Video Game Design as a Model for Professional Learning

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This chapter presents an example of how video game design can be structured to facilitate professional learning through our Interactive Cases for School Leadership (ICSL) project. We present a rationale for how the ICSL branching narrative-based game design activity can help address a central challenge for professional learning contexts, then describe our experiences with developing a game-design learning environment in two graduate-level classes in Educational Leadership at the University of Wisconsin-Madison. We present an example of how to feasibly implement game design as a scalable model for professional learning while using common technologies. We provide templates for how we organized student design activities, elicited the requisite expertise to develop and test emergent game designs, and regularly assessed as students learned. We present a five-step plan that guided students through the ICSL game design process, involving topic selection, narrative development, scripting an interactive narrative, playtesting and post-production activities. We discuss how students used ICSL design to integrate theory and practice while producing playable, reusable learning games. In the conclusion we explore how game-design activities such as ICSL might be adapted to fit the needs of other professional learning environments.

Why video game design for professional learning?

Professional preparation programs in education play a critical and controversial role in our education system. Education programs provide an important path for practitioners to enter their professions with the appropriate knowledge and skills. But graduate programs in education have come under fire for the quality of the preparation provided to students (Levine, 2005; Labaree, 2006). While many of these difficulties are outside the control of education schools, some problems are located in the struggle to develop viable programs to induct students into the problems of practice. Adult learners present interesting challenges for designers of learning environments. Adult learners bring robust knowledge structures reinforced by long experience to any learning opportunity. Good instructional design must lead learners to problematize what they already know in order to open up fresh possibilities for learning and growth. Preparation programs have well-established techniques for introducing novices to key concepts, theories, strategies and practices; many preparation programs have also developed rich practicum experiences that introduce novices to the conditions of practice. Like other professional preparation fields, education classes have also long relied on tools such as problem-based learning (PBL) scenarios (e.g. Bridges & Hallinger, 1995), case study discussions and role playing activities to help students apply theories and strategies to contexts. But preparation programs have difficulty providing legitimate feedback in activities that allow students to adapt their knowledge to professional circumstances. Students can, for example, discuss strategies for addressing the issues that arise in a PBL scenario, but seldom receive feedback from the actors represented in the scenario itself. Students can also try out theories and techniques in a practicum situation, but feedback about whether the theories were appropriately implemented typically comes from practicum situation, not from the education program. If professional programs could develop methods to provide direct feedback on student efforts to experiment with the ideas learned in education programs, then perhaps the quality of activities designed to induct novices into professional practices would improve.

At first glance, it may seem as though video game design is a curious choice for a possible strategy to design professional learning activities. Video game play itself has received considerable attention as a possible platform for professional learning. Gee (2004) argues, for example, that video games can introduce learners into sophisticated discourse practices and allow for vicarious experimentation in virtual environments. Reeves and Read (2009) suggest that experience with video gaming will become more relevant as professional environments begin to look more like virtual worlds. Instead of focusing on *play*, however, we will argue that video game *design* provides an intriguing model for professional learning (see, for example, Mateas, 2005). Relatively few adult learners, however, have significant experience with digital media design, much less video game design. The world of game design is driven by a younger generation – the reaction of many adult learners to the claim that games and game designers can yield valuable learning outcomes typically ranges from skepticism to scorn. We argue that addressing the critical gap between theory-testing and feedback in professional practice programs may outweigh the challenges of establishing video game design as a legitimate adult learning activity. The successful implementation depends on how the instructor structures a learning environment that can problematize prior knowledge while scaffolding the skills and tools necessary to engage in game design activities.

ICSL locates the process of video game design in the wider context of design-based research (Barab & Squire, 2004; Edelson, 2002). A design-based research investigator builds hypotheses about practice into features of interventions, then studies how users interact with the intervention to determine the accuracy or feasibility of the hypotheses. For example, a design-based researcher may develop a curriculum that encourages students to test the quality of evidence given to substantiate historical claims. The researcher can then study how the curriculum influenced student behavior in an authentic classroom context while also studying the quality of the curriculum design. Design-based research thus yields both theoretical and practical insights about the practices that interventions are designed to influence. Researchers have already adopted a design-based perspective to engage in hypothesis testing through video-game design and play (See, for example, Squire, 2005; Dede, et. al. 2004). Of course, the relation between doing and learning as a model for pedagogy is as old as education research. Constructionist learning theory (Papert & Harel, 1991), for example, offers a compelling account of the power of learning through creating manipulable models of understanding. Building and testing a model of prior assumptions leads learners to perceive the shortcomings of their initial hypotheses and to model new assumptions that better fit the problem space. A key to constructionism is providing learning environment that allow students to build dynamic models of what they know. These types of learning environments that link actions to outcomes through direct feedback depend on constraining the range of possible learning activities. Constructionist learning environments, from *NetLogo* to *Boxer* to *Squeak*[1] typically depend on developing a "procedural literacy" (Mateas, 2005) in programming in order to develop dynamic models. These environments lead toward learners asking the kinds of questions that are afforded by programming-based environments, including a wide-range of social science investigations that involve system and agent-based modeling (for an overview, see Gilbert & Troitzich, 2005). Once students learn the rules of the environment, they can develop and test models of the kinds of phenomena that can be represented in these kinds of environments.

