


# Theoretical Issues for Game-based Virtual Heritage

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**Abstract.** This paper critiques essential features in prominent theories of serious games, and compares them to interaction features of commercial computer games that could be used for history and heritage-based learning in order to develop heuristics that may help future the specific requirements of serious game design for interactive history and digital heritage.

**Keywords:** Heritage · History · Serious games

## 1 Definitions of Games

Thomas Malone's paper, *Heuristics for designing enjoyable user interfaces: Lessons from computer games* [1], was an attempt to understand why games are "captivating" and how they can be "used to make other user interfaces interesting and enjoyable to use." In order to answer this question he set up three empirical studies (but only describes two), and takes away "motivational features" to see which features add the most to captivation. Malone asked eight groups of ten students to play a computer game (called "Darts"), and then another game ("Hangman") but with one of eight features missing. He recorded how long played each game (completion time), their personal opinions (as to which game they preferred), and their gender.

In his second study, using a similar method, Malone found that explicit goals, scorekeeping, audio effects, and randomness were particularly important. These two studies were then followed in his paper by the claim that challenge, fantasy, and curiosity were the important ingredients that make games captivating and fun to use. More recent publications, such as a doctoral thesis by Federoff [2], and other papers [3–5] have stressed the importance of Malone's paper in explaining the unique features of games, how they differ in the way they are experienced from other types of software, and from typical HCI, and how a new set of heuristics is needed to address these specific game features.

In contrast to typical software design aims, Malone's paper reminds us that our quest is to create more challenging environments, (and challenge in the sense of a difficulty people wish to face, not wish to avoid). There is an often-overlooked gap between games and other software, for games are not just efficient rules-based systems. Malone explained that HCI traditionally seeks to improve software that is easy to learn and easy to master, but notes the founder of Atari said games are designed to be easy to

learn but difficult to master. Malone argued that computer games are more like toys than other software applications, which in turn are more like tools.

Games have goals but they do not have to have clear outcomes. They do however incorporate challenge and fantasy, and stimulate curiosity. Malone's paper defined challenge as involving "a goal whose outcome is uncertain," as there is often variable difficulty level or multiple goals (potentially distributed over different levels). Fantasy incorporates emotionally appealing features, or well-mapped cognitive metaphors. Curiosity is seen as "optimal level of information complexity." It may incorporate randomness or contextual humour.

Malone was perceptive enough to realize that challenge is not merely about making things difficult, but also making these barriers tantalizing to solve. For example, when the author evaluated [6] over eighty people and how they learn about the original inhabitants through exploring virtual reconstructions of archaeological sites, he asked the users if the environments were challenging without realizing this subtle distinction. The users were confused as to whether he meant challenging as in "this is difficult, I am not sure I can or want to complete it", or "this is really testing me but I really don't want to do anything else until I crack it." This second meaning of challenging is an important feature of a successful game; it affords hard fun.

Gestalt theory seems to be behind Malone's concept of curiosity as a motivating feature of games, he suggested users want to have 'well formed knowledge structures,' that games deliberately suggest such knowledge but present the "knowledge structure" as incomplete, inconspicuous or unparsimonious (by this he may have meant games provide red herrings or an overflow of potential clues).

Like Malone, James Gee [7] reiterates that games are "hard fun" but also that games are successful because game designers also have to learn the hard way, success in game design is through trial and error, ensuring that the very design of the game helps people learn them in a challenging but enjoyable way. Their income depends on it. This may seem obvious, but Gee also says something fascinating, that games are good "if you act like a game designer while you play the game." While thinking and talking about games is important, one should not have to think like a designer to enjoy a game. If you design objects, events and spaces so that people have to think like you to have "good experiences" then the richness and variety of potential experiences have been lost.

Another potential confusion in reading Gee's work is that he emphasizes the advantages possible with games as if they are inherent in all games. For example, Gee wrote that "good games are problem solving spaces that create deep learning" and that "good video games are hard work, deep fun and provide "good learning" for other contexts, i.e. transferrable knowledge. "Tetris", "Pac-Man", and "Space Invaders", are often considered to be good games, but they don't appear to fulfil all three of the above criteria. And yet it would seem, following Gee, that good games have to always create "deep learning" and if games are sometimes tools then they must always be "...new tools for letting people understand from the inside out the worlds other people inhabit or worlds no one has seen yet." Unfortunately Gee seems to be conflating the apparent potential of computer games with the current state of computer games.

