

## Chapter XXII

# Modding Neverwinter Nights Into Serious Games

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*“Ludologists love stories, too.”*

—Gonzalo Frasca (2003)

### ABSTRACT

*Game Modification, or Modding, is a unique and valuable way of learning with digital games as well as a means to earn beginners' stripes in the game design world. Beginners who emerge successful from a modding experience, having created at least one playable game, have stepped out of the comfort zone of being gamers, and shown the courage in taking on a real-world adventure. Their rewards are altogether different from having beaten the toughest boss in a game. A team of modders share a unique bond with one another as comrades, as members of a fellowship. It is an experience found, not in the retelling of ancient epics by others, but in the making of one's own adventure. This chapter is an account of one such undertaking that shows the potential and value of game modding for education. Readers who are contemplating the use of game modding for creating serious games should find the chapter useful.*

### INTRODUCTION

School teachers and video games have something in common. People can usually remember their favorite teachers and what they have done; similarly, avid gamers are often able to recount their

favorite video games and their favorite moments of playing. In the 30 years of video game history, titles such as *Castlevania*, *Final Fantasy*, and *The Legend of Zelda* were extra special because they were able to capture the hearts of many players through a blend of memorable plots and game

play. A number of games employed cinematic “cut-scenes” during game play that added realism to the game world and heightened players’ emotions. It is small wonder that these titles quickly outsold other games upon release.

Although many of these video games are of eastern (Japanese, in particular) origin, this did not mean that westerners were no good at storytelling. Bioware, Inc. based in Canada, is a video game company that prides herself on delivering “the best story-driven games in the world” to her customers (per company vision statement). Those who have played games created by Bioware (such as *Star Wars: Knights of the Old Republic*, *Jade Empire*, and *Mass Effect*) will readily attest to the memorable plot twists in these epics. (We have purposely chosen words like “written” and “epics” in attempt to describe the games created by Bioware, Inc., to commend their story-driven approach to making games.)

Among the titles developed by Bioware, Inc., it was *Neverwinter Nights* (hereafter, *NWN*) that received the highest acclaims. The games saw several official expansions and premium packs by Bioware, and other third-party developers since its debut July 2002. Although *NWN* have to be classified as an “old” game by the video game industry standard in 2008, it continued to receive strong support from the *NWN* gamers’ community. Apart from a good narrative, the success of *NWN* has much to do with Bioware’s decision to share the game development kit (GDK)—also known as the Aurora Toolkit—with the gamer community at large. Anyone who purchased the game immediately gained access to the GDK that was distributed on the *NWN* game discs.

The dissemination of the GDK to the *NWN* gamers community not only allowed the owners to create their own game content using the 3D models and resources available but also opened up the world of video game creation to casual players. Any *NWN* player with the will to learn the GDK could potentially become a (self-hired) *NWN* developer. As gamers learned how to make

new game contents and shared these “home-brewed” modules with other gamers, more players became motivated to do likewise. According to the Bioware website, over 3 million copies of *NWN* were registered and nearly 5000 “home-brewed” *NWN* modules have been created from since 2002 (as of May 2006). Put in another perspective: anyone who had purchased *NWN* gained instant access to 5000 playable games instantly with a single payment of \$20! [**Note:** new game contents created using the Aurora Toolkit could only be played using a compatible game engine, in this case: *NWN*.]

### Game Modding

The idea of making video games by modification (or game *modding*) is in the same vein as constructionism, or “learning by building” (Harel & Papert, 1991; Kafai, 2006; Kafai & Resnick, 1996). Whether it is in relation to game playing (Papert, 1993; Turkle, 1984), or game making (Kafai, 1994; Rieber, Luke, & Smith, 1998), the theory proposes that students attach meanings to constructed artifacts (Blumenfeld et al., 1991) in order to make sense of their own learning; in contrast to performing classroom exercises that are typically disconnected from everyday lives (Papert, 1980). When students knew the fruits of their labor (created artifacts) could be used, not for grades, but for a purpose—be it a competitive event, or showing off to friends—they became more interested and were motivated to go the extra mile in the learning process.

Wikipedia defines *mod* (or *modification*) as “computer games, especially first-person shooters, role-playing games, and real-time strategy games... made by the general public or a developer, and can be entirely new games in themselves. They can include new items, weapons, characters, enemies, models, modes, textures, levels, story lines, music, and game modes... Mods that add new content to the underlying game are often called partial conversions, while

mods that create an entirely new game are called total conversions.” [[http://en.wikipedia.org/wiki/Mod\\_\(computer\\_gaming\)](http://en.wikipedia.org/wiki/Mod_(computer_gaming))]. The term is used in this chapter to mean creating entirely new game, or *total conversion*.

The phenomenon of game modding has been replicated many times over with game titles such as *Halo*, *Diablo*, *Titan's Quest*, *Unreal*, *Doom*, *Half Life*, *Company of Heroes*, and *Neverwinter Nights*; and from PC games to console games (e.g., Geddes, 2007). A number of online repositories were available through professional game sites for the distribution of “refillable” game contents to game owners: e.g., Neverwinter Vault (<http://nvwault.ign.com>). Because of the issue of intellectual property, game modules (or *mods*, for short) made by the gamer community from a commercial GDK must be distributed freely without cost. Yet, despite little monetary return, modders were happy to spend time in learning the GDK and to create new game contents for free. Over the years, making new game contents through modding using official GDKs (and in some cases, game editors) gradually became a second reason for gamers to buy games. Gamers understood that the GDK they had in their hands was the same tool used by the developers to create the original games. Hence, an official GDK that cost approximately \$50 is a very economical and reasonable means for gamers to experiment with game making. In contrast, a commercial game engine could cost several thousands of dollars (e.g., Unreal engine was priced at \$350,000)!

Non-gamers and occasional players may find the endeavor of game modding to be a “time sink” because amateur modders must first expend many hours in learning the GDK before they are able to mod a playable game. Nevertheless, those enthusiastic enough to take the challenge often find the learning experience worthwhile, learning many things in the process. Game modding often calls for a whole range of skills, ranging from programming to graphic editing, storytelling, video making, sound recording,

summarizing, conversation writing, scripting, and keeping a sense of humor! Many modders end up collaborating in small groups, and learn important people skills as they work together as a team, sometimes under tight deadlines. In rare occasions, modding teams might enjoy moments of fame when game publishers retailed successful mods as official expansions of the original games—as in the case of *Counter Strike*, which first originated as a *Half-Life* mod. These are but a small subset of benefits already described by researchers in regards to collaborative learning (e.g. Johnson, Maruyama, Johnson, Nelson, & Skon, 1981; Rysavy & Sales, 1991).

New modders also derive instant satisfaction out of becoming involved in the community. Since experienced modders were once “new beginners” (i.e., newbies) themselves, they are understanding and more than willing to lend a helping hand to other newbies in need. Thus, the modders community tends to be very helpful to one another. Some of them even collaborate on “modding guides” for newcomers, and acted as the “kind Samaritans” within the modder community to help troubleshoot for the less experienced members.

