaction time is significant and important and as the game progresses a computer game often requires faster and faster responses. In puzzle games this might be suspended - and although there is no turn-taking the player can suspend time whilst problems are considered and reflected upon. Recent activity on leaning games at Futurelab has highlighted a different pace in different stages of a game. There are times within a game in real time for highly responsive interaction and there also times in a game where there is a need for a different reflective pace where knowledge is assimilated and strategy is devised.

The third factor is the way that a game ends. Some games take place in a defined time - the length of a soccer game is always 90 minutes of play. This clearly influences strategy of play - ensuring that there is sufficient resource to complete the gameplay within this known duration. Some games however have no absolute fixed time - they run to some logical completion point. This can be within real time (like a race) or within a turn-taking timescale like a card game or chess.

In computer games there is often a pause capability or even a 'save game' capability that has applications for requirements for both stamina (cognitive and physical) as a part of the prowess required to play a game - but also the ability to reflect on the game.

MAKING PROGRESS AND SURPRISE

The key element of a game is how one moves towards the game goal. There are a number of possibilities that, sometimes in combination, influence how a player makes progress in a game: random elements; physical effort (with and without the support of other devices); solving puzzles; answering quiz questions; and cheating.

Random elements are important in games. The two main random elements that are in games are in the use of some sort of random number generator - such as dice or computer programs - or some form of shuffle or deal of playing cards or other resources. The nature of this random element is significant beyond the design of the game, it may well be intrinsic to the notion of a game itself. Malone(1980) suggests that surprise is fundamental to the notion of game - and that any game where the outcome is clear from the outset does not have one of the essential ingredients in what constitutes a game. Randomness is one of the key ways in which surprise might be introduced into a game.

Solving puzzles is an important way for progress to be made in games. In backgammon, chess and GO, seeing the future potential plays is the key strength that the player brings to the game. In many computer adventure games it is necessarily for the player to bring the right elements and use the right language to be able to overcome some virtual barrier (open a door, kill a monster). The puzzles can be quite creative in some games (eg miming in charades).

Some games require quiz questions to be answered in order to make progress, and the game function is a vehicle for presenting the quiz. Trivial Pursuit is the most significant example of this genre. However in many educational computer games answering academic questions is a

barrier to be overcome before the reward of another form of gameplay.

Physical effort can either be with or without devices. The specific prowess is enacted to move forward: strength, speed or reaction times and other skills determine how well the game is played. This may be controlling a mechanical or electromechanical device (racing cars, joysticks etc) or control of devices (bats, balls) in combination with body movement that determines game outcomes.

Cheating may seem an odd thing to include. However for some players it is clearly one way to make progress, and designing to support or eliminate cheating is an element that may go into making a game. In sports there are now sophisticated tools for checking on the use of performance-enhancing substances. The use of video evidence is becoming widely used to resolve disputes between players and referees. In some cases the notion of cheats however is an intrinsic part of the culture of the game. Game designers engineer potential cheats into the game as part of a process of seeding a community of interest around a game, which in effect gives the potential of increasing engagement and interest in the game - which is often the reason for both designing and playing games.

PUTTING IT ALL TOGETHER

The components of games described above when married to particular narratives allow for a multitude of games. Malone suggests that some games can have intrinsic fantasies - where gameplay closely matches the fantasy - and other games that have extrinsic fantasies - where gameplay matches the fantasy. Thus in a car racing game your expertise in selecting the right kind of tyres for the vehicle and track conditions clearly is intrinsic, whereas the ability to guess the letters in a word in hangman has no relationship to being an executioner.

It is clearly possible to choose a theme - say the Adventures of Robinson Crusoe - and think of gameplays that might be appropriate. One could start with exploration and collection gameplay so that the essentials of shelter and life are found. One might imagine a target-based game on hunting for survival. Other rounds might be solving the issue of developing communication between Robinson and Friday by matching and collecting games. Starting from a full anatomy of parts of games it may be possible to match games to fantasy or games to learning/thinking outcomes. This is unlikely to be completely mechanistic as there is also a clear need for invention, imagination and the social interactions in the spaces where games are played, designed and discussed.

CONCLUSION

This paper is part of an ongoing attempt to devise good learning activities that adopt some of the qualities of playfulness, engagement and motivation we recognise when people play games. This paper recognises it is insufficient to just consider the historic elements construction of a game in producing a compelling and educative game. The paper recognises that good games are unlikely to be made by recipes - there is usually some inventiveness that is required to make something motivational and compulsive. However games are capable of description, and understanding something about how existing games are put together may help us develop new games. The next stage in this development is to see how the historic construction of a game as an activity emerges in the wider activity system of a game actually being played by learners.

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