Anderson et al. [8] and Dondlinger [9] defined a game as essentially an activity that: has some goal in mind, the player works to achieve; has systematic or emergent rules; and is considered a form of play or competition. While this encompasses "skill

and drill” types of games, many of today’s digital games are much more complex, providing an interactive narrative in which the player must test hypotheses, synthesize knowledge, and respond to the unexpected [9]. Games also don’t have to provide the rules, part of the challenge might be to find them, and predict what will happen next according to the player’s understanding of what the rules are.

Juul [10] defined a game as “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.” While plausible on first reading, the rules of the game are the rules of the designer or even the rules of the player. The negotiation, changes, and misunderstandings as to what are the rules exactly are, by the player, is an important and creative part of games, and by extension, computer games. If you believe the essence of the game is a rules-based system, you might not consider the possibility that even for a game a rule system could be random, changing, or open to change by the player.

Salen and Zimmerman [11] wrote “A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome.” Such definitions of computer games as systems do not address why users find games enjoyable and do not directly lead us to producing better games that users enjoy more. Salen and Zimmerman’s definition also discounts games that may never have a final outcome (such as cricket), and does not incorporate the importance of strategy. As we have seen, rules do not fully encapsulate games, they may be necessary components, but there may be games entered where the rules on entry are redefined while playing. So here is an alternative definition of a computer game:

*A computer game is an engaging challenge that offers up the possibility of temporary or permanent tactical resolution without harmful outcomes to the real world situation of the participant.*

This working definition may not appear to be exacting enough; it seems to treat all games as challenge, when the challenge element is not necessarily of the same importance in all games; and it emphasizes tactics when not all games require changing tactics and strategies. But if the game does not offer strategic resolution, then it is no longer offering a full and rich game; it is almost a game-shell, or a game-vehicle. The procedures are the same but the game is no longer enjoyable and engaging.

Papert [12] stated that games are not fun because they are easy; they are fun because they are difficult to learn. Creating something that is easy is not making something engaging. Secondly, Papert thinks that educational games that hide their true intention are misleading if not immoral. Further, games allow and in fact demand agency and effort from the player, and provide clear feedback and reward systems. Therefore Paper encourages two things, conversation between the players, and encouraging them to “become game designers themselves.”

Ian Bogost is probably most famously associated with the phrase *procedural rhetoric*. Bogost [13] defined procedural rhetoric as “a practice of using processes persuasively.” Bogost himself raises a potential flaw; he admits that for many people rhetoric has a negative connotation. For example, in *Arguing well*, John Shand [14] declared “Logic must be sharply distinguished from what might generally be called rhetoric... rhetoric is not committed to using good arguments”.

Miguel Sicart [15] wrote: “Proceduralists claim that players, by reconstructing the meaning embedded in the rules, are persuaded by virtue of the games’ procedural nature.” Sicart argued that meaning is more than just the learning of rules through play, the value of gameplay is made subservient, and if rules are all that matter why should the designers have to explain them? There is another concern here (depending on whether are we supposed to question the system of or not). Adherence to the altar of “procedural rhetoric”, whether intended by Bogost, or not, can lead to people thinking that the designer’s idea of the game rules are what matters.

There has also been some criticism of Bogost’s other (but related) book, *Unit Operations* [16]. Alex Wade [17] wrote “description of ancient videogames Pong and Combat as games with ‘tennislike attributes’ (59) stretches the membrane of the operation of units beyond perspicuity and into the realm of fiction.” How can procedural rhetoric be employed in designing serious games? While Bogost seems to be saying we have to understand procedural rhetoric, astute critics and game designers do not seem sure as to how they can implement these theoretical notions [18].

## 2 Narrative and Historical Reality

So how can we use games for history? At a very basic level we can distinguish them as follows. Games can be used discursively to play and answer questions. The classroom can play them in a group or individually and then present their viewpoints on authenticity or character motivation to the class. Secondly, games are performative, but they can also be performative in a more general sense. Students could role-play game characters, with puppets, or as actors or as narrators, and could film their historical interpretations as machinima (film created by the in-game cameras). Thirdly, at least some games are thesis-based kitset visualization and simulation machines; they can help structure and procedurally test theories as to how cities and empires are formed. Players can mod cities and empires events based on interpretative theories inside games that are moddable, or sandbox games.

