Activity–Based Scenario Design, Development and Assessment in Serious Games

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ABSTRACT
Serious gaming environments provide the potential to create player activities and opportunities to design for experience. A flexible, powerful and rich way to create, represent and characterize player activities in serious games is through scenarios. Scenarios are stories: they are realized through text descriptions and supporting artwork such as storyboards and sketches. In this way, they illustrate a game’s scenes, settings, circumstances and situations, as well as the possible future sequence or choice of events that make-up a game’s narrative flow. While the flexibility of scenarios makes them useful for describing player activities, the lack of tools and methodologies to guide their design may lead to the use of ad hoc non-standardized language. Borrowing from film, HCI, and activity theory, this chapter describes a hierarchical activity-based framework that on the one hand is sufficiently flexible to support the design and development of scenarios at any level of complexity, while on the other hand provides a standard template and language with which to frame scenarios in serious game design. The proposed framework provides a way to bridge the gaps between design, development, and implementation of serious games. In addition, it incorporates a multi-level structure providing multiple units of analysis (a variable lens) for analyzing learning from objectives to goals and sub-goals.

KEYWORDS
Serious games, human-computer interaction, activity theory, film, theatre, design, development, game writing, narrative, scenario, story, storytelling, script, assessment, learning, framework, experience, objective, motive, goals

INTRODUCTION
Although users have been interacting with computer and video games for decades, published work on gaming in the literature of human-computer interaction (HCI) has been limited until recently. Despite of this lack of research, the computer games industry has become one of the most lucrative technological and media industries, raising questions about whether the HCI community really has anything to offer the industry in terms of the advancement of games development. What HCI can provide, however, is a research base to inform design theories and methodologies to guide design and evaluation of games and player experience. Over time, methods become validated through extensive trial and testing, leading to wider use and standardization. Another sector that would arguably gain from this is simulation and game-
based learning. This is because the development of validated and standardized evaluation and design methodologies opens opportunities to: create digital games for learning based on sound design principles and pedagogical theories, integrate learning objectives, help design for anticipated outcomes, and incorporate or develop valid techniques for the assessment of learning. In addition, standardized and validated evaluation and design methodologies can inform researchers and educators as they develop their own games and strive to assess the learning that results.

It has been widely touted that the engaging and motivational aspects of video games can be incorporated with educational components to transform the way people learn and make learning more enjoyable. It is because of this that many sectors and organizations from business, health, military, to education the world over are considering the potential of serious games to support learning and to complement existing teaching materials and resources. Despite the fact that advocates of serious games and games-based learning now have the world’s attention, there remains little in the way of standardized tools and approaches for assessment of learning in serious games (Chen & Michael 2005) and little in the way of design guidelines that embrace “well-established and practical instructional theories” and “good game design principles” (Gunter, 2006). To overcome this, several researchers have argued for taking game-based learning more ‘seriously’. For example, Zyda (2007) suggests a need for “creating a science of games”, Van Eck (2007) argues for a more rigorous research approach with games-based learning, and Marsh (2007) calls for “serious approaches and methodologies for serious games”. While some propose “design dimensions” (Hendriksen, 2006) and “formal design principles”, incorporating learning theories (Gunter, 2006) for serious games, it is largely theoretical work rather than operationalized, applied and tested research.

Recently we have witnessed an increase in the number published serious games literature outside of HCI. However, rather than pursuing a complementary research and development approach much of this work focuses on development alone. Generally this involves building ad-hoc games for a specific purpose or situation, paying little attention to research that can go towards the creation of tried and tested design guidelines or tools supporting underlying theories of learning, to demonstrate a games’ learning or educational value and can generalize to a wide range of serious games learning environments.

Serious games provide designers and developers with opportunities to create activities for players and the potential to design for experience. Activities in serious games are for purposes other than, but also including, entertainment. An increasing array of categories are used to encapsulate emerging purposes for serious games (e.g., learning, training, education, health, well-being, for change, persuasion, or simply experiential). Specifically, purpose in a serious game is achieved by undertaking a number of actions in order to reach or fulfill the serious game’s objective. A flexible, powerful and rich way to represent actions in serious games is through story, narrative or scenario. While such approaches imply a narratological approach to tell a story (Crawford, 2004) and engage the player (Murray, 1997), it is also argued that they can incorporate rules (i.e., ludology, where mastery of rules leads to player engagement, Juul, 2005) or that at least narrative and rules can coexist side-by-side in a game.

