

Applying simulation experience design methods to creating serious game-based adaptive training systems

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Abstract

The purpose of the present paper is to briefly introduce adaptive training systems, and describe the Simulation Experience Design Method. Adaptive training systems are serious games whose goal it is to engender communication opportunities for players to learn about their strengths and weaknesses, receive real-time in-game performance feedback, and share diverse solutions and strategies during, between, and after game play in order to update, or adapt, player understanding. The Simulation Experience Design Method extends HCI approaches to create engaging multiplayer learning experiences by focusing on how dynamic game content, roles, scenarios, and assessment feedback contribute to emergent culture. Preliminary evaluations of an earlier instantiation of serious game-based adaptive training systems employing this design method have been positive. The contribution of the present paper lies in describing how designers create rich systems of experiences for serious games and adaptive training systems by employing HCI principles and the Simulation Experience Design Method.

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1. Introduction

Game-based education and training for adult learners has a long history with disciplines such as military science, business and management science, economics, and intercultural communication. Games and simulations have been played to communicate complex dynamics with both large and small audiences, through the use of board games, cards, large scale face-to-face social simulations, small group exercises & discussions, computer simulations, or even paper-based activities to just name a few. Salen and Zimmerman (2004) define *game play* as the formal interaction that ensues when players follow rules and structures that have been designed to result in an *experience*.

Regardless of the media involved, games are aimed at engendering a variety of cognitive, sensory, and emotional experiences for players. The methods, approaches, and

techniques by which we create experiences are often referred to as *game design*. The purpose of the present paper is to introduce a method of game experience design developed by the author that was influenced by the human–computer interaction discipline and prior work on developing persistent collaborative virtual environments (Raybourn, 1999, 2004), and that over time has been imported to the development of serious games and serious game-based adaptive training systems. This approach is called the Simulation Experience Design Method (Raybourn, 2006) and is particularly useful in designing multiplayer communication-based computer games. The method was first briefly mentioned in 2005 and since has been refined considerably as the method continues to be applied to the design of experiential game-based learning and education environments such as adaptive training systems. The *Simulation Experience Design Method* is a process that addresses game design as a *system of experiences that exist within an emergent, adaptive cultural context* that the designer strives to engender throughout game play, as well as before, between, and after game play has concluded. The word

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simulation in the name of the method refers to an experience in which the role of a human, environment, or both, can be simulated.

A *serious game* is defined in this paper as the use of interactive digital technologies for training and education in private, public, government, and military sectors. For example, serious games include games and simulations for exploring interpersonal development, diplomacy, governance, health, education, management, and leadership (see www.seriousgames.org). The present paper explores the specific application of the Simulation Experience Design Method to the design of serious games such as adaptive training systems currently under development by the author and collaborators. *Adaptive training systems* are defined in this paper as serious game-based systems whose goal it is to engender communication opportunities for players to learn about their strengths and weaknesses, receive real-time in-game assessment feedback on their performance, and share diverse solutions and strategies during, between, and after game play in order to update and adapt their understanding.

Specific related subjects such as adaptive thinking and critical thinking are mentioned in the next section to provide background, but are not discussed in detail in the present paper. More detailed accounts of how to design an adaptive thinking game are discussed elsewhere (Raybourn, 2005a; Raybourn, 2006). Finally, although the focus of the present paper is on a design method for creating serious games and serious game-based training systems, the Simulation Experience Design Method may also be used to create a host of games from different genres including those mentioned in the first paragraph.

2. Serious game-based adaptive training systems

Multinational organizations including industry, non-governmental organizations (NGO), government organizations, and emergency relief organizations are confronted with uncertain times and resources to operate in a perplexing geopolitical world. These uncertain times are characterized by complex and ambiguous situations across a broad spectrum of activities. An essential element to addressing uncertainty and change is the development of appropriate competencies. Adaptive (critical and reflective) thinking and the ability to communicate effectively have been identified as important skills especially when facing change (Aldrich, 2004; Dewey, 1933; Witherspoon, 1997). These competencies are essential elements of personal and leader development and have been trained experientially with the use of serious game-based adaptive training systems that are still in use today.