Many are using and testing the portrayal of history in games through their history class or in their research [19], while at the other end of the spectrum the same games have endured some considerable criticism by practicing historians. For example, the famous historian Niall Ferguson [20] wrote in the *New York Mag*, “Civilization and Empire Earth, to take perhaps the best-known examples, are not what the historian needs, since what they provide is such a crude caricature of the historical process.”

Despite these criticisms, games are growing in popularity, and many cultural heritage projects have harnessed game technology and techniques. The heritage projects may use a game engine [21] or be games in the fuller sense of the word [22] and there have been recent surveys on games appropriate to cultural heritage [23]. To counter the burgeoning interest in games, there have also been papers warning of game ideas applied to cultural heritage with disastrous results [24].

Using powerful game engines may help us prototype digital representations of virtual heritage environments in a medium accessible to a generation less appreciative of books, but these games carry “genre baggage”. Even first year archaeology students are keen to find out what they can destroy in these virtual environments designed to

show them past artefacts in use [6, 25]. They are accustomed to games, and may attempt to do the same destructive things in game-based historical environments. This problem of using a toy as a tool is something the author has previously described as the “Indiana Jones dilemma” [26], where the popular media presentation of archaeology dramatically increases its popularity while diminishing the public understanding of what archaeologists actually do.

This dilemma worsens the more we have actual user-accessible interactive content to model, something not shared with traditional, flythrough, and instructor-controlled, virtual environments. The more interactive the content, the more visitors will want to manipulate or even sabotage it. In the author’s own 2004 evaluations of archaeology students and visualization experts, he found that game genres are both a blessing and a curse [6]. When told a virtual environment is a game, participants of all ages and both genders seem much more at ease and aware of potential affordances. However, they tend to look for interaction and personalization while disregarding the actual content, and they conflate fact, conjecture and fiction, when a discursive and contestable simulation may actually be the preferred option [27].

It could be counter-argued that computer games featuring history and heritage can be used and interacted with in a meaningful way by teachers and students (which is the argument of McCall [19]). It also depends on the interrelation of teacher and student, and blended learning may not fully immerse the student in the “there” of virtual heritage environments. For example, Gaver et al. [28] wrote that the games differed from typical software: “If a system can easily be used to achieve practical tasks, this will distract from the possibilities it offers for more playful engagement.”

Game designers may also be led to believe that games using historical characters, events, or settings are readily adaptable and immediately appropriate to virtual heritage, and many have made the case for using game engines for virtual heritage projects [29–31] but there are fundamental conceptual issues still to be addressed. To what extent is the past more or less important or retrievable than history, and how is it attainable through interaction (as otherwise there is little point to using virtual environments)? One answer may be adopting virtual reality to represent the past or online digital worlds to represent the future, but it is still too easy to be taken in by the lure of technology and forget to concentrate on enhancing the user experience.

### 3 Evaluation and Understanding

Evaluating serious games featuring the latest technology raises several issues. When evaluated the user experience of interactive virtual environments, the author was faced with choosing people to compare two virtual environments against each other (subjective preference), or compare the task performance of two different user groups in two different environments. With the first method people typically lack experience in judging virtual environments against each other, for it is such a new technology; with the second method there is no guarantee that the testers’ relevant demographic factors would be spread relatively evenly across the two groups.

A very simple rule of thumb to uncover whether a game or virtual environment helps a meaningful learning experience is to ask (based on the data available), what do

you want or expect the audience to learn? Which interaction method best achieves this? Does the resulting simulation add a new perspective, which would be more difficult to design and deliver in other media? How can this new knowledge be used, communicated, and transferred beyond the game? Does the knowledge also help uncover the process by which the original data was first interpreted, or does it help the audience (students and teachers, general public and scholars) to critique the ways this knowledge is typically presented and experienced?

Would a socially situated role help the audience understand how the place is inhabited and experienced? For example, a warrior might learn about weapon features, landscape advantages and disadvantages, a command system, wayfinding, or the privileges of ranks. A thief might also learn about hiding places, but also about where people go and when, they are on guard, where valuables are stored. A druid might learn about the cultivation of herbs, astronomy, medicine, and so on. A merchant might need to learn about artefacts, the value of objects, certain ways of counting, the location of valuable items, barter methods, trade distances, dangers, foreign language and appropriate behaviour, optimal travel routes, and so on. The challenge is to match the knowledge to be provided with the interaction suitable to both the game and the audience.