This chapter describes a framework that addresses important challenges facing serious games development; namely, the creation of scenarios in such a way to also allow assessment of learning outcomes. I start by describing earlier work in scenario and scenario-based design from the HCI literature to support interaction design. This is, in many respects, analogous to storytelling, narrative, and scenario in film and theatre. Next, I will describe a framework based on extended research in activity theory and
scenario design research in HCI that generalize to many serious games purposes. The framework will then be applied to the development of a serious game. Finally, directions for future work are described.

**SCENARIO CREATION IN HCI AND FILM**

Scenarios and scenario-based design methods have a long history in human-computer interaction (HCI). Scenario-based design methods in HCI are narrative descriptions or a “sketch of use” of people using technologies (Rosson & Carroll, 2002a, p. 1032). They have been found to be particularly appropriate for interaction design, both in analyzing how future technologies shape people’s activities and in guiding the design and development of technologies that enable use experiences (Rosson & Carroll, 2002b). Crampton Smith & Tabor (2006) refer to scenarios as “the imagining of a fictional situation and its representation as a written narrative. . . storyboard, performance, or video, within which possible interactive behaviors between users and systems emerge.”

Nardi (1995, p. 393) describes scenarios succinctly as deriving from two things:

i. the inclusion of context
ii. a narrative format, as in a text narrative or storyboard

She suggests that if these characteristics are missing, then the term scenario can seem very similar to other areas of design and analysis in HCI such as, “user requirement,” or “feature,” or “test pattern,” or “system configuration,” etc.

The key advantage of scenarios as used in HCI is that they can be adapted to different styles of human practice (Karat, 1995; Nardi, 1995). While work with scenarios in HCI is usually restricted to human practice involving work and work-related activities, a key advantage arising from the flexibility of scenarios is their potential to describe a plethora of genres (e.g. learning, training, education, entertainment). Furthermore, scenarios provide a means of “embodying and communicating user experience” (Nardi, 1995, p. 396), offer “a rich view of . . . experiences of users,” (Rosson & Carroll, 1995, p. 268) and as suggested by (Nardi, 1995, p. 398), “will undoubtedly remain a part of our design repertoire as we push forward toward more theoretical means of predicting and explaining user experience”.

In spite of their flexibility, Kuutti (1995) argues that there is no generally accepted definition and their use and scope in different contexts varies drastically. He divides these varying definitions into two main approaches. The first is scenario as an external description of what a system does, for example, “to specify use scenarios that cover all possible pathways through the system functions” (Rubin, 1994). The second approach sets scenarios in a wider context. For example, this is “the ‘big picture’ of how some particular kind of work gets done” in social settings, with resources, and goals of users (Kuutti, p. 21 citing Nardi, 1992). In addition, Crampton Smith & Tabor (2006) draw our attention to a third approach elucidated in the work of Brenda Laurel, to account for the improvisational (“improv”) or unpredictable way that things occur or are played out.

It is no stretch to see how these different approaches to defining scenarios might just as easily apply to simulation, games and serious games environments. The combination of all three approaches makes scenarios potentially powerful for use in simulation, games and serious games environments. This is because of their flexibility to either cover all possible pathways or the improvisational or unpredictable
nature of interaction (e.g. to travel between two points, in the use of an artifact, or communication between characters) or the “big picture” approach focusing on context, setting, situation, resources and player goals.

Other areas where a more creative approach to scenario development is central and which games and serious game scenario development can draw upon is film and theatre. As scenarios imply temporal components or episodes, they begin to resemble the unfolding events of a film or theatrical performance.

In Carroll’s (2002) description of scenarios in HCI, we can see the close resemblance to scenarios in film and games. They “presuppose setting”, “include agents or actors” and “have a plot; they include sequences of actions and events, things that actors do, things that happen to them, changes in the circumstances of the setting, and so forth” (pp. 46-47).

The similarity between scenarios, scripts/screenplays of films or theatrical plays, and scenarios with virtual, gaming and serious games environments is further illustrated by looking at dictionary definitions of scenarios in film and theatre.