Our ICSL game-design efforts focus on building *branching narrative* games for professional learning. While systems and agent-based modeling provide insights about the operation of complex systems, they do not exhaust the range of theory-practice integration and testing activities that novice professional learners must participate in to gain expertise. Game-design activities can follow the programming-based path established by traditional constructionist learning environments (see, for example, GameStarMechanic.com), but the variety of videogame genres offer a range of approaches for how learners can model and test hypotheses about complex phenomena. The branching-narrative genre creates opportunities for designers to create interactive stories that give players feedback on choices. Branching narratives are useful for motivating learners to participate in complex environments. "Choose your own adventure" stories (e.g. Packard, 1979) provided early examples of branching narrative environments in

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[1] For more information on NetLogo, see http://ccl.northwestern.edu/netlogo/resources.shtml; for Boxer, see http://www.soe.berkeley.edu/boxer/; for Squeak, see http://www.squeak.org/.

which readers could choose the pages that would allow the story to continue in different directions.[2] Interactive fiction games create virtual branching narratives that allow players to choose from among multiple paths through a complex story (Shelton, 2009). Gordon (2004) uses the phrase outcome-driven simulation to suggest how branching-narrative models can be adapted for developing training applications. Gordon's account describes a branching narrative building strategy to capture relevant professional knowledge and to present learning challenges in terms of critical choices that distinguish novice from expert perspectives.

A key design step in Gordon's account is to structure narrative options that reflect several novice interpretations of the given problem, then to construct responses to each option that challenge novice conceptions to include more characteristics of expert problem solving strategies. This two-step process – narrative options and consequential responses – gives the designer an opportunity to anticipate player perceptions of problems and to provide responses that will challenge players to rethink the initial problem-setting. Playtesting provides the critical step in providing feedback for the designers to understand the accuracy of anticipated options and responses through player reaction and comments (Winn & Heeter, 2007). In playtesting, players interact with early versions of the learning environment in order to provide feedback on design decisions. Playtesting typically occurs at multiple points during the design process in order to test different aspects of the environment (Zimmerman, 2004). In learning game design, playtesting provides feedback on the pedagogical assumptions as designers assess how players learn from the options and responses coded into the environment. In Gordon's model, playtesting allows designers learn whether the anticipated novice preconceptions reflect how novices actually think about presented problems, and whether the range of responses provided by the designers actually lead players to rethink their approaches.

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[2] An alternative is to expose students to web-based Choose Your Own Adventure games such as the ones found at http://www.angelfire.com/ny/AdventureGame/1.html or http://www.dmoz.org/Games/Video_Games/Adventure/Browser_Based/Choose_Your_Own_Adventure/.

ICSL pushes the design-based research framework into service as a pedagogical strategy for professional preparation courses. If design-based research allows *researchers* to test hypotheses in real contexts of practice, then structuring learning environments to allow learners to act as designers ought to allow *students* to gain similar insights as a result of their designs. This study adapts Gordon's outcomes-based education framework to help learners create their own branching narrative games. Shifting the locus of control from designers to learners allows students to reap the insights designers of learning environments typically enjoy. Our cases illustrate how to structure a learning environment in which students select an example story for adaptation to a branching narrative; build a single narrative path through the story-line; develop decision points that allow players to test different hypotheses of action; construct a working branching-narrative prototype; then structure playtesting opportunities for designers to learn about the assumptions they felt players would make in their narratives. The ICSL narrative design process engages students in design activities that lead them to anticipate the ways players are likely to encounter complex environments; and playtesting serves as an assessment that pushes designers to revise their initial design decisions. Game design, however, requires significant technical and design expertise, and the pressures for content coverage can make it difficult to implement game design as a classroom learning activity. ICSL highlights a method for providing a structure sufficient to organize game-design for a non-technical audience in ways that supplement, rather than supplant, existing course learning goals.

The context for design

Our ICSL examples focus on two graduate level courses in educational leadership offered at the University of Wisconsin-Madison in 2009. One class was designed as an introduction to K-12 education leadership (702); the other addressed how to evaluate teaching and learning (703). The first author (Halverson) was the instructor of record for both classes; Christopher Blakesley and Regina Figueiredo-Brown served as graduate assistants. The 702 ICSL project involved students adapting a problem-based learning case derived from the *Journal of Cases in Educational Leadership (JCEL)*. Each of five groups (consisting of three 702 students) chose a JCEL case for adaptation into a branching narrative game. 702 students were challenged to show the core ideas developed in the course through their game design project. In contrast, the 703 ICSL project was situated in a teacher evaluation cycle context. Each of two groups of 5 students chose a videocase example of classroom teaching – one of a 8th grade math teacher; the other of a 7th grade language arts teacher. The purpose of the 703 ICSL project was to structure the anticipated post-observation evaluation conference between a principal and the teacher represented in the video-case. The 703 project put the player in the role of a principal who was challenged to provide effective feedback without either being irrelevant or judgmental. Together, the ICSL projects resulted in seven interactive cases, through which students were able to test their assumptions about how theories of leadership and evaluation would play out in everyday contexts.

There were several significant problems we faced in asking our students to engage in ICSL game design. First, it did not appear clear to many of our students how game design was a relevant activity for introductory education leadership coursework. Several students were put off by the demands of engaging in design work and wondered how these projects would either link to the course content or help them develop leadership skills.[3] We reminded students throughout the game-development activities about how class outcomes described connecting theory to practice, and explained how the playtesting experience would help students see the connections between game design and professional learning. Second, only a few students had any experience with technology design. Most of the students had experience with learning management systems,

[3] Although after hearing that the course would involve a game design activity, one student remarked that "I am glad we are doing this and not a literature review. It feels practical, it feels real, it feels helpful."

e-mail, office applications and Internet tools, but little experience with web-design, video production, storyboarding or production tools. We felt that asking students to learn new production technologies would probably overwhelm our intention to have the learning be about school leadership. We thus decided to confine game development activities to a tool with which all students were familiar: PowerPoint. We treated PowerPoint as form of HyperCard stack by using hyperlink connections across slides to simulate a branching narrative game environment.