## **Game Modding as a Learning Tool**

Can game modding become the next viable “Mindtool” (Jonassen, 2000) in education? We are seeing that: (1) a large majority of students or young people play video games, and many families already have the necessary hardware to do so, (2) as digital game based learning becomes increasingly popular, there is a groundswell of interest from students and teachers to introduce video game playing as a means of learning, and (3) there is an on-going initiative to create more educationally friendly video games suitable for learning in classrooms. Nevertheless, educators in colleges and schools are unlikely to: (1) find the time and resources to make their own (serious) games from scratch—start from building a game engine, (2) have the financial support to

purchase a highly priced commercial game engine, and (3) commit to “moonlighting” a game development project apart from their day jobs and family-lives. One should not suppose that: (1) game companies would begin to churn out serious games in the same capacity as games-for-entertainment, (2) game developers would begin supplying serious games at a very low cost (or even free) to educators for altruistic reasons, and (3) universal GDKs that were as easy to use as PowerPoint would become available for public use. Hence, game modding seems a logical and viable choice, because it is far more likely for teachers and educators to: (1) become familiarized with the game modification concepts and skills through weekend workshops, (2) form in-house development teams through partnership with student bodies, social clubs, non-profit organizations, and special interest groups, and (3) promote game modding as an extra-curricular activity (ECA) to interest more students to participate in competitions and for fun.

Like many NWN modding projects in the past (e.g. Berger, 2006; Carbonaro et al., 2005; Robertson & Good, 2005; Szafron et al., 2005), our experience confirmed that it is indeed suitable for college undergraduates and high school students. Other educators have reported similar success stories with other GDKs with at-risk children and younger elementary school students (see BBC, 2004; Pepler & Kafai, 2007; Wyeld et al., 2007). By working together in teams with regular brainstorming sessions towards a common goal, members of a mod team learn precious social skills, such as listening to one another, critiquing one another’s idea with respect, and striving towards the common good; not to mention logical thinking, communication, negotiation, public speaking, and even basic computer programming skills. The process of game development, beginning from the conception of a story, to narrative writing, to turning their ideas into a fully playable video game, becomes an exhilarating and motivating learning experience, in and of itself.

## **GAME DEVELOPER POSTMORTEM**

The Game Developer magazine describes a “game developer postmortem” as follows: “*Your game has been completed, and you are documenting what went right and what went wrong along the way. Hopefully the lessons you learned along the way will be communicated to others so that they can repeat the successful parts of the development process, and avoid the pitfalls you encountered along the way.*” [Available: <http://www.gdmag.com/postmort.htm>] Why the term, *postmortem*? Just like medical coroners reveal the cause(s) of death through real-world postmortems, game developer postmortems allow other developers to understand what happened to a game during production. While some readers might find it unsettling to consider shipped games as being similar to cadavers, the game development community viewed these postmortems as important lessons based on real-world cases for future development (e.g. Fraser & Wardell, 2008; Grossman, 2003; Schaefer, 2000). The rest of the chapter is written not as an academic report, but a game developer postmortem of the serious game, *Saving Adryanee*. The game won a Finalist entry to the 2<sup>nd</sup> Annual Serious Games Showcase & Challenge (SGS&C) which took place on site the Interservice/Industry Training, Education Conference (I/ITSEC) from Nov 26-29, 2007 in Orlando, FL.

The SGS&C was a serious game competition co-sponsored by Autodesk and I/ITSEC [<http://www.sgschallenge.com>]. The development team of *Saving Adryanee* comprised of 4 members: an instructor (Loh) and a doctoral student (Byun) from the Instructional Technology program, a master student from Computer Science (1<sup>st</sup> programmer), and an undergraduate student from Electrical Engineering (2<sup>nd</sup> programmer), of the Collaboratory for Interactive Learning Research (CILR) of Southern Illinois University Carbondale. Although it took the team just over two months to create the NWN mod, *Saving Adryanee*, the actual learning journey of game modding had

begun much earlier. (A detailed timeline is available at the end of this chapter to provide readers with a different perspective.)

We, the developers, hope to take you, the readers, on a journey of game development and provide you with an insight of what worked and not worked for us in our project. Special sections entitled “Lesson Learned” highlight the important lessons which we considered useful for those of you who might be interested in trying or taking on game modding projects in the future.

### **The Beginning: Arecibo Valley (The Draft)**

Our modding adventure first originated as Byun’s final project for a workshop on video game modding (with Bioware’s Aurora Toolkit) in summer of 2006. Although the objective of the class was to create a game (and not an educational game, specifically), Byun was interested to see if he could create an educational game out of the commercial GDK. He soon realized that it was extremely difficult to find a fit between classroom subjects and video games due to the disparity in their purposes: one for teaching, and one for entertainment. This changed when he came across an article about learning the chemical elements using a 1974 NASA project called, “Arecibo Interstellar Message.” Five chemical elements, namely: Oxygen (O), Hydrogen (H), Carbon (C), Nitrogen (N), and Phosphorus (Ph) were taught in that lesson. Byun went on to create a story where the player must learn about the 5 chemical elements, in order to save a girl living in Arecibo Valley.

In this story, a girl named Adryanee was suffering from an unknown disease that could only be cured by a special potion made from the 5 chemical elements: O, H, C, N, and Ph. The player must embark on a simple quest to find the elements and then have them made into a potion by a wizard. For example, water ( $H_2O$ ) from a well would provide the elements of Hydrogen (H) and Oxygen (O), while tree branches would

contain Carbon (C). To make the story more interesting, Byun suggested creating two different potions based on the sources of the elements: a super potion and a regular potion. For instance, diamond would be considered a pure form of C necessary in creating the super potion, whereas a burnt branch would be a common form of C that would yield a regular potion. Should the players return to the wizard with five chemical elements in their purest forms, the wizard would be able to create a “super potion;” otherwise, a regular potion would be made. Based on the potion received, the players would experience a different ending. If the player gave Adryanee a regular potion, she would be healed and reward the player with some gold and experience points. However, a second (surprise) ending would be shown to the player should they heal Adryanee with a super potion and she would be return to her true form: a friendly alien! The alien would thank the player for helping an interstellar friend, before being taken away by a spaceship.

### **The Verdict**

Byun’s classmates viewed the story of Arecibo Valley and the surprise ending favorably. Most of them found the story to be unique and interesting, and furthermore, has a distinct educational element for the teaching of science. However, his instructor pointed out that it might not be possible to create the mod because Aurora GDK did not include any spaceship or alien models in its library. In addition, the role-playing fantasy genre of NWN might make the spaceship and alien seemed out of place in a medieval setting. Although the different endings were highly innovative, it would require additional creative programming skill, a commodity that was sorely lacking at that time. In the end, the mod remained unfinished because (1) the summer workshop was quickly coming to an end (lack of time), (2) there was no UFO or alien model in Aurora Toolkit (lack of game resources), and (3) none of the students

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in the class had enough programming/scripting skills to help Byun create the two different endings (lack of programming skills).