For example, from 2003 to present, the author has led teams in developing interactive, serious game-based adaptive training systems for communication, critical thinking, and leadership. The teams have consisted of subject matter experts, stakeholders, game developers, instructional designers, social scientists, usability practitioners, game

designers, artists, modelers, engineers, and interculturalists. A serious game leveraging the internet-based multiplayer game called *America's Army* (directed by the US Army Office of Economic Manpower Analysis) and designed using the simulation experience design method has been in use by the United States Department of the Army John F. Kennedy School since 2004. A full description of the particular instantiation of the adaptive training system mentioned above, preliminary user self-assessments on learning, and usability feedback on the classroom-deployed product is available elsewhere and therefore will not be discussed in detail here (Raybourn et al., 2005). Design examples from more recent instantiations of adaptive training systems currently in different phases of development are provided in the following sections.

2.1. Adaptive training system general design description

Complex problem solving approaches such as critical thinking, conflict mediation, and planning in stressed environments are often best learned experientially through face-to-face exercises, role-plays, or live action simulation. Since live action exercises are costly in terms of time, human resources, and funding recent advances in interactive digital technology offer exciting ways to augment more traditional methods of experiential learning and classroom instruction. As mentioned above, an application area for serious games is adaptive training systems. *Adaptive training systems* (defined in an earlier section) are concerned with the entire system of interactions (among humans, avatars, software agents, AI, cognitive models, etc.) that are relevant to the creation of experiences in serious game-based learning. The system of interactions may range from metagame pre-game play, to game play, to giving and receiving real-time in-game performance feedback, to the conversation held between and after game play whether informally or during structured debriefings, or after action reviews (Knerr et al., 2002). An after action review (AAR) typically allows instructors and students to critically review the decisions made and actions taken during game play.

The general design of an instantiation of adaptive training systems could include any or all of the following as component elements of a larger system experience or as stand alone serious game experiences: (1) single player game that addresses-specific training objectives, (2) multiplayer games that address-specific training objectives, (3) real-time, in-game feedback or assessment functionality, (4) computer-based after action review system, and (5) instructor or stakeholder authoring functionality. The general design components of adaptive training systems are briefly described below. Subsequent sections further describe how HCI techniques and the Simulation Experience Design Method were employed in the general system design to achieve the desired system of player experiences.

2.1.1. Single player game

A scripted single player game can often serve as a tutorial for novice players to navigate the game space, practice using controllers, or perfect keyboard commands. In an adaptive training system single player game structures can also be used to introduce complex problems and training objectives that the player will encounter in the multiplayer game. For example, training objectives that have been addressed by single player games in the adaptive training systems include understanding leadership hierarchies, gathering evidence from disparate sources to solve a mystery, or practicing communication strategies. Since by definition a single player competes and/or cooperates with a game system, the designer must carefully consider the interactions between the game system and the player in order to design a believable experience (Fullerton et al., 2004).

2.1.2. Multiplayer game

Adaptive training system instantiations have incorporated non-scripted multiplayer games tailored for use in or out of the classroom. In some cases, up to 32 players may be supported in the game at the same time (includes 1 instructor, and 31 roles for any combination of role-players or peer/instructor feedback evaluators). As the adaptive training system has been used to train more effective communication skills, such as building interpersonal rapport, and developing negotiation skills, role-players usually comprise two teams of 8–10 persons each, while the rest of the players (anywhere from 10 to 20) take on non-speaking peer/instructor assessment feedback evaluator roles. Role-players use headsets with microphones to communicate and interact with others during game play. Both private team communication VOIP channels and public channels are available for instructors and role-players. Role-players' voices are masked to preserve player anonymity. The instructor is able to communicate with each team privately, broadcast to all on a public channel, or participate in text chat with persons who are evaluating the game play. Due to the highly interactive nature of the communication training, we have found that it is best to design experiences for small groups that can switch roles at least three times to play different roles of different teams, and peer/instructor assessment feedback evaluators. Role-players have different training objectives and roles that are often in conflict or cooperation with each other (Raybourn, 2001). Through communicating with others and the game's physical environment, each player learns to strategically interact with others, notice cues in the environment, and exhibit leadership skills in ill-defined situations such as determining the credibility of a source of information, performing engineering safety assessments in the absence of complete data, or understanding high level decision making for inter-agency catastrophe management.