Designing branching narratives for professional learning

We developed a five-step ICSL design process to structure the learning environment (Figure 1). We incorporated aspects of Gordon's (2004) branching-narrative development model to articulate the procedures involved in each step. After providing a brief description of each step

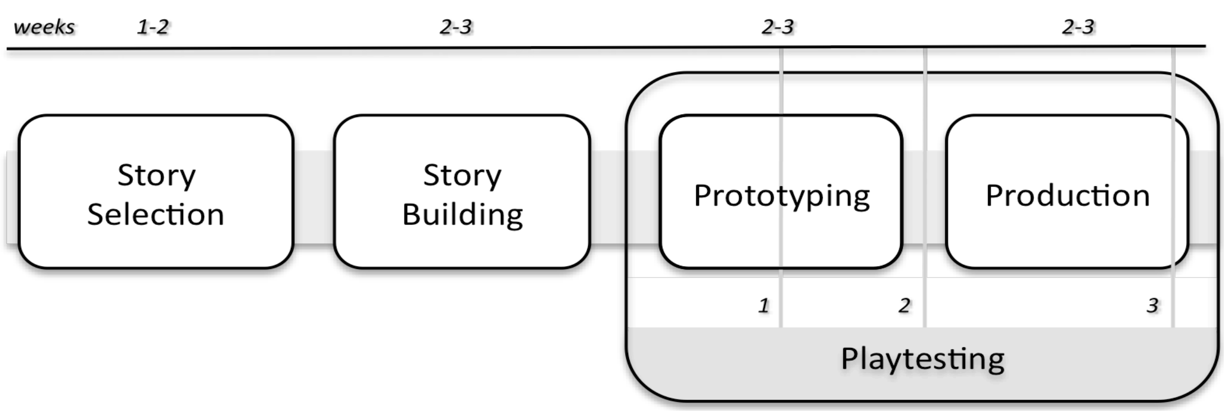

Figure 1: ICSL Design Model

in the process, we will use the steps to share reflections on the challenges and opportunities presented by the game development process.

1. *Story Selection*. This step involved introducing the student group to the design process via selecting an established problem-based narrative or video for adaptation into a branching-narrative game. Gordon's (2004) approach to design aims to *create* a narrative from expert and novice anecdotes; our process emphasizes the *adaptation* of an existing narrative to a

game format. In the 702 course, problem-based learning scenarios included topics such as curriculum reform in a rural school; appropriate treatment of a special needs student; a community grievance about a faculty member's political views, and data-driven decision making. The 703 course allowed student teams to pick from among several videos of classroom teaching practice to structure a post-observation conference branching narrative.

2. *Story Building* involved adapting or extending an existing account into a branching-narrative game. Story building addresses three points of Gordon's model: *chapter sorting*, *point analysis,* and *decision formulation*. Chapter sorting addresses a significant problem with branching narrative design. Each decision-point in the narrative yields at least two choices, which in turn yield at least two more, which lead to two more, and so on. Soon designers are faced with an exponential number of story directions to construct, making the narrative process unwieldy for both the designers and the players. A chapter structure allows designers to resolve decision-point multiplication by drawing story threads together into a new singular decision-point. Next, the designers conduct a *point analysis*, which highlights the narrative events that might lead novices and experts to different reactions. The final part of story building involves decision formulation, in which designers script how the game system will respond to player choices. These activities allow students to build multiple narrative paths into their games.
3. *Prototyping* is the activity of translating narratives into a virtual environment. Prototyping begins with Gordon's *graph assembly* task. Designers may use notecards to detail each step of the narrative process, then fit the cards into a comprehensive narrative map and script that show how narrative elements fit together. Then designers engage in Gordon's *narrative assembly* by translating the notecard text into a PowerPoint-ready blueprint. Prototyping results in a fully articulated version of the story that includes all designed narrative elements.

4. *Production.* At this point, the branching narrative must be translated into as a stand-alone PowerPoint document. Gordon's production step involves the design and selection of graphic elements and formatting necessary to bring the story alive. The production task allows designers to revisit the story from the perspective of the player to assess the degree to which the intended narrative branches successfully convey the story lessons.
5. *Playtesting.* The three occasions for playtesting constitute the central ISCL learning and assessment tasks. Playtesting tasks are iteratively woven into the prototyping process. The first playtest occurs after designers have completed story building. This low-tech playtest helps designers to recognize gaps in their narratives, and clearly shows where the responses and narrative elements are insufficient to carry the story along, The second low-tech playtest occurs after script has been fully articulated. Here designers see how well the branching narrative makes sense, and to recognize the degree to which their point analysis and decision formulation decisions adequately captured how practitioners might respond in the situation. The final playtest occurs after the production process, and gives the designers feedback about the adequacy and persuasiveness of the media used to present the case.