The medieval setting of *NWN* game world (see Figure 1) could pose as a potential problem to educators who were interested in using it for game modding projects. Because of the *Advanced Dungeon & Dragon* setting, the models and game “props” used in *NWN* has a strong “Tolkien” feel about them, and come complete with elves, dwarves, gnomes, hobbits, sorcerers and wizards. Hence, a modern setting with scientists dressed in white lab-coats working in a chemical laboratory was simply not possible at our budget level—it would require several 3D modelers to recreate all the game resources. This limitation of the GDK forced anyone interested in working with *NWN* to stick to the medieval setting. A modding team by the name of “D20 Modern Mod” (<http://frozenfar.com/d20mm>) has taken it upon themselves to

supply “modern contents” such as machine guns, white lab coats, and space vehicles to the *NWN* modding community. (However, based on the frequency of the news postings, the project might have fallen to disuse or been abandoned.)

## Lesson Learned

Plot twists in the narrative would add more interests to the gameplay, whereas alternate endings would add re-playable values to the game (i.e., provide a reason for player to replay the game using different gender, race, class, so as to “see” the different endings. However, story writers (or level designers) needed to be very familiar with the content of the game library, meaning that they needed to know what objects and models were available (or not available), as they planned for the plot twists or alternate endings. In this example, the lack of premade model of UFO means that

Figure 1. Medieval Objects (e.g., Crossbow, Torch, and Parchment) and Environment in *NWN*



either the writer must change the narrative, or a 3D modeler must be hired to create the model needed. Both approaches would result in unnecessary delay to the project, demanding extra time and human resources, respectively. Another thing to bear in mind: even if the necessary 3D models were procured, there was no guarantee that they would integrate well into the GDK.

However, as the Aurora Toolkit was the self-same GDK used by the developers to create the commercial game, *NWN*, there was nothing to prevent the modders from creating game mods with equally high commercial values. Our advice for those who wish to try their hands on game modding is to familiarize themselves with the original game and any expansion packs that are released soon afterwards, because each expansion adds more 3D models, resources and new scripts to the GDK. This was the same reason why the *NWN* (version 1) GDK remained more popular than the *NWN 2* GDK (for now), because there were currently more resources available for the older version of the game than for the sequel.

### **The Transition: Arecibo Valley (The Game)**

Byun's game narrative was adopted as a serious game project by CILR in the following semester. In view of the shortcomings of the original narrative, several brainstorming sessions were carried out to alter the plot of the story, and particularly, to avert the ending involving "friendly-alien" and spaceship. It was further suggested that the quest for 5 elements be reduced to just one. A high school science teacher proposed changing Adryanee's sickness to a quest involving acid neutralization, partly to fit a high school science curriculum, and partly, inspired by a lesson plan on the Alka-Seltzer website. After examining the lesson plan, the team agreed to change Adryanee's ailment into a life-threatening, sudden-onset, *stomachache*. The player would have to quest for a calciferous compound in this new narrative and

to obtain a healing potion from a wizard or cleric. The use of a naturally existing mineral (limestone, or chalk) would further fit the medieval setting required by *NWN*.

The team felt the narrative would benefit from a mission giver to task the player with the necessary quest, and decided to "gift" Adryanee with a younger brother for the role. The backstory would be that Adryanee's mother had suffered the same strange illness a while ago, and the wizard was not able to save her in time. He then spent most of his days drinking away his frustration. The players would find the wizard's cave and recover valuable notes about the symptoms, and other important clues to locate a "fizzling" rock, which was to be the limestone and the main ingredient to the healing potion. When given the potion, Adryanee would be cured. She and her brother (the mission giver) would thank the players and award them with experience points and gold. This would give the story a more conventional ending, one that is more in line with the *Advanced Dungeons & Dragons (AD&D)* rules that formed the basis for *NWN*. The more "serious" portion of the game would include the *learning* of:

- **Reading Skills:** Player must read through the wizard's collection of notes.
- **Life Facts:** Drinking causes drunkenness. A drunk is not coherent in his speech and thinking process.
- **Spatial Thinking:** Players must put themselves in the wizard's shoes and retrace what he has done to find the rock.
- **Deductive Analysis:** Players must deduce that if the rock can neutralize vinegar, it may be useful as an ingredient to create a potion for cure to stomach-ache.

### **The Verdict**

The extra time that went into revising *Arecibo Valley* paid off in a big way. The detailed plans allowed the team to complete the mod in less than

two weeks, in time to debut at the 2006 annual conference of the Association for Educational Communications and Technology (AECT) in Dallas, TX. After a demonstration of the game mod, conference attendees were asked to name the potion created should the story happen in today's world. While many attendees found the story to be interesting, they were caught off guard when asked to consider the possible relevance of the game story in today's modern context. We found the school teachers to be more adventurous than others in venturing the potion to be, possibly: Tums, Alka-Seltzer, or Pepto-Bismol. The attendees also discussed about how a serious game such as *Arecibo Valley* could be used for teaching or instruction in a classroom. It was agreed that, at the very least, *Arecibo Valley* would be immediately useful as a supplementary activity to high school science lessons on the neutralization of acid. The educators were particularly impressed that it took only a couple of week to create and complete *Arecibo Valley*. Feedback from the conference attendees indicated that the new narrative of *Saving Adryanee* was a success.

### **Lesson Learned**

Educators who are interested in leading a student group in modding need to heed the following warning: adapting or redesigning somebody's story into a game narrative not only involves much alteration of the original story, but could spell trouble for the team. As the team changed and adapted the story to fit the GDK, changes to the narrative could offend the writer to the point of causing him or her to leave the team. It is important for team leaders to educate the writers or level designers that once the story has been written, that the ownership has now been transferred to the entire team. While story writers could continue to provide opinions, their jobs in the process have concluded. The job of the story writer was merely to provide the scaffoldings necessary (for the team) to bring the story to life, it is now

the team's effort that will turn the narrative into a playable story. The amount of changes could be drastically reduced if the writers are already familiar with the original game, and hence, the limitations of the GDK.

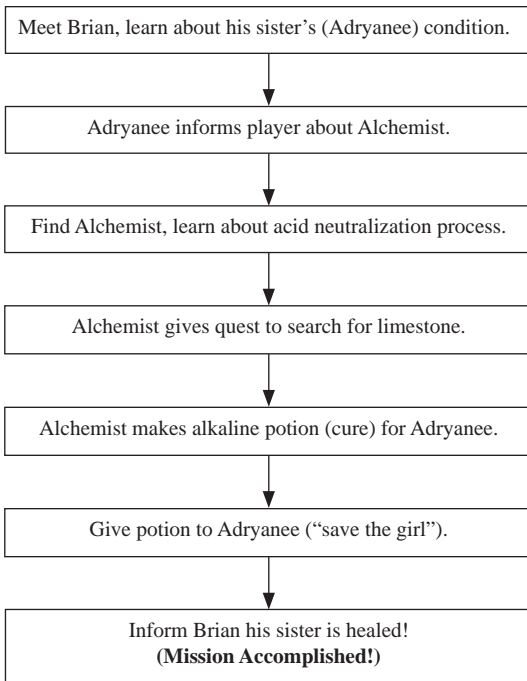
In the real-world, a writer would have received the payment and left. In extreme cases, the finished game might turn out to be very different from the original narrative prepared by the writer. What's important is that from this point on, the narrative becomes everybody's work, and the team must work towards the common good: making the best game they could while using the narrative as a guide to do so. Other members who are more familiar with staging and scripting would now step in and take over the process. The stage must be set, the non-player characters (NPC) created, and the placeable objects (props) placed accordingly for the narrative to come to life.