1a. A sketch or outline of the plot of a play, ballet, novel, opera, story, etc., giving particulars of the scenes, situations etc; 1b. ...A film script with all the details of scenes, appearances of characters, stage-directions, etc., necessary for shooting the film; 2. A sketch, outline, or description of an imagined situation or sequence of events; esp. (a) ...outline of any possible sequence of future events; (b) an outline of an intended course of action; (c) ...circumstances, situation, scene, sequence of events, etc. (Oxford English Dictionary 1989)

Indeed, story or script writers of early film were referred to as scenario writers. For example, D. W. Griffith, who is considered one of the leading pioneers of filmmaking, began his career by writing scenarios whose emergence marks the beginning of narrative film (Loughney, 1990). It is no surprise then, that scenarios have long been proposed as a means of representing participant actions in virtual and gaming environments by virtue of their connection to theatre (Laurel, 1993) and film (Laurel, Strickland & Tow, 1994; Pausch, Snoddy, Taylor, Watson & Haseltine, 1996).

Thus, by drawing parallels between scenarios in games and scenarios in film, theatre and HCI, a natural next step is to look to the more mature scenario processes used in HCI as well as to the creative scenario processes of film and theatre to inform scenario creation in games.

While the flexibility of scenarios makes them useful for describing human actions in wider contexts, as argued herein, this flexibility can also be a limitation in their application to gaming and serious game environments. Kuutti (1995, p. 33) suggests that one problem with scenarios lies in their ad hoc language (i.e. non-formalized and left up to the developer) and that a challenge for the future is to find “a more standard language” in which to talk about and structure scenarios. One approach to solving this challenge is to provide a standard “template” in which to describe scenarios. For example, in HCI Beyer & Holtzblatt (1998) provide five complementary models for describing work (e.g. flow, cultural, sequence, artifact and physical). However, the focus of this approach is centered primarily on work-related activities.
Another example appropriate to non-work as well as work-related activities is Kenneth Burke’s “Pentad”, (e.g., Wertsch, Del Rio & Alvarez, 1995). This approach includes agent, act, agency, scene and purpose to study human motivation through analysis of drama. While this is an interesting direction for future research, my interest in this chapter is in the extension of the hierarchical framework and concepts provided by activity theory. Indeed, Kuutti (1995, p. 33) provides support to this direction by suggesting that activity theory is a potential approach for structuring scenarios. The next section extends concepts from activity theory to provide a standard template and language in which to structure scenarios in serious games.

**ACTIVITY-BASED SCENARIOS IN SERIOUS GAMES**

Originating from Soviet psychology, activity theory has been usefully applied to interaction design and analysis in HCI because it is “a powerful and clarifying descriptive tool” (Nardi, 1996b, p. 7). However, it can be argued that the adoption of activity theory is not as widespread as it could be because it is relatively difficult and time consuming to understand in comparison to other analysis and design methodologies in HCI. Compounding this difficulty, two activity theory approaches currently co-exist: the original approach of activity theory proposed in Leontiev’s (1978; 1981) hierarchical framework of activity and Engeström’s (1987; 1990) expanded activity triangle to incorporate social/collective activity.

While essentially developing from similar roots found in the work of Vygotsky, the two approaches are different and even have “different views” for the same concept (e.g. object; Kaptelinin & Nardi 2006, p. 141). However, I argue that a clear distinction between these two approaches isn’t always made and at worse concepts from both approaches have been mixed together, and subsequently this has led to misunderstandings and confusion. A detailed account of the historical developments and the similarities, differences, and tensions between Leontiev’s (1978; 1981) and Engeström’s (1987; 1990) activity theory approaches is beyond the scope of this chapter. For an informed discussion, the interested reader is referred to Kaptelinin & Nardi (2006).

The focus in HCI has been primarily on Engeström’s (1987; 1990) approach, largely because of its expansion to analysis of social/collective activities. However, this chapter focuses on Leontiev’s activity theory approach in general, and in particular the work contained in Leontiev (1981). This is because it is arguably the most practical and operationalized theory in terms of the support for design and development of scenarios in serious games, and because it incorporates a multi-level structure providing multiple units of analysis (variable lens) that can be extended to analysis of learning. To aid the reader, each concept and feature of the activity theory-based framework will be clearly described and annotated.

As illustrated in Figure 1, central to activity theory is Leontiev’s (1981) hierarchical framework of activity composed of: activity, actions and operations and characterized respectively by objective, goals and conditions, as discussed below. The hierarchical structure is not static but dynamic with shifts between activity, actions and operations determined by situations and circumstances of the scenario.
Activity is directed towards achieving an objective as denoted by “a”. The objective is a process characterizing the activity as a whole. For example, consider a hypothetical game in which the objective is to overthrow an unscrupulous ruler. When the objective is fulfilled the activity ends. The objective is closely related to motive, and the motive is the intention that stimulates and drives a player in a game / to play a game. In our hypothetical example, the motive is to return the kingdom to its rightful heir and restore peace. In activity theory, the objective’s outcome and motive have to be considered in the analysis of “activity proper” (Leontiev, 1981, pp. 399-400). This provides the basis for framing activity for assessment. With serious games this provides the basis to reason about learning.

