Learning Stories: Design Considerations for Narrative Elements in Serious Games

Michael W. Freeman, EdD
MW Freeman Solutions
Fayetteville, NC
Mike@MWFreeman.com

Mark Friedman
Adayana Inc
Suffolk, VA
mkfrie@gmail.com

ABSTRACT

Serious games are powerful tools for providing direct experience and concrete contexts in military training environments. They depend on stories, or narratives, to provide the basis for effective, engaging learning experiences. However, there are few research-based guidelines to support design of learning narratives or account for why they include specific characters, environments, or activities. While the fundamentals of good instructional design and learning are enduring, narratives for serious games require careful design to leverage the great promise and inherent power of the serious game.

This paper proposes an inclusive model for understanding and designing serious game narrative. The paper starts with a working definition of serious game narrative and continues with a distillation of a review of the literature to propose the components that make up an effective narrative for serious games. The paper continues by proposing specific design considerations based on a review of learning theories and best practices for each of these components. This is intended to recommend to serious game designers and developers a common lexicon of terms to describe narrative and to enable a purposeful process for designing the game narrative and experience. The paper concludes with recommendations for implementation and future study.

ABOUT THE AUTHORS

Michael Freeman is an independent training and learning technology consultant. He provides tailored consulting and management services for training and learning technology, distributed learning, R&D, solutions design, customer engagement, proposal writing, program/project management, serious games, and system/content development. Previously, he was the program manager for the Training Research and Development contract in support of the Technical Support Working Group (TSWG), DoD Counter-terrorism Technical Support Office, where he managed 11 complex, firm fixed price projects for multiple prominent government anti-terrorism clients. He also served as the deputy director/program manager for technical support for the DoD Advanced Distributed Learning Initiative. A career Army officer, Mike is a certified Project Management Professional (PMP), and a graduate of the U.S. Army Command and General Staff College, the Army Management Staff College, and Army Engineer Officer Career Courses. Mike holds a doctorate in Vocational and Technical Education from Clemson University.

Mark Friedman is a Sr. Information Technology Analyst for Adayana Government Group. He is responsible for development, testing and fielding of advanced technology training and instructional technology projects for Government clients. Mr. Friedman brings over 25 years of education and training, instructional technology development and project management experience to his assignments. Mr. Friedman has an MBA in Strategic Management from the College of William and Mary and a Certified Knowledge Management Professional certificate from the KM Pro Society.

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INTRODUCTION

Serious games are powerful tools for providing direct experience and concrete contexts in military training environments. They depend on stories, or narratives, to provide the basis for effective, engaging learning experiences. However, there are few research-based guidelines to support design of learning narratives or account for why they include specific characters, environments, or activities. While the fundamentals of good instructional design and learning are enduring, narratives for serious games require careful design to leverage the great promise and inherent power of the serious game (Marsh, 2015; Van Eck, 2006; Connelly et al, 1990).

Narrative inquiry has a long intellectual history both in and out of education, and it is increasingly used in studies of educational experience. One theory in educational research purports that humans are storytelling organisms who, individually and socially, lead storied lives. Thus, the study of narrative is the study of the ways humans experience the world, and the playing of narrative-focused games is yet another way for humans to practice that experience. More specifically, adventure type games are usually narrative-driven and open-ended learning environments and are likely to be best for promoting hypothesis testing and problem solving. Many games blur taxonomic lines, blending strategy with either action or role playing, for instance (Barkhuizen et al, 2014).

This paper proposes an inclusive model for understanding and designing serious game narrative. The paper starts with a working definition of serious game narrative and continues with a distillation of a review of the literature to propose the components that make up an effective narrative for serious games. The paper continues by proposing specific design considerations based on a review of learning theories and best practices for each of these components. This is intended to recommend to serious game designers and developers a common lexicon of terms to describe narrative and to enable a purposeful process for designing the game narrative and experience. The paper concludes with recommendations for implementation and future study.

WORKING DEFINITION OF SERIOUS GAME NARRATIVE

In its simplest form, a narrative is a story with a chronological implication. The stories of players and the characters in a serious game are the elements that drive the player to purposeful experiences and provide meaning to those experiences (see Figure 1). Well designed stories provide the basis for an engaging, social learning experience. Additionally, learners have been shown to perform better when the storyline of a scenario was relevant to the training objectives (Sung, 2015; Belanich, Mullin, & Dressel, 2004).