2.1.3. Real-time in-game assessment

Adaptive training system design includes a Sandia Labs proprietary method of capturing real-time in-game assess-

ment and feedback from instructors, subject matter experts, or peer learners (Raybourn, 2006). During game play, some players are practicing their analysis skills by evaluating what is transpiring in the game scenario. An easy to use interface allows them to both quantitatively and qualitatively evaluate individuals and teams. Statistical analyses are performed on the assessments provided by each person in the role of peer/instructor assessment feedback evaluator and displayed from the after action review system. Instantiating real-time assessments & feedback as part of the training tasks build metacognitive skills such as analyzing and assessing decision making processes (Raybourn, 2005a, 2006).

2.1.4. Computer-enhanced after action review

Not all serious games feature after action review (AAR) capability; however, its inclusion in the total learning experience is critical (Knerr et al., 2002). The AAR which is part of adaptive training systems allows for computer-enhanced reflection via playback of recorded time-stamped, synchronized sound and game play, and display of real-time, in-game assessment and feedback (Raybourn, 2005b). Reviewing the recorded game play performs important cognitive and metacognitive functions that are imperative to solidifying the learning experience, incorporating feedback, and updating understanding that can be demonstrated in subsequent game play. The adaptive training system computer-enhanced after-action review allows instructors to bookmark events, and replay events while adopting diverse camera viewpoints such as flyovers, or by tracking individual players to see what they saw during game play (see Fig. 1). Frequency statistics on actions taken are performed, as is the display of real-time statistical assessment measures on individuals or teams (Raybourn, 2006). Individuals and teams can be traced by tracking actions performed, and snail trails (tracking where someone has been). Actions logged by the computer-based training system are later viewed in a drop-down list and may be filtered, printed, or used as talking points during the after action debriefing.

2.1.5. Instructor and stakeholder authoring

Finally, instructors create dynamic content/actions for scenarios in real-time or a priori through a scenario authoring interface. By introducing content in real-time the instructor can influence the actions taken by role-players in the scenario. This helps the instructor create opportunities for adaptive thinking and the demonstration in communication or leadership skills as the situation dynamically changes and becomes more stressful. Examples of introducing real-time content in the game include placing objects or clues in diverse locations for players to find, and initiating scripted events such as interactions with non-player characters. Instructors may modify textual content a priori to create scenario variations or new ones altogether.

In summary, the objective of adaptive training systems is to create immersive digital game-based experiential sys-



Fig. 1. Example instructor viewpoint during AAR.

tems in which players update understanding to create new knowledge via experiences that hone their critical thinking, communication, and leadership skills (Raybourn, 2005b). Recall that the adaptive training systems are serious game-based systems whose goal it is to engender communication opportunities for players to learn about their own leadership strengths and weaknesses, receive real-time in-game feedback on their performance, and share diverse solutions and strategies during game play and between sessions in order to update their understanding. For these reasons, utilizing a combination of HCI principles with the simulation experience design method extends adaptive training system design beyond traditional notions of serious games, game design, or even game play to include a *design cycle of system experience*. This design cycle of system experience is a core element of adaptive training systems and is further discussed in subsequent sections on the Simulation Experience Design Method.

3. Simulation experience design method for serious game-based systems

The Simulation Experience Design Methodology is based on HCI experience design principles that have been modified to include the design of serious games and game-based adaptive training systems. HCI experience design solutions require that designers understand what

makes a good experience first, and then translate these principles, as well as possible, into the desired medium without the technology dictating the form of the experience. Experience designers strive to create desired perceptions, cognition, and behavior among users, customers, visitors, or the audience. The simulation experience design method lies in purposefully weaving players' interactions with all entities and variables in the game environment in order to guide certain experiences. The system of interactions executed in the game guides players to experience the effects or consequences of behaving and feeling in certain ways. One's game play experience is unpredictable, and has no right or wrong approach. Thus the simulation experience design method focuses on creating problem-solving opportunities in an open-ended, rich system of experiences.