As our ICSL model evolved, we encountered one key difference with Gordon's model. Gordon assumed that the goal of the designer is to identify and articulate a clear difference between novice and expert interpretations of a given event. Emphasizing a clear expert/novice distinction would lead to more accurate measurement of learning for players who worked through the case. However, we felt that clear distinctions between expert and novice learning might result in cases that led to mutually exclusive right and wrong paths. Instead, we pushed our game designers to elicit mutually plausible narrative paths that would challenge players to think through the implications of a given approach to the problem. This reflected our assumption that the in-class learning was to take place in the *design* process, not through *playing* the games.

Building mutually plausible choices into the game model would force designers to reflect on the advantages and disadvantages of differing approaches to leadership, rather than creating an artificial distinction between correct and incorrect responses. Gordon's emphasis on clear expert-novice distinctions was perhaps influenced by the military context of his design work that aimed to help players understand which policies and procedures to implement at a given time. Although we could conceive of leadership cases in which there were clear choices between appropriate and inappropriate expert/novice responses, we felt that these concepts might be adequately treated by conventional instructional methods. The ICSL cases were structured to help designers think through the ambiguities of practice in order to discern the consequences of action in ill-structured problems – a notoriously difficult leadership area to teach (e.g. Leithwood & Steinbach 1995; 125ff.)

Lessons from the ICSL design processes

In the following section we present several observations about how the ICSL design process unfolded in our 702 and 703 courses. Prior to our class meetings, the design team met regularly to organize content and discuss how students would be likely to experience game development. We recognized that we would have to develop the structures and relationships necessary to help our students to succeed. We felt that students would need to situate their design work in a familiar frame of reference and would need a clear vision and plan about their design. Our discussions often focused on the student familiarity with the practice of design. We discussed how much of their regular work as school leaders and teachers involved everyday design of learning activities and environments, and we sought to transfer these familiar practices into the unfamiliar world of media design. Design evokes a creative process of collaboration where team dynamics and clear communication is essential to a successful experience and product. Students need help to become successful designers.

We structured the story building process by forming design teams with students who complimented each other's skills and practical experience. Each team needs to be balanced with certain roles filled, and students need to be aware of those roles. One of our students said that when design work started "it seemed rocky at first but once everyone understood their roles, it was smooth sailing." Team *leaders* have the ability to take initiative with project tasks (even when there are unknown variables) and to collaborate and communicate well with team members. Concerning *technical expertise*, the interactive cases we propose do not require sophisticated technical skills, but they do require a comfort level with multitasking, experience with certain office software tasks and multimedia tools. The ability to work within a systemic environment (e.g. programming) is a plus, but not essential. Since classes rarely afford the time necessary to facilitate technical skill acquisition for all class members, it is important that those with some tech skills be evenly distributed between the groups. Team members with *content knowledge* are those with experience in the topic area of the project. They can help direct the narrative design with their procedural knowledge (e.g. "Would this cause-and-effect happen in the real world?") as well as influence authentic scripting. The 702 and 703 classes included students with higher education administrative and teaching expertise, K12 leadership and teaching experience, American and international students, and some students with little practical school experiences. Some students had limited background in media design; others were completely new (and apprehensive) about engaging in media design work. Teams will also benefit from having a content novice to ensure that the more knowledgeable students maintain clarity.

Step 1: Story Selection

As described in Figure 1, the first step in the ICLS project is story selection. Story selection introduces students to the game-development process. In the 702 course, we sparked the story building process by offering an assortment of problem-based learning (PBL) scenarios.

We invited students to read through and critique the narratives, then asked them to imagine how the PBLs would feel if they included interactive dialogue rather than prompts for discussion. In the 703 class, the branching narrative project arose in the context of one of the most difficult tasks in teacher evaluation – the post-observation conference. After reviewing a dozen videos of classroom teaching practice, we asked each of our two groups to select a teacher whose practice would challenge an evaluator to have a formative post-observation conference. In both cases, we tried to motivate the design process by problematizing an activity that we had used in the ordinary course of instruction.