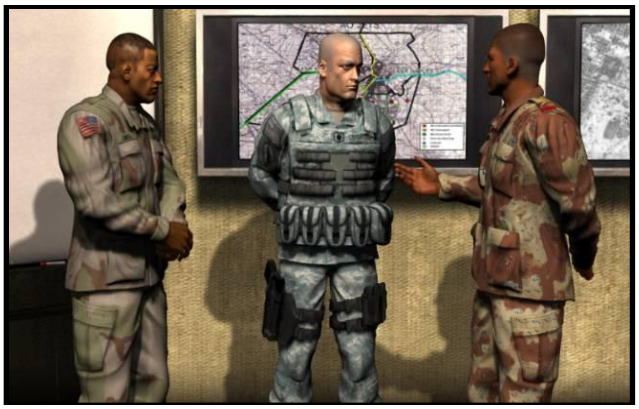

Figure 1. Good Narrative Drives Purposeful Experiences and Meaning

COMPONENTS OF SERIOUS GAMES NARRATIVE

Typical Serious Games Narrative components include:

- Context
- Character
- Place
- Drama
- Motivation
- Action!
- Feedback

NARRATIVE DESIGN COMPONENTS AND BEST PRACTICES

Narrative Context

One of the major roles of the narrative is to provide the social and organizational context of the learner, learning experiences and the entire game. The story should describe the hierarchy of organizations and social groups along with where the learner fits. This includes who the learner works for, who are his peers, who are his subordinates and who are his adversaries (Ryan, 2001; Bonk, Dennen, 2005).

The best context for learning is as close as possible to the context for the job performance. Therefore, the closer the game narrative corresponds with the situation and experiences of the learner, the better. However, this doesn't mean typical (less specific) contexts aren't effective. The most important thing about typical contexts is that they are authentic, plausible and support the task performance. Any artificialities or generalities should be explained so the learner understands the resulting limitations and requirements (Holden & Sykes, 2013; Gee, 2004).

Narrative Characters

Good serious game narratives provide rich development of characters to enable learners to understand who the characters are, their personalities and what role they fill in the game world. This includes the character of the player as the central actor in the world since the player experiences the world through the point of view of this central character (Heliö, 2004; Woods, 2004).

Characters with distinct, well defined personalities and needs provide the basis for conflict and social learning in the game (see Figure 2). Understanding these characters and using them to play the role required of the player is necessary to establishing a personal connection to the game world and mission (Ang, 2007; Björk & Holopainen, 2003; Gredler, 1996; Lankoski, Petri & Heliö, Satu, 2002).

While they should be used carefully, stereotypical characters can be useful in quickly establishing a sense of the social and operational structure of the narrative. Stereotypical characters create expectations and can be used well for secondary characters and those who are seen only briefly, but the stereotype must be familiar to the player. Examples could include the tough sergeant or the inexperienced second lieutenant (Hejdenberg, 2005).

An important measure of effectiveness is whether players develop social relationships with the characters. This can be observed by players talking to the characters or by their imagining additional details about the character's personality and story (Nabi & Krcmar, 2004).

Figure 2. Well Defined Characters Provide the Basis for Engagement and Social Learning

Narrative Place

A sense of place is provided to show both where (geographically) and when (temporally) the experiences take place. A sense of place is also required to create a "Magical Circle" or temporary world where the player acts outside the ordinary world (see Figure 3) (Nieuwdorp, 2005).

Archetypical buildings and terrain can be used to establish an expectation of types of action or goals for the learner. For example, a war torn village with ramshackle homes and inhabitants in traditional Arab clothing creates different expectations on the part of the learner than a prosperous modern western city with large buildings and business people. Archetypes can also be invoked with sounds such as animals, traffic and conversations in other languages.

Expectations of action can be said to begin when the player experiences the first screen of the game or even sees the pictures on the box the game comes in. Archetypical structures can also be used to influence player's movements and travels in the game world. A prominently placed warehouse or market can draw players into moving toward them and exploring. Conversely, a bunker with a sentry can cause players to move away if the mission is to navigate undetected. Also important is the genre the game represents. The genre builds expectations of types of activities and experiences available in the game (Lankoski, et al , 2002).

The locations that are part of the learning experience should be expressed as scenes. Each scene should have its own sense of place to create the appropriate expectation of action and provide the necessary setting for the player to take action (Moreno-Ger, et al, 2007).

The narrative should also explain why everything in the real world is not available in the game. An example may be certain weapons or vehicles aren't available due to airlift restrictions (Squire, 2005).

Game entities should also be described in terms of attributes (speed, damage, power) and abilities (flight, shoot, swim). Designers should also indicate if the attributes or abilities can be changed and under what conditions (Zagal, et al, 2005).