### **FINAL REVISION: SAVING ADRY- ANEE**

When the team found out (in Summer 2007) that the 2<sup>nd</sup> annual Serious Games Showcase & Challenge (SGS&C) listed Aurora GDK as one of the approved game engines, there were only three months left to the submission deadline. Since this was a serious game competition, the team felt that the mod submitted should be focused more on education and, at the same time, be relevant to public schools. Since *Arecibo Valley* was about saving Adryanee from a (gastric acid induced) stomachache, the "acid neutralization" quest was a natural fit as a supplement for high school science education. The team decided to re-work *Arecibo Valley* and expand the main quest to include more details (and side quests) before submitting the new mod to the serious game competition. The new mod would be renamed *Saving Adryanee*.

As we began re-working *Arecibo Valley* into *Saving Adryanee*, one problem became glaringly apparent: there was simply too little content in



Figure 2. Game events in *Arecibo Valley*

*Arecibo Valley* to qualify it as a “complete” game (see Figure 2). In fact, the game could be completed in less than 30 minutes! The game consisted of just one goal: finding the limestone (and turning it into a potion for Adryanee). If *Saving Adryanee* was to stand out from the rest of the competitions, presumably other professional entries, we would need a more comprehensive story.

## Creating a Game World

At around the same time, the CILR development team had just completed *Requiem for Amanda*—a prototype game with players tracking architecture called *Information Trails* (see Loh, 2006, 2007; and Loh, Anantachai, Byun, & Lenox, 2007, for more details). Since both *Arecibo Valley* and *Requiem for Amanda* were intellectual properties of CILR, the team decided that it would make sense to combine the two game areas to create a larger game world. This would not only help reduced the men-hour needed for planning/writing a new narrative, but also present a larger game environment

for exploration by players. Key characters such as Adryanee, and Amanda would be retained, but most of the other characters would be replaced. Since the mod would be targeted at high school students, the team decided to remove all reference to witchcraft and wizardry by “firing” the wizard and replaced him with an Alchemist.

## Side-Quest

Several small quests about vitamin deficiencies were being added to the game. Additional research on vitamin deficiencies showed the cures to be rather “medieval”—e.g., native Indians preparing pine leaves tea for sailors to help cure scurvy, a vitamin C deficiency. Several changes were made to incorporate the “vitamin deficiency” side quest; for example, Amanda’s dad (from *Requiem for Amanda*) was given the “night-blindness” due to vitamin A deficiency. Based on further research, a chicken farmer was added to the narrative, and was given the quest for vitamin B deficiency. In the end, the new *Saving Adryanee*, comprised of one main quest (i.e., finding a cure for Adryanee) and six sub-quests ranging from finding cures for various *strange* diseases, finding a lost child, reuniting a family, to saving a dying girl. The areas of the game grew from one Arecibo Valley, to include three additional areas: (1) an overly busy, mid-size port town, (2) a small inn, and (3) a dark, foreboding, “Blackwing Forest” (see Figure 3 for an early concept map of *Saving Adryanee*).

Once the concept map was finalized, the development team went to work immediately and was able to complete the game mod in time for submission. Since this was our first attempt at a serious game competition, we were not sure if our game would “make the cut.” After one month of waiting, we were elated and greatly encouraged upon receiving the notice that *Saving Adryanee* had made it to the Finalists in the SGS&C competition! With travel support from the university, the team traveled to Orlando, FL,

Figure 3. An early concept map for the game, Saving Adryanee

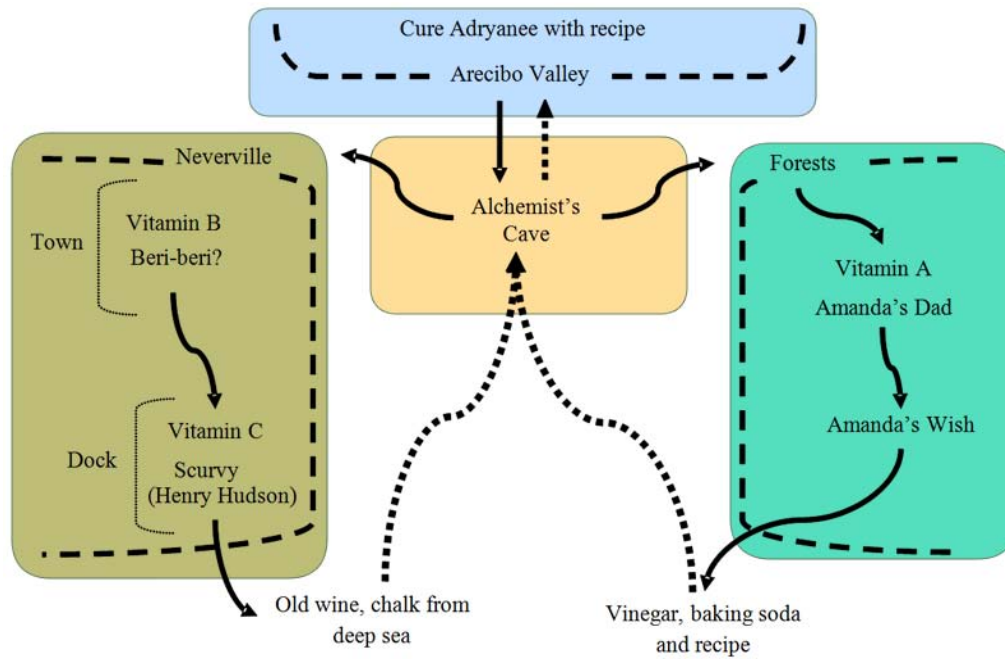
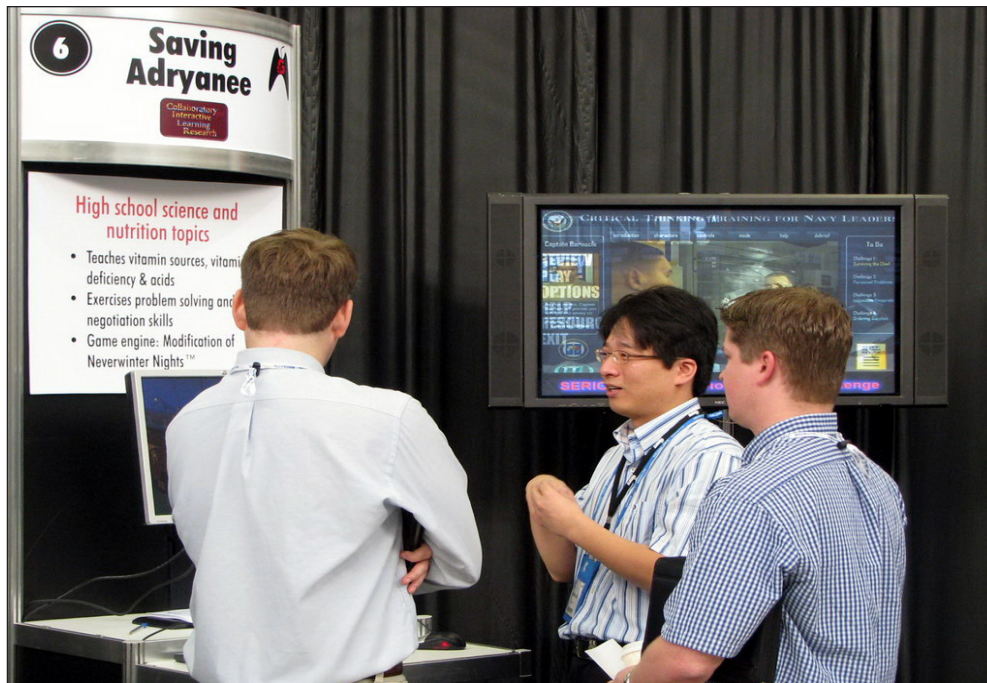