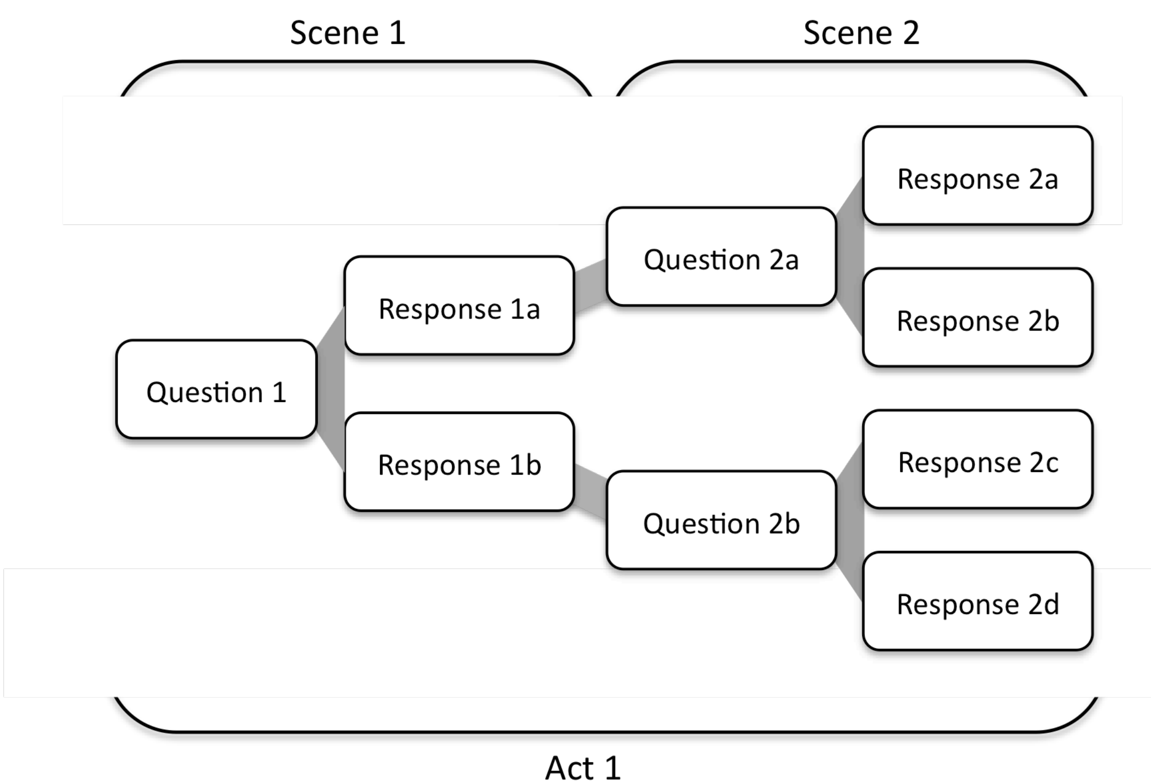

Figure 2: ICSL Act and Scene Structure

Next we needed to introduce students to the medium of branching narrative game design. For students who have never seen an interactive narrative game, we provided several *Chose Your Own Adventure* texts and online links to prepare for the design work. Prior to the course, the

ICSL design team had created an example branching-narrative game based on an existing PBL scenario.[4] We walked through the case with students, and invited students to examine the case structure. Students played the games in pairs, replaying the game multiple times to test how different decisions led to different consequences. A class discussion followed gameplay. One student commented that "having something finished to see before we ever started – as a goal – was nice." Students were given access to copies of this example game (and associated design documents) throughout the semester via our learning management system (LMS) and the instructors.

Structuring the story building activity involved a several step process, First, designers were asked to determine the "gist" of the story, that is, the lesson they felt that players should learn from engaging in the game. Then designers are invited to determine who is the protagonist of the story. The protagonist will reflect whose perspective the player will take during the game. Next, the players will determine who the non-player characters (NPC) are in the game. The NPC roster will comprise the range of actors represented in the game scenario. Designers will select 2-3 NPCs whose opinions "matter" in the game context. The perspectives of these stakeholder NPCs will determine the player's "score" at the end of the game. For example, if the scenario involves a principal trying to resolve a dispute between a teacher and a parent, the designer could select the principal as the protagonist, and the teacher and parent as the stakeholder NPCs. The perceptions of the teacher and the parent (as reflected in a meter or other scoring graphic) would determine the relative success of the principal's effort to resolve the dispute. Finally, designers are asked to determine the story locale. Setting the game in a specific place, and locating subsequent decision points in this space, reduces some of the abstraction of interacting with a virtual environment.

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[4] http://slg.gameslearningsociety.org/icsl.php

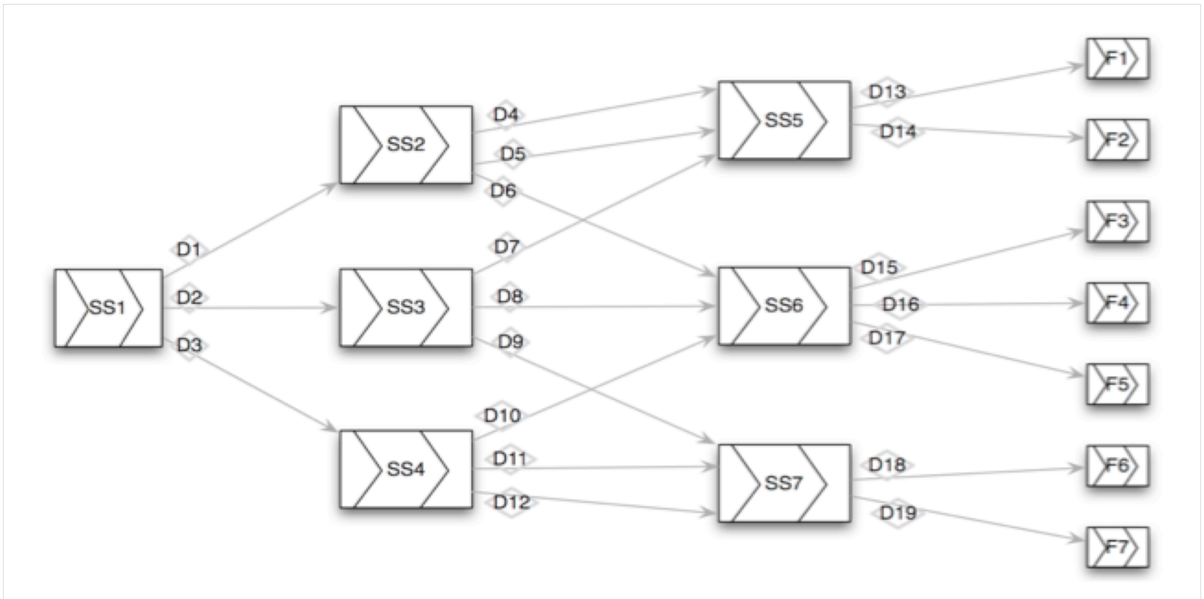

Figure 3: ICSL Narrative Map.