The Simulation Experience Design Method employed today to the design cycle of a system of experiences in the adaptive training system also has its foundations in interaction design persona development (Cooper, 1999), social-process simulation game design (Gredler, 1992), and in a framework first introduced by the author in 1999 for the design of multicultural collaborative virtual environments, adaptive community-based intranets, and intercultural agent-based systems (Raybourn et al., 2003, 1999, 2004). In earlier instantiations of the 1999 framework called "Designing from the Interaction Out" the author

focused on how designing user supports for cross-cultural discovery by way of interactions, narratives, how communication defines a place, and how user co-created emergent culture could result in more intrinsically motivating virtual environments that in turn engendered more equitable intercultural communication (Raybourn, 2004). In the present paper, the author extends the “Designing from the Interaction Out” framework to include an overlay of the simulation experience design of serious games and game-based adaptive training systems as well as HCI principles and social-process simulation design.

The “Designing from the Interaction Out” framework suggests that supporting equitable intercultural communication is comprised of several salient elements, among them (1) the type of communication, or interaction (interpersonal, group, etc.), (2) the place, or context, in which it occurs, (3) the narratives that are co-created and negotiated by the interlocutors, and (4) the culture that emerges from the communication event (Raybourn, 2004). Following the framework, design tasks may then be considered as a cycle from interactions to emergent culture, and then on to new interactions that are spawned by emergent culture, and so on. The framework is focused on improving the quality of equitable intercultural communication in collaborative virtual environments (Raybourn, 2004).

The Simulation Experience Design Method overlays the elements of the initial “Designing from the Interaction Out” framework to become: (1) dynamic content creation and the development of personas and roles in the interaction phase, (2) the addition of scenario design to the narratives that are co-created by players, (3) the physical game environment as contributing to the sense of place, and (4) the creation of emergent culture that arises from updating one’s understanding due to receiving and giving assessment feedback evaluations during, between, and after game as supported by computer-enhanced after action review (Fig. 2). Now, following the Simulation Experience Design framework for serious game design, we can consider the design cycle in terms of a *system of experiences* that the designer strives to engender throughout game play, between games, and after the game play has concluded. The Simulation Experience Design framework is focused on improving the quality of experience in serious games and game-based systems and utilizes a variety of techniques toward that goal. Thus, HCI principles and social-process simulation techniques used in the design of adaptive training systems are discussed in the context of relevant phases presented below.

3.1. Interaction as dynamic content, personas, and roles

The Simulation Experience Design Method incorporates the “Designing from the Interaction Out” framework (Raybourn, 2004) as a base for designing serious game-based adaptive training systems. Now in addition to creating opportunities for engaging communication interactions a designer also focuses on setting the stage for players to

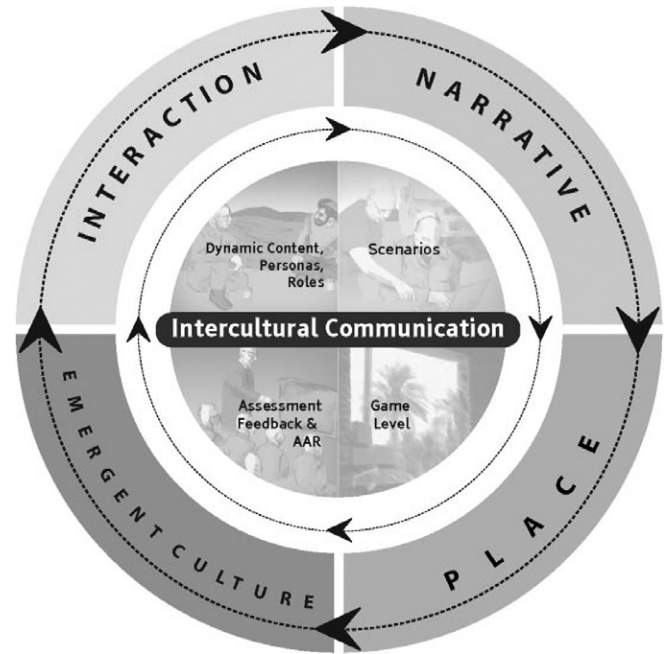


Fig. 2. Simulation experience design framework.