Figure 4. Conference attendees visiting the Saving Adryanee booth at I/SEC 2007



and presented the game mod at the 2007 I/ITSEC conference. When we arrived, we found out that we were the only student/instructor submission among eleven other commercial finalists. Even though we did not clinch the Best Game Award, the opportunity enabled us to learn from the other finalists as we witnessed first-hand, the strengths and weaknesses of other commercial companies as they showcased their own interpretations of “serious games.” We also received useful feedback from conference attendees who visited the *Saving Adryanee* booth to try out the game (see Figure 4).

### Lesson Learned (What Went Right):

Many things must have gone right for *Saving Adryanee* in order for it to be selected as a Finalist entry. From our (the developer’s) perspective alone, the “excessive” planning and brainstorming sessions helped tremendously and allowed us to tackle the development work within a fairly short time. The iterative modding process (the mods were revised and expanded in 3-4 cycles) also helped us expand on the good design, and eliminated the bad. This is in agreement with Rolling & Morris’ (2004, p. 98) observation that “games are best built according to an iterative process.” Since the team has become highly familiar with the narrative, we were able to quickly “pick up the slack” when one of the members failed to deliver his part of the project on time. There was also a strong sense of “group ownership,” as oppose to “personal owner” of the project. It had become *our* common interest to see to it that the project was completed. The four areas of the game also help with the division of labor as each took charge of creating one single area.

We were rather fortunate to have assembled a team where all team members possessed some level of technical skills. Even though half of the team did not have much programming skills, the “commercial grade” GDK helped. Since we stayed within the boundary of the resources, we did not

have to create new 3D model for our mod. The existence of a *NWN* modders community, and the resources accumulated over the years since the game’s debut in 2002 also provided us with much of the working knowledge needed. In addition, the Wikipedia was very useful in providing obscure information, such as what cures of Scurvy were available during the Middle Ages. We seriously doubt our chances of completing the mod in time should we be using an open source GDK.

### Lesson Learned (What Went Wrong):

Although time management was not explicitly listed in the modding process, it became an implicit and integral component for the project. As the deadline drew near, the team ran into numerous “minute” development problems along the way that must be resolved *one at a time*. The recurring “develop-troubleshoot” process eventually took a serious toll on the development timeline, and we ran out of time. Due to the impending deadline, we were forced to focus on the essentials. Hence we decided to “cut a few corners” along the way—for example, the game mod was still missing the “Journal” feature at time of submission. There was also not enough time to edit the conversations for spelling and grammatical mistakes. However, the judges’ comments revealed that these “missing corners” did not go unnoticed. Looking back, we felt that we could now appreciate why many game titles had to be delayed in their launch date, time and again—no doubt, they too, ran into the same problems. It is the same reason why many games needed to be “patched” in order to work properly.

We had also overlooked the possibilities of “external” technical problems. Despite extensive planning and countless rounds of testing, we found out (much too late) to our chagrin that the game would “crash to desktop” on certain computers. After several days of extensive trials and errors, the designer found that the mysterious crash would “disappear” if an extra area was added. At the

end, we were forced to add a new small area that served little purpose just so to avoid any potential “crash-to-desktop.” A second “external problem” that we found was the latest (NVIDIA) graphic card driver would cause a black screen during the loading of the game. Although a workaround was documented on Bioware’s *NWN* forum, downgrading the graphic card driver was not exactly a reasonable request to make to the panel of game competition judges. Fortunately, the panel of judges was very patient and understanding, and worked closely with us during the judging process to ensure that we had a fair chance.

## **Reflections**

Astute readers who are familiar with traditional instructional design models (such as ADDIE) (Dick & Carey, 1996; Leshin, Pollock, & Reigeluth, 1992) might already notice the similarity with video game design. (This is discussed in Chapter 7 of this book, by Celina Byers.) From our experience, making video games is closer to Rapid Prototyping (see Dey, Abowd, & Salber, 2001; Jones & Richey, 2000) than to ADDIE. More importantly, unlike instructional materials, video games tend to not have any chance for improvement or revision. This is because the game industry viewed video games as an end in itself, and tended to terminate the project once a game became pressed into CD/DVD for mass production; at which point, the development team would usually be dismissed, with majority of the members going on to other game projects. This is the why the term, *postmortem*, was chosen to describe lessons learned from the making of a particular game. All feedbacks and testing needed to be carried out in small focus groups and by beta testers before the game was finalized. This is very different from the traditional instructional design processes where instructional materials were allowed to be revised in order to make them better. In comparison, instructional materials have many lives as instructional designers keep

on refining the materials through much iteration of design, development, implementation, evaluation, and revision.

Having described our learning journey to game modding in the previous sections, we would like to dedicate the rest of this chapter to readers who are interested in starting a modding team, or leading their students in a modding contest.

## **IMPLICATIONS & ADVICES TO OTHER MODDERS**

“What lessons have we learned and what can readers take away from it?” Apart from the technical knowledge gained from learning how to mod with a commercial-grade GDK, we realized the experience also changed us socially. One of the special moments in our journey was seeing the fruit of our labor make it to the Finalist round of the SGS&C competition. We found it difficult to name another learning opportunities in our education that have created such elation and excitement in us as learners.