Step 2: Story Building

With source material selected, students are ready to author story elements. The story building process began by writing a story summary. The story summary is a roughly one-page description of the story, from beginning to end. The summary served as a common anchor, along with the map (used later in the process) to keep the team on the same page. The teams use the setting, protagonist and NPCs to flesh out the story direction. These descriptions, with some detail can seed creative thinking for the teams.

The next story-building activity involves chunking the story into narrative parts to reflect Gordon's (2004) chapter sorting task. The teams separate their story summaries into "acts" and "scenes." Acts are marked by the beginning and the end of a given decision-tree; scenes are component parts of acts that include each decision and player response (Figure 2). Acts include a beginning scene that introduced the main problem, a middle scene that highlighted the central conflict, and an ending scene that either resolved the problem or set up the next act. A story-building handout allows design teams to develop brief descriptions of specific events that constituted scenes, highlighted the choices players must make to resolve a scene, or articulated the transition to the next scene.

We developed a narrative map (Figure 3) to guide design choices and to make the narrative construction process more manageable for students. Design teams were asked to develop three-act narratives; each narrative would have two or three scenes. This structure constrained the design teams to choose decision points that would be critical for story advancement and to background other narrative elements as NPC comments or contextual description. Figure 3 demonstrates the narrative construction process of a single Act. Scene 1 is described in slide series 1 (SS1) which introduces the act and provides the first decision point. Scene 2 is broken into three parts, SS2, 3 & 4, which describe the possible consequences of the initial decision. Decisions 4-12 (D4-12) represent the choices players can make as a result of Scene 2. SS5-7, the components of scene 3, reflect the consequence of choices in scene 2. Finally, players are led to conclusions in final slides 1-7 (F1-7) as a result of choices D13-19 in scene 3. Providing narrative maps allowed design teams to focus on how to turn their stories into practical, usable narrative elements. One student observed that this process "really forced you to dig into the decision-making process to not only determine the decisions you would personally make, but also feasible decisions you would not make."

Typically, students used a shared document (e.g. Google Docs) to develop and label narrative elements in terms of the narrative map.[5] Teams used the Act-Scene structures to frame how they expected interaction to happen in the real world. Narrative development reflected Gordon's *point analysis* and *decision formulation* steps. The point analysis process helped designers to articulate the decision points for each act. Students were expected to develop at least 2-3 points per act, which would then come to constitute scenes. For example, a story about a teacher

[5] One student who was unfamiliar with document sharing systems remarked that: "Google docs was extremely helpful for working collaboratively within our group. Once I worked with the video/note taking software I became more comfortable using it and found it much more efficient than trying to handwrite notes."

conflict with an administrator might include three points: 1) introducing the conflict; 2) the teacher's reaction to what the administrator chose to say; 3) the administrator's follow-up question.

Next, students developed "situation statements," based on their point analyses, which created plausible story elements for their narrative. (This step reflects Gordon's decision formulation step). Students write in the second person and include an event relevant to their story. For example, designers might develop three possible conversation angles for the administrator to take with the teacher.

One option could be a cordial opener that emphasizes mutual professionalism; the second could be a frank description of the interaction the administrator observed in the classroom. A third option could be a judgmental outburst that condemned what the administrator perceived as the teacher's unprofessional behavior. Each of these options could then be scripted, for example, in everyday language to structure the NPC teacher's response.

> *Situation statement: "You have just reviewed Ms. Campbell's teaching video clip with her, and she looks embarrassed. She did not accurately understand a student's question, and she proceeded with the lesson anyway.*
>
> > *Choice 1: You want to keep her spirits up, so you give her a complement on her lesson structure.*
> > *Choice 2: You feel she needs to hear some tough truths, so you compliment her on what you liked, but then ask if she noticed her mistake.*
> > *Choice 3: You get angry with her about the obvious mistake.*

Because creating a learning game is a creative process, we found that it was easy for design teams to tread into unrealistic territory, or to simply forget that authenticity is central to their project. One student said, "we wanted to enrich the case and make it real. But once you get real you get messy." Structuring the design process with narrative maps and situation statements help students engage in the messiness while making a realistic game. One student remarked "I do my best when I can see what the end product is supposed to be." The messiness of anticipating what people actually might say in a given situation prompted many rich debates and conversations among team members about the best way to represent an aspect of professional practice.

Students generated abundant game content during story building. Teams may complete several story building handouts, and need to bring their ideas together into a single narrative structure. According to one team member, "the hardest thing in the whole design process was narrowing it down…it was a challenge to scrap a lot of stuff and narrow." Students will be compelled to narrow their content through the process of creating decision points and mapping the story.

Step 3: Prototyping

We intentionally kept the story building process low-tech so that the design teams could focus on developing narrative elements rather than on mastering new technologies. The prototyping step allowed design teams to build a fully articulated narrative in preparation for conversion to hypertext. First, each student team developed a narrative map to help the design team track narrative development. The narrative map served as a reference and authoring tool that linked acts, scenes, decisions and story elements. By ordering decision points and "plugging them in" to the narrative map, authors could establish a design frame of reference.

And because interactive narratives are complex, good labeling conventions are essential for accurate story mapping. The decision points and dialogue elements should have short labels that keep branching paths organized and traceable for later adaptation into PowerPoint. The story mapping process had several parts. First, students sorted and labeled their scene elements. These are the scenes most relevant to the narrative, and also decisions that are most authentic and interesting. These decision sets can be assigned to first and second decision points in the storyboard. Secondly, students assigned text developed to give context within the scenes. One challenge of mapping the scenes is that developing an *interactive* narrative means authors need to think like technical programmers as well as storytellers. With branching paths, students need to keep track of various intersecting storylines that intersect in the narrative map. The map and story summary work together as references to help students remember the big picture when they may be feeling lost.