Another interesting issue in game-based learning is in research into whether computer games can add to or will only distract student attention span. There is a school of thought in archaeology that disregards the learning capabilities of digital media, seeing visualization as purely a shop façade or even distraction for the serious and scholarly pastime of reading and writing books [32]. Yet if we avoid teaching with digital media, how will the changing attention spans and learning patterns of new generations be best addressed [33]?

So there are many important, perhaps even critical problems in using computer game technology and conventions for virtual heritage environments. Some academics worry about the violence in many computer games, or the time they take away from other pursuits [34]. Others do not believe they test the appropriate cognitive skills. Educators are also concerned that game-style interaction is typically destructive, and not conducive to developing either cultural awareness, or an appreciation of preservation of objects and the cultural values of others.

Evaluating cultural learning is also very difficult [25] so we have looked at using biosensors and brain scanning in tandem with traditional survey questionnaires to gain feedback on what does and does not work. Another option is to adapt digital exercise machines and build tracking devices into tangible interfaces that track individual user preferences and allow the experiences to be shared between individual users and a wider audience [35].

Even if we decide on what we are evaluating, it is not clear how to evaluate. The ethnographic techniques used by researchers may be effective in recording activity, but they do not directly indicate the potential mental transformations of perspective that result from being subjectively immersed in a different type of cultural presence [36]. Real-world tests will not necessarily be of help in assessing heritage reconstructions, unless the virtual experience is supposed to tally as accurately as possible with a given and accessible real-world experience of that culture. This is a problem if the real culture

being simulated no longer exists in one place or at the current time, or if the cultural knowledge is fragmented or only circulated among experts and not the general public.

This leads us to the thorny issue of how to evaluate such a concept. We could use questionnaires; we could test the ability of participants to extrapolate general cultural rules or other information and apply them to other heritage sites; we could test whether participants could detect other players or nonplaying characters that appeared to belong to or not belong to the resident culture. We could also test for engagement using questionnaires, by recording physiological data, or by testing the memory recall of the participants. A further option is to give users tasks to complete, and record their performance. However such testing only records their technical proficiency, and not necessarily their cultural understanding.

Applicable research requires continual evaluation via shared tools amongst a body of scholars who agree on suitable goals and methods. To achieve this on-going research activity, the content to be examined must be clearly understood and capable of further analysis. Interaction in a virtual heritage environment requires suitable and appropriate context that communicates the meaning not just of objects but also between objects and their creators.

It is easier to quantify technical advances, and to secure funding to do so, but the mission of virtual heritage is to communicate cultural knowledge, not merely to show it. This may be why we currently have little evidence as to whether virtual heritage environments can afford useful and unique ways for augmenting and evoking awareness and understanding of distant places and foreign cultures.

Cultural meaning comes from engagement through cultural presence and education through cultural awareness, understanding and immersion. Critical research needs to be undertaken on the specific abilities of digital media to aid engagement, understanding, and awareness of other cultures. Education, funology, and digital media are not extensively evaluated in combination, but they should be. Evaluation requires definitions, guidelines (heuristics), and dependent variables that can be tested (which is difficult in regards to cultural learning), and effectively communicated to designers so that they in turn can effectively transmit cultural information digitally to a varied audience. Hence they need to understand what exactly cultural information is, and how to best communicate it digitally [37].

To increase interest and a sense of inhabitation or specific contextually situated behaviours, a designer could deliberately evoke a sense of cultural presence (as a perceived encounter with digitally simulated cultural agency). However, we do not have agreed definitions of cultural presence and so designers do not have clear ideas, as to which factors which most aid cultural presence, cultural learning, and both procedural and discursive archaeological knowledge.

In order to improve the transfer of cultural significance, domain subject experts, such as archaeologists and anthropologists, ought to reconsider not only the technical but also conceptual features of commercial and open-source computer games. Important features of games include the ability to learn through testing and exploring, the capacity to personalize, annotate, and add content, and the ability of games to challenge people to complete tasks, and try out new strategies, techniques, and identities [38, 39].

Heritage projects are typically designed by experts directly for the general public, but subject matter expertise may blind the designers to the immediate needs of the very

audience they are designing for. Subject matter experts may already know the facts, hypotheses, and conjecture as to what was there, what was seen, what was believed, what was done, and what was valued. However, the general public needs to not just learn this, but also develop the desire to learn this knowledge. They will not have the same incentive to read the background information necessary to judge the authenticity and appropriateness of virtual heritage projects.