Even the game design process itself was exciting. In order to construct a convincing narrative, we had to engage in many learning activities: such as conducting background research (finding out about vitamin deficiencies), negotiating ideas with other members (what to add in and what to take out), and brainstorming details for the narrative (the type of sickness for Amanda’s dad, the relationship between Helen and the rest of the characters in the story). Since the Aurora Toolkit could be easily mastered in just a few weeks, it was no problem at all for the area designers to stage the narrative with props and populate it with NPCs in order to present their ideas to the project manager for a quick review. Project leader, on the other hand, must weigh carefully to make sure that the team’s ideas were reasonable, do-able, and playable. We have distilled our modding process into a 7-steps do-it-yourself guide for readers who are interested in taking up the challenge of game modding for a season of their lives.

### **Step 1: Selecting a Game Engine**

Deciding on the Game Engine is a very important step for serious game development. If you have the funding and human resources to build a game engine from the ground up, you should probably do so, since an internally developed engine would provide you with the maximum flexibility in terms of game development. If you must resort to a third-party game engine, you would do well to research beforehand on the features and limitations of each engine under consideration. Since commercial-grade game engines may range from hundreds to thousands of dollars, most amateur game developers would resort to using: (a) “free” game engines that were included with the commercial product (e.g., *NWN*, and *Company of Heroes*), or (b) open-source game engines (such as Delta-3D, and Ogre) for their work. The amount of technical support in the latter category could be very limited and therefore needed to be taken into consideration before one embarks on the project.

### **Step 2: Selecting a Learning Subject**

This step is probably the hardest part of the serious game development process, at least for the time being. Because serious games were yet an integral part of classroom learning, we were hard-pressed to come up with a learning topic that would lend itself naturally to a (convincing) game story. In our case, the processes of acid neutralization and vitamin deficiencies have, fortunately, been in existence for centuries; and thus, could be fitted into a story with medieval setting conveniently and convincingly. We were less successful in trying to conceptualize a learning subject involving some of the more “modern” aspects of education for *NWN*; meaning, for a more modern setting, one might have to include the D20MM resource pack for *NWN*, or choose a different game engine altogether.

### **Step 3: Constructing Plots and Making Concept Maps**

The planning stage should include construction of the story plot and making of a concept map to show the flow of the story, and how one game event would lead to another. This is the most crucial step in making the story playable, even fun. A good storyteller who could come up with witty conversation could add a different dimension to the game. This is the place where special attention to the details could help make a story come alive for the players. For example, the Amanda’s Wish portion was known to be rather emotional to many female players.

### **Step 4: Designers & Programmers**

This step required considerable team work and division of labor. Team members who were non-programmers should try to familiarize themselves with the toolset and take on the roles of Designers, leaving those with programming knowledge to assume the role of programmers (or scripters). Although someone with programming knowledge could certainly take on the responsibilities of a “designer,” it would be nearly impossible for non-programmers to pick up scripting within a short time. Hence, a division of labor would benefit the overall project considerably. As shown in the figure, because there were many tasks to be accomplished, repetitive testing and regular meetings were the means to keep everyone “sane.”

### **Step 5: Matching Learning Objectives to Narrative**

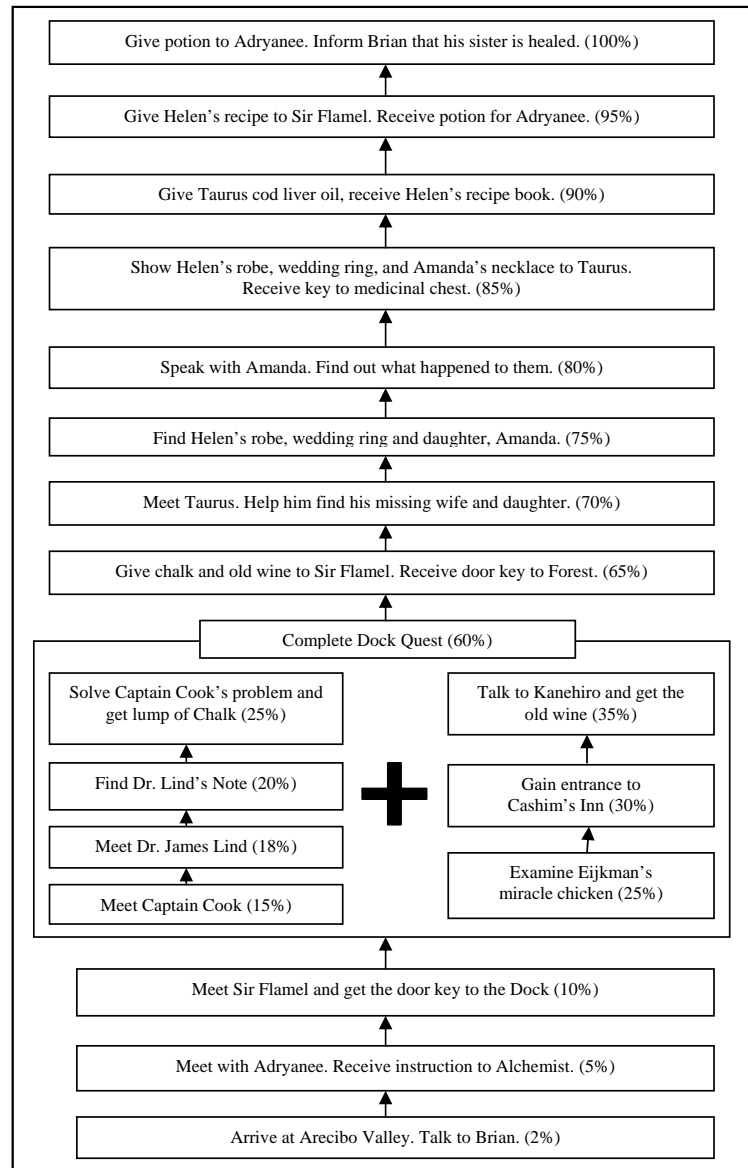
Game designers would probably find responsibilities such as area/level/character design and conversation writing to be quite common among game development projects. However, “Matching Objective to Narrative” is unique to serious game design. Because an assessment component (not

found in non-serious, casual games) is useful in serious games (Chen & Michael, 2005), it would do well for serious games designers to integrate any *learning* (or *training*) objective into the gaming process, so as to allow a formal or informal evaluation process.

Although we did not have a formalized methodology to integrate game-appropriate learning objectives into *Saving Adryanee* at the time of development, we have since adapted the Objec-

tive Hierarchy Mapping (OHM) process towards this purpose. We have further found the OHM process to be useful, both as a “storyboarding” template for the matching of learning objectives into narrative of a serious game, and as an assessment guide. A sample Objective Hierarchy Map for the game, *Saving Adryanee* is shown in Figure 5. [Note: For more information on how to construct an OHM, please refer to the “Decision

Figure 5. A (Sample) objective hierarchy map for *Saving Adryanee*



Protocol 2.0” originally developed by the USDA Forest Service (Berg et al., 1999).]