Next, each team translated the narrative map into a script. The script is made up of the descriptions of what happens, and actual dialogue between characters (for an example, see Figure 4). Through script writing students work out their assumptions about how protagonists and NPCs would actually interact, as they must write down what they think someone would say and do. A student observed, "I'm internalizing most by scripting, by writing the dialogue down." The script is created as a collaborative document that enables team interaction in real-time and remotely. Scripts must then be labeled consistently, typically by using color-coding or notations (as described in figure 3). Since several members of the design teams are in the kinds of positions represented in the scripts, teams can record and transcribe role-playing reenactments of sample interactions in order to capture authentic dialogic interaction. The act of writing dialogue required creativity. One student remarked, "I've written papers all through this program…this [project] was creative, fun, different, and for that reason, kept me very interested." Another student commented that "constructing the cases really forced you to dig into the decision making process to not only determine the decisions you would personally make, but also the feasible decisions you would not make."

There were several problems with scripting that we encountered across the design groups. We found that students often had difficulty keeping track of similar, slightly diverging storylines in their story maps. We found that teams tended to frontload their initial scenes with contextual information that included few decision points. A student in one design team commented that "the hardest thing in the whole design process was narrowing it down… It was a challenge to

(1)

VIDEO1 - (0:00-0:50)

P1 (3) + T1 (4)

(Principal) - The project you worked on, the budget tour, where did that project come from?

(Teacher) - I was watching the history channel, and they were taking tours of museums and I felt it would be a good activity, a simulated tour, to engage the students in their reading.

(Principal) - The History channel is a great resource and I like the creative approach of using it. So what was your favorite part of the lesson, what seemed to engage your students and draw them in?

(Teacher) - The group work, they were engaged, helping each other, sharing ideas and expanding their thinking

P4 (7) - I agree that they were engaged and your use of cooperative groups was also good to see. You have a nice rapport with the kids and your management is good. The kids were well behaved. Here I have a clip of how the kids were raising their hands before they spoke. (go to video 2)

P5 (7) - Lets talk about engagement, what do you think about the pace of the lesson?

(Teacher) I might have been a little bit zealous in what I thought they could do in the time we had.

(Principal) - So what would be one or two concepts that you want to be sure you covered if you were to re-teach this lesson?

(Teacher) - I would want to ensure they understand how to summarize.

(Principal) Great - lets look at the end of the lesson and see how they did with their summaries

P6 (7) - I didn't see engagement or a way their thinking was expanding. In fact here is an example of when you failed to make a connection or expand their understanding of what budget means. You completely missed an opportunity to guide the class to the point you were trying to get to with budget. (go to video 3)

Figure 4: Sample ICSL Script Page

scrap a lot of stuff and narrow the content." Too much information setting up the story made it difficult to motivate players to engage in the game. We encouraged design teams to get players making decisions as soon as possible. Only one or two slides should communicate the role and goal of the player, before the player "enters" the narrative.

Step 4: Production

The production step involved translating the script into a usable PowerPoint hypertext game. We developed a template file with slides labeled to correspond to the notation of figure 3.

Most of the design teams had already worked with PowerPoint, and most teams included at least one member experienced with using hypertext links. The conversion to PowerPoint proved a time consuming process. Teams converted their scripts into PowerPoint one scene at a time, then tested the links with other members of the team to assess linkages and coherence. The cycle of conversion-playtest-revision can then repeat until the entire project is authored in a slideshow. Towards the end of the production process students add multimedia elements to increase visual appeal and motivation, reduce text, facilitate storylines and reinforce intended messages.[6] Multimedia can include images, audio, animations, or video cut scenes. We intentionally placed media production at the end of the development process to focus design team attention on the quality of the narrative rather than the attractiveness of the graphic elements. Multimedia can take substantial time to develop and incorporate, and additional technical skill or knowledge is often required. However, well-selected graphics can make the case more understandable, compelling and entertaining.

Step 5: Playtesting

Playtesting provides the main method of assessment in the ICSL process. Playtesting, a type of usability testing, involves non-designers playing through the game so that designers can assess the quality of their assumptions about gameplay and content. By allowing designers to compare their hypotheses of interaction with actual game play, playtesting provides the kinds of formative feedback that directly link intended learning and outcomes (c.f. Black & Wiliam, 1998). Developing clear content and process goals for the ICSL game meant that assessment criteria were developed prior to beginning the project. Clear content objectives and goals made the game design more than just an exercise in technology use. With these goals in mind, students,

[6] One of our projects included instructional videos. We used an application for video analysis called the Teaching Evaluation Game (TEG); (freeware available for download at http://slg.gameslearningsociety.org/thegame.php). Instructional videos were opened from within TEG so that students could more easily time-stamp relevant clips and take notes for future discussion. Other technologies were used at group's discretion to integrate audio, video, or animation. One group used the site http://xtranormal.com to adapt text into animated movie clips. Other groups integrated sounds and images into the games to make play more compelling.

playtesters and instructors will be able to assess designs long before projects are turned in for a grade. As one student commented, "you forget to put critical information (into the case), playtesting helps you realize what the designer is assuming and taking for granted. Good design means you need to be clear."