Figure 3. A Sense of Place Develops Expectations of Action

Narrative Drama

Dramatic techniques are used to engage the learner's attention and create suspense in the story. The dramatic technique of creating player desire to solve a mystery (Hermeneutic Code) and desire to see the results of their actions (Proairetic Code) are important in creating suspense and maintaining player engagement (see Figure 4).

The Hermeneutic Code's dramatic effects are caused by unanswered questions and drives players to answer those questions to complete the story. Examples include providing clues to a mystery along the way to solve a crime or figure out what is causing a problem. This is closely related to the desire to learn and gain more knowledge in order to solve a problem (Hejdenberg, 2005).

The Proairetic Code's dramatic effects are caused by creating an anticipation of the results of the player's actions. This can be implemented by showing dramatic effects from player actions as a payoff to correct performance and penalties for poor performance. This can include spectacular explosions of enemy vehicles when an attack is well executed. The main point is that the player is motivated by the expectation that something will result from his actions. Importantly, the code of action (Proairetic) provides the basis for decision-making in a serious game (Brooks, 1984).

Other dramatic techniques used to progress the narrative and enhance engagement include backstory, cut scenes, flashbacks, foreshadowing, cliffhangers and red herrings. The three act restorative structure includes setup, confrontation and resolution. Each act builds to a plot point or crisis. The resolution of this crisis moves the story to the next act, or in the case of the resolution, to the end of gameplay (Lindley, 2003; Dickey, 2005).

Figure 4. Narrative Drama Enhances Player Engagement

Narrative Motivation

The learner is compelled to take action in the serious game by providing motivational elements. The more authentic the motivation, the more meaningful the learner's actions. Motivational sub components include Goals and Conflict (Salen & Zimmerman, 2004; Belanich, Sibley, & Orvis, 2004; Oliver, & Nabi, 2004).

Motivational Goals: Goals provide the reason for the learner to take an action. A goal is something the learner will try to accomplish in the game. The goal may be the actual learning action or may be a reason for the learner to be placed in situation to take an action caused by a precipitating event. The learner may be given the mission to move to a village which provides the context for an ambush along the way (Costikyan, 2002)

Motivational Conflict: Conflict motivates by providing a foil or disruption to the learner's plans. This creates tension and heightens engagement by creating a sense of overcoming obstacles. The conflict can come in the form of an adversary such as an enemy, the natural environment or problems such as supply issues or mechanical breakdown. Adversaries should have believable personas and motivation to increase the feeling of conflict and these personas must be developed in their character. Conflict can be heightened by imposing time restrictions and other limitations on the player, but these should be part of the narrative. Conflict can be the starting point, motivator or dynamic element in a game (Crawford, 1982; Heliö, 2004; Salen, & Zimmerman, 2004).

Conflict creates a sense of urgency and the basis for player action. Conflict is so important that there can be no game without it. The primary method of increasing the difficulty level of the game is to increase the level of conflict (Lindley, 2003; Lankoski & Heliö., 2002).

The forms and level of conflict come directly from the rules established for the game. The competition aspect of games also comes from conflict and rules. Without effective conflict, players could not judge their progress through the game and feedback would be much less meaningful (Salen & Zimmerman, 2004; Caillois, 1961).

Rules

Rules establish what is possible and forbidden in the game world and what conditions must be met to achieve the goals. Rules are best established and reinforced through the game narrative. They should be plausible in the context of the storyline so the effects on decisions make since to the player. Rule sub components include rules for how the world works and rules for winning and losing (Aarseth, 2004; Kirriemuir, & McFarlane, 2004).

Rules for how the game world works: these are necessary to set the physics and learner interface with the world. Examples are generally based on the likeness or difference from the real world, such as how fast different characters can go, effects of weapons and how much learners can see in the world. These rules in large part establish the requirements for the underlying simulation that provides the game world environment (Magerkurth, et al, 2004).

Rules for winning and losing: these are necessary to provide what specific things must be achieved or contingencies met and under what conditions in order to achieve the goal. There are also penalties for not meeting

required conditions or not following the rules for winning. The rules form the basis for determining outcomes and performing assessments of game outcomes (Davis, Javelot, 2005; Hopson, 2001; Juul, 2005).

Dynamics

Game Dynamics provide the adaptation of the learning experiences to the expertise and capabilities of the learner. Games are more interesting and engaging when the actions required are achievable while also challenging. This is all about the balance of challenge (how hard something is to accomplish) and pace (how fast the learner has to perform). When new tasks are introduced through the story, the pace is reduced. As the learner gains mastery, the pace can be increased (Csikszentmihalyi, 1990; Beal, & Christ, 2004).