## **Step 6: Conversations & Story Development**

Since *NWN* was a conversation-driven story, we felt that the dialogue also played a major role in *Saving Adryanee*. The final game mod comprised of a total of 23,000 words. (Based on the rough estimate of 400 words per printed page, *Saving Adryanee* would worth about 58 pages, if printed.) Despite the fact that *Saving Adryanee* was a relatively short game with a playtime of 2-3 hours, any high school student who had completed the game must have read close to 40 pages (or 16,000 words) worth of text! Hence, a well-written story could potentially help raise the reading ability of many under-achieving high school readers, and ESL (English as second language) students.

## **Step 7: Play Testing**

As the project drew to an end, it was best to play test the game mod using players who knew nothing about the plot. Using the feedback provided by the play testers, problems areas would be revealed. Depending on the remaining time and resources, the development team might choose to: (a) fix the problems, (b) rework the area(s) or even modify some part of the narrative to accommodate the new changes, or (c) eliminate the problem area(s)/ NPC(s) altogether. Do what is within your power to ensure that “the show must go on”!

## **CONCLUSIONS**

In the near future, instead of waiting for new serious games to be made available, the students and teachers could learn to use GDKs as learning tools. For instance, all high school freshmen may be required to learn the GDK, and to use it as one of the project presentation tools throughout

high school. Instead of using PowerPoint for a classroom presentation, some students could create a short movie with the GDK (better known as “machinima”) to present their ideas, or stage a “virtual play” using props and characters in periodic clothing for a reading project in English, or other foreign languages. Computer club members might learn the scripting language as a introduction to programming. Team of students could then band together as development teams to mod new serious games for fun, leisure and competitions. They may also be asked to create serious game mods for use by their juniors in order to demonstrate their understanding in the selected subject. Exemplary game mods may then be submitted for judging and showcasing at the International Student Media Festival (ISMF) (<http://www.ismf.net>) and the Serious Games Showcase & Challenge at I/ITSEC (<http://www.iitsec.org>). [Note: The ISMF hopes to begin accepting (1) game mods and (2) machinima as media projects for their festival beginning 2009. Entry submission is open yearly from March 1 to May 15.]

Last but not least, we believe the game design process also imparted lateral thinking skills (de Bono, 1973). Instead of approaching a development or scripting problem head-on, many a time, the development team is forced to work around the situation, or to approach the problem from a different perspective. Although we find it rather challenging to solve every problem thrown at us by the design process, we have gradually learned to enjoy a good challenge, and to discuss it as a team. There is much to be learned from serious game development and game modification using commercial off-the shelf GDK (such as *NWN*), if only educators would begin the first step.

Hopefully, in the not so distance future, game and education will finally catch up with one another. Not only would students learned with digital games, but games making will become the equivalence of “classroom assignments” representing artifacts of their learning outcomes. In

that time, teachers may be caught playing games in class, and not the other way around.

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## REFERENCES

- BBC. (2004, August 11). Video games “good for children”. *BBC News*. Retrieved April 30, 2008, from <http://news.bbc.co.uk/go/pr/fr/-/1/hi/scotland/3553352.stm>
- Berg, J., Bradshaw, B., Carbone, J., Chojnacky, C., Conroy, S., Cleaves, D., et al. (1999). *Decision Protocol 2.0*: USDA Forest Service.
- Berger, A. (2006, January 31). Neverwinter Nights in the Classroom. *University of Minnesota News*. Retrieved April 30, 2008, from [http://www1.umn.edu/umnnews/Feature\\_Stories/22Neverwinter\\_Nights22\\_in\\_the\\_classroom.html](http://www1.umn.edu/umnnews/Feature_Stories/22Neverwinter_Nights22_in_the_classroom.html)
- Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palinscar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist*, 26(3 & 4), 369-398.
- Carbonaro, M., Cutumisu, M., McNaughton, M., Onuczko, C., Roy, T., Schaeffer, J., et al. (2005). *Interactive Story Writing in the Classroom: Using Computer Games*. Paper presented at the DiGRA 2005 Conference: Changing Views—Worlds in Play.
- Chen, S., & Michael, D. (2005). Proof of Learning: Assessment in Serious Games *Gamasutra*. Retrieved from [http://www.gamasutra.com/features/20051019/chen\\_01.shtml](http://www.gamasutra.com/features/20051019/chen_01.shtml)
- Dey, A. K., Abowd, G. D., & Salber, D. (2001). A Conceptual Framework and a Toolkit for Supporting the Rapid Prototyping of Context-Aware Applications. *Human-Computer Interaction*, 16(2-4), 97-166.
- Dick, W., & Carey, L. (1996). *The Systematic Design of Instruction* (4th ed.). New York, NY: Harper Collins College Publishers.
- Frasca, G. (2003, November). *Ludologists love stories, too: Notes from a debate that never took place*. Paper presented at the Level Up: Digital Games Research Conference, University of Utrecht.
- Fraser, B., & Wardell, B. (2008, April 28, 2008). Postmortem: Ironclad/Stardock’s Sins of a Solar Empire. Retrieved April 30, 2008, from [http://www.gamasutra.com/view/feature/3638/postmortem\\_ironcladstardocks\\_.php](http://www.gamasutra.com/view/feature/3638/postmortem_ironcladstardocks_.php)
- Geddes, R. (2007, December 21). First UT3 User Mods Released For PS3. Retrieved January 3, 2008, from <http://ps3.ign.com/articles/843/843052p1.html>
- Grossman, A. (Ed.). (2003). *Postmortems from Game Developer*. San Francisco, CA: CMP Books.
- Harel, I., & Papert, S. (Eds.). (1991). *Constructionism*. Norwood, NJ: Ablex.
- Johnson, D. W., Maruyama, G., Johnson, R., Nelson, D., & Skon, L. (1981). Effects of cooperative, competitive, and individualistic goal structures on achievement: A meta-analysis. *Psychological Bulletin*, 89, 47-62.
- Jonassen, D. (2000). *Computers as Mindtools for Schools: Engaging Critical Thinking* (2nd ed.). Upper Saddle River, NJ: Merrill- Prentice Hall.



Jones, T. S., & Richey, R. C. (2000). Rapid prototyping methodology in action: A developmental study. *Educational Technology Research and Development, 48*(2), 63-80.

Kafai, Y. B. (1994). Electronic play worlds: Children's construction of video games. In Y. B. Kafai & M. Resnick (Eds.), *Constructionism in practice: Rethinking the roles of technology in learning* (pp. 97-123). Mahwah, NJ: Lawrence Erlbaum Associates.

Kafai, Y. B. (2006). Playing and making games for learning: Instructionist and constructionist perspectives for game studies. *Games and Culture, 1*(1), 36-40.

Kafai, Y. B., & Resnick, M. (Eds.). (1996). *Constructionism in practice: Designing, thinking, and learning in a digital world*. Mahwah, NJ: Lawrence Erlbaum Associates.

Leshin, C. B., Pollock, J., & Reigeluth, C. M. (1992). *Instructional Design Strategies and Tactics*. Englewood Cliffs, NJ: Education Technology Publications.

Loh, C. S. (2006). *Tracking an avatar: Designing data collection into online game*. Paper presented at the annual conference of the Association for Educational Communications and Technology (AECT 2006), Dallas, TX.