Activity is made up of a combination of actions as denoted by “b” in Figure 1. “Activity is what gives meaning [intention] to our actions” (Bannon & Bødker, 1991, p. 242). The action level contains the heart of the scenario, using text, graphics, storyboards, etc. to describe the game environment (e.g. settings, surroundings, circumstances), the game mechanics, and what players do. Actions are performed with conscious thought and effort, and are planned and directed towards achieving a goal. Nardi (1996) states that actions can be considered similar to what the HCI literature refers to as tasks. Objectives and goals provide units for analysis through the fulfillment of activities and actions respectively, and this informs design.

Actions may themselves be made up of sub-actions directed towards sub-goals, and sub-actions can be made up of sub-sub-actions directed to sub-sub-goals, and so on. This depends on the level of complexity that is required by the scenario. Each sub-action/sub-goal has to be fulfilled in order to fulfill the higher-level action. For example, consider an action/goal in the aforementioned hypothetical game to enter a castle. In order to enter the castle, the player first has to fulfill the sub-action/sub-goal of lowering and then crossing a drawbridge. Before lowering the drawbridge, the player has to fulfill the sub-sub-action/sub-sub-goal to find gold coins to pay the gatekeeper. The fulfillment of actions/goals, sub-

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**Figure 1. Hierarchical Framework of Activity Applied to Games:**

<table>
<thead>
<tr>
<th>a. Activity</th>
<th>motive: intention stimulating user to/within game</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>objective: characterizing activity as a whole</td>
</tr>
<tr>
<td></td>
<td>goals:</td>
</tr>
<tr>
<td></td>
<td>- planned and directed processes performed with conscious thought and effort towards the fulfilment of goals/sub-goals</td>
</tr>
<tr>
<td></td>
<td>- collective outcome of actions fulfills activity</td>
</tr>
<tr>
<td></td>
<td>- heart of the scenario is contained in actions</td>
</tr>
<tr>
<td>b. Actions</td>
<td>conditions: physical or virtual artifact use that is performed with little conscious thought and is triggered by conditions of actions</td>
</tr>
</tbody>
</table>

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actions/sub-goals and so on, not only provides an indication of task-level completion, but in serious games can also serve as an indication of learning.

Actions are performed by a combination of operations. Operations are processes performed with little conscious thought or effort in the use of physical interactive and virtual in-game artifacts triggered by conditions of actions as denoted by “c” in Figure 1. Players’ shifts in focus between action and operation levels provide an indication of learning. For example, the early phases of learning to use an artifact will have been performed with deliberate and conscious attention. At this point they are actions. When they become well practiced and experienced, actions become routine. That is, they do not need to be planned and at such a point are performed with little conscious thought or effort. In this way, actions become operations as represented by the downward pointing vertical arrow “d” in Figure 1. This provides a way to reason about the mastery of artifacts/tools. Conversely, operations become actions when something goes wrong, impedes interaction, or is associated with user-player learning. Unfamiliarity with interaction or an interface, or reflecting on the learning content of a serious game are examples of operations becoming actions. Players’ shifts in focus of attention are represented by the upward pointing lower vertical arrow “e” in Figure 1. Following the work of Bødker (1996) and Winograd & Flores (1986), this provides a way to reason about and design for “focus shifts” and “breakdown”, respectively.

Breakdown and learning may also be the cause of shifting players’ focus of attention from the virtual or gaming environment context (depicted by rectangle “h”) to the real world (denoted by the horizontal arrow “g”). The cause of this shift in focus of attention can be design problems, interruption or disruption, shifting from in-game to off-game learning actions/activities, or momentarily taking time out from interacting with the serious game to reflect/contemplate on the subject matter.

**Activity Proper: Objective Outcome Coincides With Motive as a Measure of Learning**

As previously discussed, an objective is a process characterizing the activity as a whole and is closely related to motive. According to Leontiev (1981), an activity without motive cannot exist. Whether intrinsically or extrinsically driven (Malone, 1981), motive stimulates a player to begin an encounter or to continue an encounter in a serious game. A player’s motive for playing a serious game may be, for example, “some special need”, interest, “to understand”, “to comprehend”, for fun, enjoyment, or pleasure (Leontiev, 1981, p. 36). Both the outcome from an objective and the motive have to be considered in the analysis of activity (Leontiev, 1981).