## 4 Critical Gaming Checklist

How can we ensure that our critical positions, theories, and arguments about gaming have merit? This is a work-in progress checklist that may help identify weak points in an argument. Ideally a critical position /argument about computer games should be:

1. Falsifiable and verifiable. Not such a common feature in the Humanities, and not always relevant, but in my opinion a good argument should be saying where and when it is contestable, and where and when it can be proven or disproven.
2. Extensible and scalable. We should be able to add to it, extend it, apply it to more research questions and research areas or add it to current research findings or critical frameworks.
3. Reconfigurable. Components are more useful than take it or leave it positions.
4. Is useful even if proven wrong in terms of data, findings, methods, or argument (possibly this heuristic should be combined with number 3).
5. Helpful to the current and future design of computer games, and has potential to forecast future changes in design, deployment or acceptance.
6. Not in danger of conflating describing computer games with prescribing how computer games should be. Several of the arguments cited in this book appear to make that mistake.
7. Understands the distinction between methods and methodology, the selection or rejection of methods should always be examined and communicated.
8. Is lucid and honest about the background, context, and motivations as factors driving it. The parameters of the argument should also be disclosed.
9. Aiming for validity and soundness of argument.
10. Attempting to provide in a long-term and accessible way for the data, output, and results of any experiment or survey to be examinable by others.

This suggestion is corroborated by the method employed in a recent journal article and survey on serious games [40], it determined “high quality” publication by:

- The appropriateness of the research design for addressing the research question.
- The appropriateness of the methods and analysis.
- How generalizable the findings were (with respect to sample size and representativeness).
- The relevance of the focus of the study.
- The extent to which the study findings can be trusted in answering the question(s).



## 5 Design Implications

Through the game itself, we can also create our own levels that bend space and time. Could we also bend or invert conventional notions of historical narrative? Is it possible to meaningfully do so, and personalize a virtual environment through the interactions that take place within it, even if that interaction initially appears to be destructive? Can we share these meanings within a community, or reveal meanings about a community that is typically removed from us? Given improvements in technology, will these environments improve or hinder a sense of authenticity?

Possible learning mechanics include learning by resource management; learning about social behaviour (chat, observation, mimicry); visualization of scale, landscape or climate; depicting varying levels of uncertainty; allowing visitors to filter or reconfigure reconstructions; immersion in the excitement of the times; selecting correct objects or appearance to move about the 'world' or to trade or to advance social role or period of time; deciphering codes, language, avoiding traps; and online walkthroughs.

The major theories in game design that concentrate on serious games may all need to be re-examined and re-adjusted for interactive history and virtual heritage. For historical simulations we may wish for players to understand the rules, and debate them, or learn how to extrapolate from them. For heritage, while we may wish for players to understand or to debate system rules, we are probably going to stress the learning of local culturally constrained perspectives. In such a scenario, the fiction world-real world becomes a local belief-outside belief system. Procedural rhetoric may also lose some of its appeal because the games/interactive environments are likely to be approached as a group, in a museum or similar institution, and so there would be fewer opportunities for continual repetition.

Given the above, historical simulations should endeavour to achieve the following:

- Provide (at some stage of the experience), a framework in which the player (or perhaps, here, participant is a better word) gains an overview of what has been documented, simulated, or construed.
- Convey a sense of the historical context, and the way in which that shaped the actions of the inhabitants.
- Affordances to help participants understand and explain the information in a way that suits them rather than the designer and to allow for different pathways, actions and goal selection.
- Encourage the participants to seek out more information for themselves beyond the historical simulation.

How can we find out how the original inhabitants and historical figures and associated minor characters interacted? Each assortment of historical data and quasi-historical data will differ; there won't be an easy universal solution. However, any historical simulation should have some robust and consistent way to understand the level of engagement and knowledge and curiosity acquired by the simulation. So a further step would be to incorporate a way in which the participants' engagement and acquired conceptual understanding (and/or acquired historical skills) can be ascertained without

interrupting the participants' experience and without relying on subjective intervention biased due to subconscious aims of the researcher or designer.

## 6 Summary

While games and game design principles have and will continue to enrich and inform games designed to educate and disseminate virtual heritage and interactive history, the specific challenges of this research field suggests that new theories as to how people can and should learn are best developed looking at more specifically relevant domains than by extrapolating overarching principles from games in general. Games are not designed according to the aims of generic software, and history and heritage-based games also have specific issues to resolve. As a response, this paper suggested a general definition of a computer game, a working checklist for reviewing theories of game design, and recommendations for developing historical and heritage-based content with computer game themes and elements.

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