experience the game structure and each player through dynamic content and interdependent roles. In a multiplayer game setting interactions with others can be guided to occur by introducing content that is dynamically placed by the instructor (in real-time) in the game environment as well as a priori. For example, an instructor may change the direction of the outcome of an interaction as well as introduce conflict by hiding resources from some players and placing them in obvious places to be found by others. Alternatively, an instructor may guide players to cooperate by making scarce the resources that players commonly desire. The content provides the backdrop for certain communication events to occur. In the course of the interactions facilitated by game content, players then co-create a narrative that is consistent with the game environment and roles.

Designing roles for serious games presents an additional challenge in that the roles are often a reflection of real lives. As such, there is also a player expectation in serious games that not only the roles are realistic, but also that the outcomes are as well. Therefore to assist in designing compelling real life roles a designer may choose to use the HCI “persona” methodology. Personas are hypothetical archetypes used to identify the needs, objectives, and characteristics of a single user in a scenario, and therefore focus design goals on specific attributes (Cooper, 1999). Instead of referring to an unidentified “user” in a scenario, a specific persona can be constructed to guide the design process. The HCI method of developing personas can assist game writers and game designers who are writing realistic or believable roles for players. Designers can use personas to guide the development of character arcs, or determine reward structures (see Freeman, 2004). As designers use

personas to pay closer attention to the perspective that players may be playing from and what they bring to the table – richer roles are created to enhance game play. For example, in using personas to design roles for adaptive training systems we identified several critical mindsets and expectations from which our players would engage the system: (1) above all, the roles and scenarios had to reflect detailed, credible real-world situations, (2) the system experience had to be high adrenalin enough to engage first-person shooter genre gamers, and (3) there had to be an opportunity for improvisation within the role and the game environment – or there was a strong desire to not be boxed into poorly conceived game mechanics.

3.2. *Storytelling through narratives and scenarios*

Supporting narrative in computer-based systems is essential (Murray, 1997; Crawford, 2005). Players co-create narratives around the roles and scenarios that have been written to support game play. Through thoughtfully designed interactions, roles, and scenarios players both discover and enact a story that may progress linearly (cause and effect), use symbols, and metaphors to enhance intrigue, or create associative relationships and linkages among signs, patterns, objects, and strategies (Wells, 1998; Gee, 2003). Scenarios may be written to highlight the subtext of interdependent, yet conflicting roles, or reveal hidden information that only certain roles possess. An example of how players co-create narrative reality in adaptive training systems is brought to the forefront when important details are privy to some or one player's character, but not all. At the conclusion of game play, during the after action review, the group can see how closely their co-created narratives align with intended outcomes and learning objectives hidden in the scenario, roles, and characters.

Through the use of social-process simulation design techniques the designer further focuses on various human interactions involved in pursuing social or political goals (Gredler, 1992). As players role-play, they may experience frustration, pride, rejection, acceptance, cooperation, conflict, anger or a host of other emotions. Players might empathize with others' emotions and put themselves in others' shoes in order to adapt and update their situational understanding (Freeman, 2004). Therefore, one important component of social-process simulations is to explore the origins of emotional reactions and their relationships to the larger sphere of human experience and its impact on decision making. Another important aspect of social-process simulation design is to challenge existing beliefs. The designer can create scenarios which compel players to take particular actions that challenge their own assumptions and create dissonance or conflict among other players. During game play, players may realize that conflict negotiation and mediation will allow them to successfully arrive at solution. Finally, it is through group discussion, self-assessment and feedback that the players reach the learning objective (Gredler, 1992). Scenario design that is based

on social-process simulation and intercultural communication techniques for adaptive training systems can guide players through falling into the trap of assumption and stereotype, and working past the pitfalls through mediation and feedback, toward the goal of exercising adaptive, critical thinking.