If the objective outcome of performing actions of an activity with a serious game is the inducement of appropriate and/or stimulating learning experience, the objective outcome will coincide with the motive that stimulated the player to begin or to continue an encounter. Then, in the words of Leontiev, (1981: 399-400) it is “activity proper”. Hence, the encounter is successful. When the objective is fulfilled the activity ends. On the other hand, if the objective outcome does not provide appropriate and/or stimulating learning experience then it does not coincide with motive (Leontiev, 1981). So for example, returning to our hypothetical game, if the outcome of the objective is to overthrow the unscrupulous ruler then it has been fulfilled and coincides with the motive to return the kingdom to its rightful heir and restore peace.
Stimulating experience: doing it because we want to do it

One of the interesting implications of activity theory, especially as applied to games, is that it is possible for an action to be so stimulating that it actually becomes its own activity. According to Leontiev (1981), this transformation is the result of “an action’s result [outcome] being more significant…than the motive that actually induces it” (p. 403). Hence, it can be postulated that if actions performed within serious games are stimulating enough, then players continue to engage with the game because they want to, which transforms the action itself into “activity proper” as illustrated by the upper arrow “f” in Figure 1.

This provides a way for evaluators to reason about extrinsic drives (e.g. having to learn) transforming into intrinsic motives (playing/learning because we want to) through innovative design that is stimulating. Hence, this can provide an operational definition for engagement in serious games learning environments. The implication for designers is then to design serious games that promote stimulating actions that transform into their own activities.

Summary: Hierarchical Activity-Based Scenario

To summarize, the hierarchical activity-based scenario approach provides a flexible and dynamic conceptual framework that supports serious game design, development and analysis in the following ways:

1) Hierarchical structure aids design, creation and modeling of scenarios and narratives (from high-level activities/objectives, through actions/goals to low-level operations of physical/virtual artifacts) to any level of complexity from conception to finished game.

2) Action level contains the heart or guts of the scenario, describing and representing (e.g. through text, graphic, and storyboards, etc.) what players do, as well as settings, surroundings, circumstances.

3) Concepts and framework to dynamically trace and model player behavior/acting in the scenario during gameplay.

4) Shifts in focus of attention between levels from operations to actions as represented on the bottom vertical arrow in Figure 1 help identify when something goes wrong and/or where there is problematic design (e.g. glitch or design bug), or is associated with player learning (e.g. contemplating the serious games’ subject matter).

5) Incorporates a method to frame and reason about: (i) the degree to which a game’s scenario or backstory has been successful through the fulfillment of actions/goals and objectives; (ii) the degree to which learning experience from gameplay has been successful (through the objective outcome of activity coinciding with the motive that stimulates a player to or within the game).

6) The framework incorporates a way to reason about the situation in which an action becomes so stimulating that it drives itself and transforms into an activity. This transformation is the result of “an action’s result [outcome] being more significant…than the motive that actually induces it” (Leontiev, 1981). Hence, it can be postulated that if any outcome from game-based learning is stimulating enough then, players/users do it because they want to do it.
Putting it all together: activity-based scenario support for serious game development

The hierarchical activity-based scenario approach can be used throughout the development cycle from conception to finished game. In the very early stages of design, it can be used as a guide to identify and partition processes/elements that will make up the activity (e.g. learning objective, scenario of what the player will do, actions/goals in order to fulfill the objective, etc.).

The hierarchical activity-based scenario approach can be used to support game writers, designers, and/or development teams to generate a high-level set of ideas and concepts for gameplay during or after the creation of a scenario. Fullerton (2008) provides an informative practical guide to game brainstorming, idea and concept generation. In addition, the hierarchical activity-based scenario approach can be used to guide and support students in the constructionist approach of making games to learn as opposed to the instructionist approach of playing games to learn (e.g. Kafai, 2006; Papert, 1993).

To illustrate how the hierarchical activity-based scenario approach supports the development of serious games, I describe the development of a serious game learning environment for University of Southern California undergraduate students whose major is engineering and minor is Biology. The development of the game was part of an NSF funded research project. The purpose of the game was to allow players to learn about topics from the curriculum relating to physical and biological processes of human organs.