Challenge can also be moderated by providing scaffolding elements in the narrative such as a mentor or job aids and by combining simpler tasks to create a more complex set of required actions. Under the Piagetian process of equilibrium, when confronted by an interesting problem, learners will try to solve it if the solution seems achievable. Therefore dynamics are important in keeping the learner moving forward. An example mentor avatar for moderating challenge is shown at Figure 5 (Rieber, 1996).

Figure 5. Example Mentor Avatar for Balancing Challenge and Pace (Dynamics)

ACTION!

Action is the most fundamental component of a serious game. In fact, without action by the player, it's not really a game (maybe a movie). The most difficult actions in a serious game should be those focused on the learning objectives. The more meaningful the action in a serious game, the better, while the more action unrelated to the learning objectives, the worse the serious game (see Figure 6). This does not mean it's not a good game; just that it's not a good serious game (Gee, 2003; Freeman & White, 2008).

Each action by the player should make sense in the narrative and impact the future actions required. This could be accomplished by having each action activate a condition in the game programming and future actions can be dependent on the satisfaction of one or more preconditions (Moreno-Ger, et al, 2007).

Figure 6. Example of Game Action

ASSESSMENT/FEEDBACK

Meaningful assessment and feedback is critical to a serious game to ensure learning objectives are met and to provide the basis of modifying game dynamics of challenge and pace. This can be provided inside the game world using intelligent agents or satisfaction of conditions. It can also be provided externally to the game by a human observer. Feedback can be immediate (player's character killed, friendly unit attacked). It can also be delayed and summative (you did these tasks correctly and these tasks incorrectly). An example of a feedback flowchart is shown in Figure 7 (Freeman, & White, 2008).

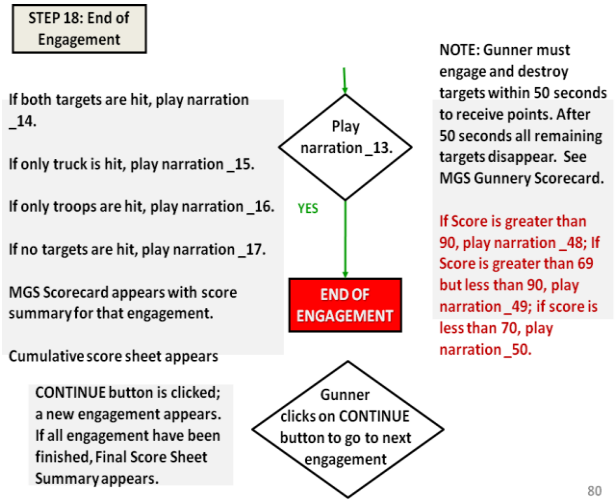

Figure 7. Example of Feedback Flowchart

A best practice is to provide both immediate and delayed feedback in order to propel the story, provide adjustment of game dynamics (turn on or off mentor assistance and job aids) and more closely follow feedback in the real world. Most experiences include immediate feedback as to performance of a task and more detailed feedback after action reviews to capture outcomes and establish less distinct cause and effect relationships.

RELATIONSHIPS

Each of the narrative design components is important in its own right, but they are also closely interrelated. The relationships are depicted in Figure 8, below.

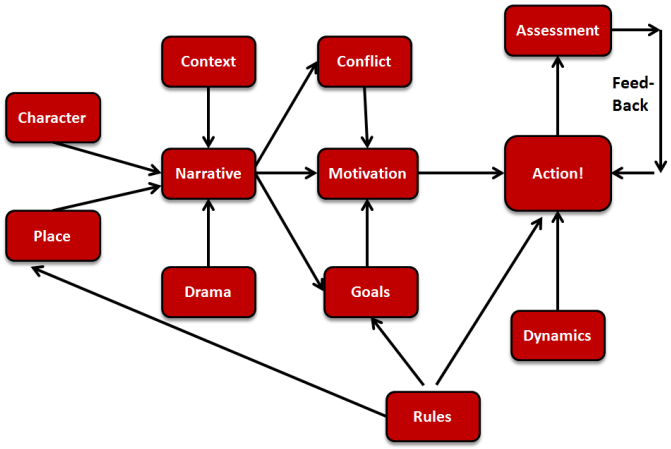

Figure 8. Serious Game Narrative Design Components and Interrelationships

Narrative drives motivation for the learner and provides context for performance. Conflict adds to learner motivation and goals provide a mission to complete. Motivation drives learning focused action.