ICSL integrates playtesting at three points in the design process: 1) as a test of the narrative map; 2) as a test of the script; and 3) as a test of the PowerPoint representation. Further, playtesting was conducted with three groups: the design teams themselves, practitioners with experience similar to that represented in the game, and technologically savvy game designers and players. In one example, a group of media designers visited class to playtest a version of the fully developed games. One design team asked the playtesters to provide feedback on elements such as authenticity of decisions, ease of navigation, visual presentation, transitions, clarity of scripts and whether the story was interesting. The media playtesters provided a running commentary on the technical elements of the presentation such as the appearance of the slides, whether the text was visually laid out in a clear or confusing way, other options for slide design or potential multimedia that would enhance the presentation. After receiving playtesting feedback, one design team determined to re-write and clarify only one of the narrative paths and to focus changes on the slide format that was confusing. They assigned the writing to one of the group members and the slide changes to another. The remaining members arranged for multimedia as a final enhancement to add interest. Another design team attended to suggestions about the 'authenticity' of their game. They focused on rewriting the script to make the interaction more realistic. One student commented that "playtesting was important to help us bring out the relevant parts of the case."

There were several challenges with playtesting. We found that if playtesters were not properly briefed on the nature of the ICSL games, they would provide with teams unhelpful or impractical advice. For example, one playtester was unaware of the short timeline in which the game could be refined. He suggested re-writing nearly all of the narrative in order to provide more compelling dissonance between narrative paths. Similarly, another playtester suggested rearranging all of the texts in a different format so that navigation would be less confusing. Without a proper frame of reference, playtesters might err on the side of how they would represent idea practice or an ideal game, rather than address the more limited learning goals of a game-based class project. For another game, playtesters questioned the design decision to include multiple slides of information about school curriculum policies and character backgrounds as a condition for game play. Playtesters successfully argued that these "walls of text" provided too much information and limited their ability to engage with the game. They suggested placing an "information" button in several slides, which would lead to an informational slide. That way, players could focus on the game and access relevant information "just in time", as needed. At first, the design groups resisted these suggestions to fundamentally revise the interface, then reflected on how to improve the player experience and decided to take another look at the interface model.

We noticed increased engagement with our students during playtesting. They valued it, and a student told us: "out of the whole process, the playtesting was great. We learned more in a half an hour than [much of the other steps] and it [the game] is so much better now." Another student commented that "to me playtesting was the most vital. I wish we had done playtesting sooner." We integrated playtesting into the design process as early in the design process as possible because it helps designers recognize major flaws in their creation, "bring out the relevant parts of the case…refine assumptions…refine the case." Students felt that playtesting provided the richest learning opportunity of the ICSL project. A student said "[I learned] more than I thought I would. I probably learned the most from the other people who played it, and the views/roles/decisions they took during the game." Another student commented that "playtesting helped us to refine our assumptions…(and) see problems that needed resolution." Students seemed to learn as their initial perceptions and beliefs about professional practice were articulated throughout their designs, then challenged through playtesting.

Concluding thoughts

Our chapter was intended illustrated the process and the value of game design as a model for professional earning activities. Game design provides opportunities for students to test theoretical concepts in multiple, plausible and relevant ways. One student commented that through this project she was able to "built up a knowledge base of how to deal with certain scenarios." She felt she got "on the job training behind the laptop." Instructors have the opportunity to check for student understanding at each design step where feedback that informs student design can also inform instructional practice. The ICSL model detailed ways to scale back the technical requirements of game design while still providing students the opportunity to make playable learning games. We found that most students thought the game design project challenging. Students reported high satisfaction and enthusiasm at the end of the semester. We hope that this chapter may spark similar efforts to use game design methods as tools to address professional learning needs.

We want to be clear that we are not arguing that game design should be used as a substitute for many of the learning activities in professional education. In education schools, for example, students need to master theories of teaching and learning, the legal requirements of student conduct and special education, and analytic methods to make sense of complex quantitative and qualitative data. Graduate schools have developed time-tested, robust methods for helping students master this content; and generative methods for guiding education researchers to enriching our knowledge of teaching, learning and school leadership. However, we contend that game design activities have a place in professional school preparation. Good professional practice learning programs must provide frequent, realistic, and direct feedback on how students adapt the theories and techniques learned in classes to authentic contexts of practice. Game design enables students to generate and use feedback throughout the design process. The ICSL experience seemed to move beyond the learning consequences of case study as discussion. One student noted how game design "made me fully think out the consequences of the case study whereas simply discussing the case and writing a reflection paper might not have made me do so as in depth." Playtesting provides a rich opportunity for receiving feedback from various audiences. Increasing the frequency and quality of feedback opportunities can results in more engaged, in-depth interaction between students around professional topics.

In a typical graduate level class students take one or two tests or write one or two papers as proof of their learning. Feedback on these assignments is minimal, but even when it is abundant, it happens only once or twice during the semester. One of the strengths of using game design as an instructional activity is that students have the opportunity to receive rich feedback throughout the project. Each stage of the design lends itself to revisions of artifacts that represent understanding. As in design-based research, each stage of game design provided an opportunity for self-assessment as well as an occasion for expert feedback from playtesting. This cycle of designing, testing, revising allows students to sink their teeth deeper into the content. One student stated, "I think this process prompted more discussion among us as students - particularly as it pertained to identifying elements of classroom practice and what to say to teachers to encourage reflection on practice. I think role playing was a useful part of this process (i.e., the videos) but it alone would have limited our development of expertise since through the video game we were forced to both teach and learn simultaneously"

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