3.3. *Game levels and environment as contributing to sense of place*

A game environment, or level, is a structure within which players experience the game play that has been designed (Fullerton et al., 2004). Integral to the design of game levels is the use of audio cues, visual artifacts, interactive objects, the interplay among objects and the environment, lighting, hidden information, and more. Game levels contribute to a player's sense of place by reinforcing attributes of the interactions, roles, and narratives in the space. Reinforcing a player's notion of place is critical in serious games and serious game-based systems since the requirements for realism and credibility may be greater. Not only must the designer account for the player's prior real-life knowledge about the environment in question, but she must also allow the player to see himself and others as credible role-players existing in, and part of the place they have contributed to through their interactions.

For example, in the game level design of adaptive training systems players role-play in culturally relevant environments that are comprised of culture-specific audio cues and artifacts that have been very carefully researched for realism and believability. Players' sense of place is reinforced by appropriate object (characters, vehicles, and organic environment) behaviors. For example, narratives are supported by encouraging players to perform actions they would normally in real life such as drive vehicles, exchange objects or see the physical consequences of actions. Another example in adaptive training systems is the design of solitary places where teams can be out of view to plan actions they will take in the game. Supporting this narrative activity has proven to be quite effective in facilitating players' decision making and strategic planning.

Finally, integral to the design of place is allowing players to contribute, and develop ownership for the artifacts, narrative, and the environment that comprise a place (Raybourn, 2004). Allowing each person to actively contribute to the development or design of a place through narrative, by manipulating objects, or changing the environment enhances the game play experience. In other words, players co-create outcomes as well as discover their characters' identities through interaction with and in relation to others and their environment.

3.4. *Emergent culture as updating understanding with real-time assessment feedback*

Designers can create more motivating serious games and game-based adaptive training systems by designing for

learner discovery experiences before, during, between, and after game play. How games interface outside of game play is referred to as a *metagame* (Salen and Zimmerman, 2004). The time before, between, or after game play is ripe with metagame activities such as reflecting on strategy, discussing in groups what happened previously during game play, sharing stories and lessons learned, and training. These activities are part of the serious game experience and in the present paper are treated as components of the total game system experience. Supporting metagame activities is a critical component of adaptive training systems design since it is indicative of a systems approach to experiential learning that includes the role of real-time in-game assessment feedback to update one's understanding, and subsequent contribution to the emergent culture.

The after action review (AAR) process is an activity that also supports metagame experiences. Adaptive training systems incorporate a computer-enhanced AAR process that is actually designed to be an important facet of the game play experience. But the AAR in and of itself is not the only mechanism for facilitating emergent culture that has been designed for adaptive training systems. Another factor that is unique to adaptive training systems is the design of the assessment and feedback evaluation experience (Raybourn, 2005a, 2006).

The assessment and feedback evaluation experience is one way to guide learner in-game discovery as well as metagame reflection. The author has designed opportunities for players to contribute to the culture emerging during game play either through direct participation or silent real-time assessment and reflective analysis of the actions taken or decisions made during game play. For example, in developing adaptive training systems, the author instantiated a method in software for peer or instructor assessment feedback evaluators to participate in the culture that emerges during role-play with real-time, in-game feedback assessments that are discussed during after action review debriefings.

The patent-pending method generally consists of providing an opportunity for feedback assessment evaluators (peer trainees, subject matter experts, instructors, etc.) to provide in-game assessments of objects and actions taken, (including communications) as they occur in real-time (Raybourn, 2005a, 2006). The assessment process relates to intended training principles and learning points. Assessment feedback evaluators provide assessments that correspond to logged, time-stamped events. Statistical analyses are performed on the individual and group assessments. The assessments are displayed either in realtime (i.e. team assessments) or during the after action review (i.e. individual assessments). As players perform this task, they reinforce the skills needed to be adaptive critical thinkers as well as provide an assessment perspective never before made available in games or serious game-based training systems. Real-time, in-game assessment allows for emergent culture to occur during game play in the form of analyses and evaluations on the actions taken, and between and

after game play during the after action review session in which players and instructors review the course of the game play, lessons learned, and outcomes in a large group setting. Players and instructors discuss alternatives not taken by the role-players that may be equally valid and serve to expand the set of solutions update and adapt their understanding for the next game session.