Loh, C. S. (2007). Designing Online Games Assessment as "Information Trails". In D. Gibson, C. Aldrich & M. Prensky (Eds.), *Games and Simulation in Online Learning: Research and Development Frameworks* (pp. 323-348). Hershey, PA: Idea Group, Inc.

Loh, C. S., Anantachai, A., Byun, J., & Lenox, J. (2007). Assessing what players learned in serious games: in situ data collection, information trails, and quantitative analysis. In Q. Mehdi (Ed.), *10th International Conference for Computer Games: AI, Animation, Mobile, Educational & Serious Games (CGAMES 2007)*. Louisville, KY: Uni-

versity of Wolverhampton, UK.

Papert, S. (1980). *Midstorms*. New York, NY: Basic Books.

Papert, S. (1993). *The Children's Machine*. New York, NY: Basic Books.

Peppler, K. A., & Kafai, Y. B. (2007). *What Videogame Making Can Teach Us About Literacy and Learning: Alternative Pathways into Participatory Culture*. Paper presented at the DiGRA 2007. from <http://www.digra.org/dl/db/07311.33576.pdf>

Rieber, L. P., Luke, N., & Smith, J. (1998, January). Project KID DESIGNER: Constructivism at work through play. *Meridian: Middle School Computer Technology Journal, 1*(1) Retrieved April 30, 2008, from [http://www.ncsu.edu/meridian/jan98/feat\\_1/kiddesigner.html](http://www.ncsu.edu/meridian/jan98/feat_1/kiddesigner.html)

Robertson, J., & Good, J. (2005). Story creation in virtual game worlds. *Communications of the ACM, 48*(1), 61-65.

Rollings, A., & Morris, D. (2004). *Game Architecture and Design: A New Edition*. Indianapolis, IN: New Riders Publishing.

Rysavy, S. D. M., & Sales, G. C. (1991). Co-operative learning in computer-based instruction. *Educational Technology Research and Development, 39*, 70-79.

Schaefer, E. (2000, October 25, 2000). Post-mortem: Blizzard Entertainment's Diablo II Retrieved April 30, 2008, from [http://www.gamasutra.com/features/20001025/schaefer\\_01.htm](http://www.gamasutra.com/features/20001025/schaefer_01.htm)

Szafron, D., Carbonaro, M., Cutumisu, M., Gillis, S., McNaughton, M., Onuczko, C., et al. (2005). Writing Interactive Stories in the Classroom. *Interactive Multimedia Electronic Journal of Computer-Enhanced Learning, 7*(1).

Turkle, S. (1984). *The Second Self: Computers and the Human Spirit*. New York, NY: Simon & Schuster.

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Wyeld, T. G., Leavy, B., Carroll, J., Gibbons, C., Ledwich, B., & Hills, J. (2007). *The Ethics of Indigenous Storytelling: Using the Torque Game Engine to Support Australian Aboriginal Cultural Heritage*. Paper presented at the DiGRA 2007. Retrieved April 30, 2007, from <http://www.digra.org/dl/db/07312.11188.pdf>

APPENDIX: TIMELINE—FROM EARLY CONCEPTS TO FINISHED PRODUCT

<p><b>Summer 2006 (Design Doc. 1)</b></p>	<p><b>Background:</b> First graduate class: Games Authoring Tools Workshop using <i>NWN</i>. Byun handed in a game design document for “Arecibo Valley” as final assignment. There is not enough time to cover scripting in the summer course.  <b>Brief Narrative:</b> Find natural existing materials containing 5 chemical elements to cure a girl of unknown illness. Two endings: common materials give you a common cure; the girl is well (1<sup>st</sup> ending). “Magical” ingredients give you a “super-potion;” girl is transformed back to her true form, a friendly alien. She called for UFO to bring her home (2<sup>nd</sup> ending).  <b>Good:</b> Nice twist in narrative, alternative endings (higher replay value).  <b>Bad:</b> No UFO, or alien in <i>NWN</i> resource library. Futuristic ending “breaks” the fantasy settings of <i>NWN</i>.</p>
<p><b>(Design Doc. 2)</b></p>	<p><b>Background:</b> The instructor of the graduate class also wrote a game design document, called “Amanda’s Story.”  <b>Brief Narrative:</b> Player received quest to find Amanda from a blind father. Player found Amanda somewhere in the forest. Story eventually revealed that Amanda was killed by wild animal while looking for medicinal herb for her father. Her love for her father kept her spirit waiting... for someone to help her get the medicinal plant.  <b>Good:</b> Emotional narrative.  <b>Bad:</b> It is not a serious game.</p>
<p><b>Fall 2006 (Game Mod 1)</b></p>	<p><b>Background:</b> The Collaboratory for Interactive Learning Research (CILR) was formed. Received funding to create a prototype game mod. Byun’s design was chosen for the project. One teacher found a (science education) lesson plan for neutralization of acid using Alka-Seltzer. The quest for 5 elements was changed to quest for a potion to cure severe stomach pain. One volunteer student from Computer Science spent two weeks to create the <i>NWN</i> mod, <i>Arecibo Valley</i>.  <b>Good:</b> We have a first playable serious game mod! <i>Arecibo Valley</i> was premiered during AECT 2006 Showcase and received much positive feedback.  <b>Bad:</b> Too simple (it’s over in 15-20 minutes).</p>
<p><b>Spring 2007 (Game Mod 2)</b></p>	<p><b>Background:</b> CILR provided the resources for the development of “Amanda’s Story.” The game mod was renamed <i>Requiem for Amanda</i>, and was embedded with an <i>Information Trails</i> architecture (Loh, 2006, 2007). This enabled tracking of players’ actions in the game. It took the programmers a couple of weeks to complete the game mod, but the project took much longer (about two months) because of the additional programming needed to include <i>Information Trails</i>.  <b>Good:</b> We have a first playable game mod with <i>Information Trail!</i> (Loh, Anantachai, Byun, &amp; Lenox, 2007)  <b>Bad:</b> The mod is very useful as a research platform. It is still not apparent as a serious game as far as the narrative is concern; although it can be considered a serious game because of the assessment component.</p>
<p><b>Summer 2007 (Game Mod 3)</b></p>	<p><b>Background:</b> 2<sup>nd</sup> Serious Game Showcase &amp; Challenge: Call for submission. We decided to submit a serious game to the competition. After several brainstorming sessions, the decision was to “reuse” the learning objects (i.e., the game mods) we have created so far into a larger game with stronger narrative. After two months of intense work (we have to recreate all the areas, characters and conversations), we finally completed <i>Saving Adryanee</i>. The serious game mod was a combination of <i>Arecibo Valley</i>, <i>Requiem for Amanda</i>, and several new quests related to vitamin deficiencies.  <b>Good:</b> The game mod was selected as Finalists to the serious game competition.  <b>Bad:</b> Due to the deadline of the competition, the submitted game was incomplete: It is missing the important in-game Journal. There were also grammatical and spelling mistakes because the main writers were not native English speakers.</p>