In reference to Figure 2, the gaming scenario or backstory provided an overall motive for students to interact within the game (i.e. *help to save humankind*) by attempting to fulfill the activity’s objective (i.e. *to revive a world renowned medical research scientist from a coma so he can continue his research*) that characterizes the activity as a whole. We recall from activity theory that a successful activity is one in which the motive and objective outcome are aligned. Accordingly, for our game, the scenario would be successful to the extent that reviving the scientist from his coma (objective outcome) would allow him to continue his research to help save humankind (motive).

![Figure 2. Example showing one goal of the hierarchical activity-based scenario for a serious game](image-url)
It is important to recognize that when designing a serious game, the learning objectives of a course may or may not correspond with a game activity’s objective, depending for example on the complexity of the topics for learning and the crafting of the games’ scenarios. In our example, learning objectives for topics of the undergraduate course were carefully integrated into the game’s scenarios. Hence, the learning objectives were integrated into the high-level actions. In keeping with the scenario or backstory of the educational serious game, the high-level actions, containing the heart of the scenario as outlined in (2) above, were referred to as missions and are shown below:

- provide energy source and reactivate digestion and adsorption processes
- regulate available blood sugar and restore systems that maintain blood glucose

The fulfillment of these main goals then provides an indication of the degree to which the outcome from the objective (i.e. to revive world-renowned scientist) was successful as outlined in (5) above. Figure 2 illustrates the representation of one action-goal in the hierarchical activity-based framework. The goal to regulate available blood sugar and restore systems that maintain blood glucose involves the sub-goal of unlocking the wormhole to enter the scientist’s organs and is fulfilled by carrying out the sub-sub-goal to identify the pancreas, liver and muscle; and the sub-goal to increase blood glucose level is fulfilled by collecting glucagons, and so on. So the lowest level goal must be fulfilled first, followed by the fulfillment of the next higher-level goal, and so on, in order to fulfill the highest level goal.

As mentioned previously, actions are performed by a combination of operations. Operations are processes performed with little thought or attention in the use of artifacts both physical (e.g. keyboard, mouse, novel devices) and virtual (e.g. artifacts, objects, environment) triggered by conditions of actions (physical and virtual). Hence, using the activity-based scenario approach, evaluators and developers can dynamically observe and model player’s behavior and interactions with the scenario as outlined in (3) above. Observing and coding shifts in levels of the activity provides a way to identify disruptions, problematic design and learning. This information can in turn be used to inform design to make improvements or as an indication of learning as outlined in (4) above. Finally, as observed through observation, and confirmed in debriefing sessions, playing this educational serious game and attempting to fulfill its actions-goals was enjoyable for students. As outlined in (6) above, this provides some evidence to show that having to play this game for most students may have transformed into playing because it was enjoyable for them. Hence, in turn, it is not difficult to see that students may be learning because they want to learn through innovative serious games design that is stimulating.

FUTURE RESEARCH DIRECTIONS

There are many possible extensions and potential future research directions building on the work presented herein. One important future direction for research is the extension of the activity-based scenario approach to support design and analysis of in-game as well as off-game learning. For example, the use of serious games in the classroom in which the learning activity encompasses both the actions in the game and in the classroom. Another future research direction is the extension of the activity-based scenario approach presented herein with Engeström’s (1987; 1990) expanded activity triangle, for example, to incorporate collective play. Steps in this direction are already underway. While I have presented an activity-based scenario approach that builds on scenario development in HCI, film and theater, the integration of these approaches can be further tightened. While the activity-based scenario approach provides a way to structure text descriptions and supporting artwork (e.g. storyboards and sketches) of scenarios, future work should draw more upon the creative process of scenario development.
in film and theater to further support the creative development of scenarios in serious games. At the same time, more consideration should be given to the player as co-author in the unfolding scenario of a game.

CONCLUSION

Borrowing from film, HCI and activity theory, this chapter has described a framework, tool and approach to support scenario design and development through stages of a serious game’s life cycle. On the one hand, the framework is sufficiently flexible to support the design and development of scenarios at any level of complexity, while on the other hand it provides a standard template (i.e. activity-objective, action-goal, operation-condition, etc.) and language with which to frame scenarios in serious games. This provides a way to bridge the gap between the processes of design, development, and implementation of serious games. In addition, the framework also incorporates a variable lens for analyzing learning objectives, goals, sub-goals, and so on. The focus of this chapter is on how the activity-based scenario approach incorporates concepts to support learning, is informed by scenario-based design in human-computer interaction (HCI) and film and theater, and how it can be used to support the development of serious games.

MUST READS


TOP TEN TEXTS FOR INTERDISCIPLINARY STUDIES OF SERIOUS GAMES

REFERENCES