4. Serious game deployment in the classroom

It has been demonstrated that adaptive training systems may be easily designed for deployment in a classroom setting in which to maximize the entire system of experience with a large group. Previous instantiations have been used in sessions lasting one hour or so for over a period of three days to one week in order to allow individuals to experience the single player game, and several roles and scenarios of the multiplayer game. After and between each session, an after action review is recorded and later played back during discussion in which players update their understanding through active participation and reviewing feedback.

Adaptive training systems augment and enhance classroom curricula by building on traditional instruction and classroom activities. The use of serious games or virtual training systems does not replace education and training efforts currently underway – instead these efforts are leveraged and reinforced. For example, initial feedback on an earlier instantiation of an adaptive training system's classroom technology adoption collected from 51 players has been positive (Raybourn et al., 2005). Players reported being engaged with realistic scenarios that were grounded by credible experiences and they reported that they believed they learned more about their strengths and weaknesses by participating in the game than they would have learned had they not participated. These results are preliminary, however, and further study is required. A description of an earlier instantiation of classroom deployment feedback is available elsewhere and therefore not discussed in detail here (Raybourn et al., 2005).

5. Future research

There are several research directions on the horizon. First, due to dynamic organizational changes characteristics of many training environments, gathering quantitative longitudinal or empirical experimental data has proven to be a challenge since the first instantiation of adaptive training systems was deployed in 2004. Nevertheless, we would like to further measure the effects of adaptive training systems on learning, and track the skill development of the players of our system and transfer of training as they return to their work sites.

Additionally, while most of the current feedback we have collected is focused on player attitudes, self-report, and focus group usability feedback of a particular instantiation of adaptive training systems, we intend to gather

future feedback on the method itself. We are interested in determining the extent to which the methodology allows designers to create systems of experiences that foster intercultural discovery, emergent culture, and successful adaptive understanding. We only have preliminary quantitative data at this time that suggests that players felt they had learned about their strengths and weaknesses by playing the game. Further unpacking this notion to tell why players felt this way is of great interest.

We intend to further refine each of the elements in the simulation experience design method cycle with further research in particular by testing the efficacy of the method in designing serious games of different genres. By changing game genres, how do players' expectations change with regard to interactions, narrative, and emergent culture? We will also evaluate whether our design of training principles tied to in-game assessments helps guide participants to have "aha" experiences in context. Finally, related research questions include, how would the use of highly interactive non-player characters in protagonist or antagonist roles and the serious games growing requirements for realism affect the design emphasis? And, how will the method need to evolve over time as players' expectations of experience, fun, learning, and challenge shift or change?

6. Conclusions

In conclusion, the Simulation Experience Design Method treats an entire serious game or game-based adaptive training system as a system of experiences that occur in an emergent, adaptive cultural context that continually changes as player understanding is updated and incorporated back into game play. We have observed in practical use and through user anecdotal feedback and preliminary data that the Simulation Experience Design Methodology supports the goals of adaptive training systems: to (1) engender communication opportunities for players to learn about their strengths and weaknesses, (2) receive real-time in-game assessment feedback on their performance, and (3) share diverse solutions and strategies during, between, and after game play in order to update and adapt players' understanding. The Simulation Experience Design Method supports the goals of serious games and game-based adaptive training systems by providing designers with a coherent framework and corresponding design cycle with which to conceptualize the *experience* design process for computer games. The methodology incorporates aspects of serious game design, social-process simulation, HCI experience design, and interaction design personas. Finally, by treating intercultural communication as a core value, the individual cultural backgrounds the players bring to their experiences are considered strengths, not design liabilities.

As we strive to create engaging serious games, differing cultural values of designers, developers, stakeholders,

and players create a myriad of complications and competing desires or expectations. Designers can mitigate frustrations and design serious games and serious game-based adaptive training systems for improved multicultural interactions by fostering a climate of cultural sensitivity in their own design teams (Mudur, 2001). Additionally a community-based culture of understanding that updates with new contributions from individuals will in turn engender an emergent culture of thoughtful participation, increased risk taking (due to the creation of a safe learning environment), and sharing of novel solutions. Supporting these design details at the system level will eventually make their way into game-play and finally into co-created narratives that players can take with them out of the game and into real life.

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