NARRATIVE STRUCTURE

Typical serious game narratives can be thought of as having the following structure (Bruner, 1991):

- A canonical steady state
- Precipitating event(s)
- Restoration
- Coda (marking the end)

Canonical steady state- In this part of the structure, the world is working in accordance with normal rules (canons). This part of the narrative is often described in terms of the situation and mission assigned.

Example: The learner is a medic, accompanying an infantry patrol to check out a suspected weapons cache. Everything is normal, as the patrol departs the forward operating base and moves toward the cache site.

Precipitating event- In the precipitating event, or breach, something happens that violates the rules and sets the world off balance. This part of the narrative can be thought of as the cue for action.

Example: Suddenly, an IED explodes and the patrol comes under sniper fire.

Restoration - in the restoration, the learner is supposed to take action to correct the problems and return the world to the steady state, operating according to normal rules.
Example: The learner medic rushes to the site of the explosion and begins to assess and treat the casualties.

Coda - the coda (from the Latin "cauda" or tail) is the end or conclusion of the task or subtask. It marks the end of the narrative segment. The world returns to the normal state and the learner gets feedback on results of performance (Wiktionary, 2015).

Example: The wounded warfighters are shown in the hospital recovering and happy to be alive. The patrol completes its mission.

Note: the narrative may be nested to include multiple precipitating events and restorations based on a single canonical steady state (Bruner, 1991).

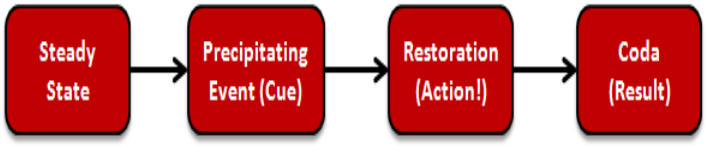

Figure 9. Narrative Structure

NARRATIVE CONSTRUCTION: EPISODIC VS SERIAL

Serious game narratives can be constructed as either episodes or serials (see Figure 10). In an episode construction, the story stands on its own with no need for information from other narrative events or connection to later events (no prerequisites). The episode represents a complete story within the context of the overall situation. Episodes are useful to facilitate reuse apart from the other content, but usually lack the deep culture and meaning that come from the narrative development in a serial. Many TV shows, like Law and Order, are developed so each episode stands alone within the larger premise of the show (Mittel, 2015).

In a serial, the story has a continuing plot that depends on information in previous events to inform the current event. Serials provide a deep culture and meaning for the learner while reducing the need for detailed development of background and character during each learning event. However, the dependent nature of a serial can limit reuse of the learning experience unless recaps of critical information is provided. These recaps are often used with lead ins such as "previously on Mad Men."

Of course, narratives are often constructed as hybrids of episodic and serial requirements. These are often reflected by nested story threads, some requiring prerequisite information and others which don't. Examples include "to be continued" activities in otherwise episodic stories.

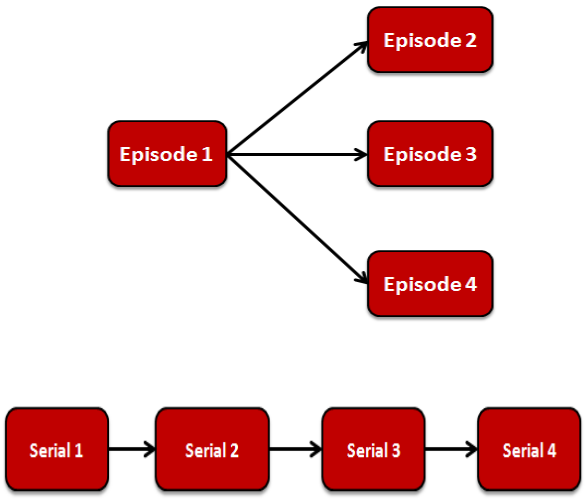

Figure 10. Narrative Construction - Episodic vs Serial

CONCLUSION

The Serious Game Narrative Design Components described in this paper can provide a research-based model for understanding what makes games serious. This paper also provides some design considerations and examples of specific implementation. Perhaps more importantly, it also provides a common lexicon for stakeholder communication and agreement on what's important in serious game design and why. Using this lexicon, an audit trail can be developed for all elements in the serious game while maintaining a focus on active performance of the learning objective by the learner.

For future work, this paper and model should be validated and improved through discussions with the serious games design community. It should also be extended into instructional design processes and specifically described in documentation required for Serious Game projects. This could include the Interactive Multimedia Design Package and storyboards for production. Additionally, a plain language software tool for guiding design and development of games using the design component model resulting from this study would be useful.

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