Design Research and Game Development in a Multiplayer Virtual Learning Environment

D. Matthew Boyer
Michigan State University

Conference Proposal
Meaningful Play 2010

Abstract

Building online games to support learning requires attention to the complex interaction between game and instructional design. Developers creating these types of game-based virtual learning environments must attend to issues of game play, content delivery, and player assessment. The online setting presents a difficult problem, that of limited data points and sparse opportunities for anecdotal feedback to help understand what occurs in the game. To assist in the review of their design, developers need to embed methods for investigation that are iterative and ongoing throughout the life of the project. Design-based research focused on the periodic review of player activity, analyzed in light of development goals, provides empirical evidence for potential changes to in-game structures and guarantees a process for sustained revision toward meeting learning outcomes. Using each iteration of data analysis and formative evaluation as a chance to reflect, developers can assess current game activity in relation to their design goals. This paper describes the process of analysis and reflection used to assess design goals for a game-based virtual environment to support learning Chinese language and culture.

keywords: design research, formative evaluation, language learning, learning games, MMORPGs, online games

Design Research and Game Development in a Multiplayer Virtual Learning Environment

Online games show promise for use as virtual environments to support learning. Replicating game-based methods found in entertainment-sector productions, these spaces are used to create simulations where players can engage in activities that mirror real-world, authentic situations. "Games are inherently simplifications of reality" (Shaffer, Squire, Halverson, & Gee, 2005) allowing players to interact with activities designed to progress a narrative, instruct a skill, or provide the player with necessary information. Instructional designers can embed supportive, content-rich opportunities for engagement into these contexts in ways typically not possible in traditional physical learning environments.

The attractiveness of using games as vehicles for instruction is understandable given the multitude of concepts and contexts that require practice and interaction in complex settings not readily available in traditional instructional environments. Using online simulations to supplement face-to-face instruction can focus students "on an immediate and practical application of the knowledge they have acquired by situating them within a virtual environment that requires it" (Bryant, 2007). As designers construct simulated immersive environments to address specific learning goals, however, it has become apparent that developers need tools to assess their ongoing designs in light of their projected goals. Understanding issues related to activity and learning in these virtual environments is a crucial piece of the overall instructional design puzzle facing developers as they construct online games to support learning.

This study examines the question of how to use design-based research to aid the process of game development. Embedding a procedure of iterative reflection in the development timeline allows researchers and developers the chance to address issues related to both game and instructional design. The example used in this paper is based on an online game that is early in its development. This iteration focuses on player activity and engagement in an online learning environment, Zon , in relation to the goals and assumptions that underpin its design. Investigating what players do while they are in the Zon environment allows developers to view learner actions in the context of the simulation, providing a portrait of engagement with the structures for interaction with content throughout the game. This examination can provide designers with information for assessing the effectiveness of the structures and activities in the online environment, thus informing ongoing work on the Zon project, but also informing future iterations of design, development, and research of other online games for learning.

Using Online Games to Support Learning

Online games have important capacities that other instructional techniques do not. With a textbook, the text or graphic information is inert, whereas with an online game, information can become interactive as it is manipulated by the user. Text and images can be malleable and moveable, reacting to learner input. In a tutor situation meant to support one-to-one interactions, it is difficult for one tutor to communicate synchronously with many students, unlike a game environment that can be designed to support multiple learners at once, in a collocated space, or many single users in multiple versions of the same virtual space (i.e., copies of the game). Using virtual game-based environments allows designers to support instructional methods that require interactive learning structures within an environment that can be used by multiple users, so that

activities are no longer static text on a page and learners are able to communicate with others in their quest for successful progress. The ideal situation in the multiplayer environment becomes a combination of intentional, persistent elements and opportunities for interpersonal communication and support between players. While designers cannot always determine the extent to which players will interact with fellow users, they can develop the conduits for communication and the underlying motivations for interacting with others during gameplay.

Given these structural and functional capabilities, authors have made attractive claims about games and simulations that use digital technologies. Activities focused on learners "such as collaboration, visualization of complex concepts, and connections of concepts between classes and disciplines are some of the useful effects" (Bryant, 2007). With this potential comes the need for additional research to better understand the role that game-based activities can play in educational projects. "While many credit game play with fostering new forms of social organization and alternative ways of thinking and interacting, more work needs to be done to situate these forms of learning within a dynamic media ecology that has the participatory and social nature of gaming at its core" (Salen, 2008).

Research on Online Games for Learning

Other research projects have used iterative design-based methods to examine player activity for a variety of purposes. Investing a disease in the Whyville online game that gave pimples to players' avatars while inhibiting the ability to chat with "sneezes," researchers "gathered information about participants' online interactions and personal experiences with the disease to understand the impact of the event on different aspects of community life and its potential as a model for educational interventions" (Kafai, Feldon, Fields, Giang, & Quintero,

2007). Although Whyville.net was not particularly designed for instruction, Kafai and Feldon

chose to use the environment for its wealth of users and interactions, its fidelity and popularity,

and its usefulness as a test environment for understanding player behaviors. The authors

identified one of the main challenges of this work, which involves the glut of data that is

available during such an analysis. "When learners participate in a virtual environment, they are

simultaneously in two worlds - the online (virtual) environment and the offline (real-world)

environment. Consequently, the collection and analysis of data are complicated and require

careful considerations that are unique to the study of virtual environments" (Feldon & Kafai,

2008). Considering the overwhelming amount of information available, the authors suggested

beginning by creating a system for weeding through the data to find appropriate indicators,

which will be an important component of analysis on this research. Viewing vast amounts of

server data by itself can provide necessary quantitative feedback on individual criteria, but it is

the combination of this analysis with interpretation of the data in light of design goals that

provides the formative evaluations necessary to guide development.

   In addition to their potential for learning, there is the fact that video games in all of their

formats have become an integrated part of popular culture. As Kafai reminds us, "like it or not,

the phenomenon of video games is clearly a highly significant component of contemporary

American children's culture and a highly significant indicator of something (though we may not

fully understand what this is) about its role in the energizing of behavior" (2006). Even as

children are "coming to see virtual worlds as one of their primary ways to interact over the

Internet," (Wyld, 2008) adults are also being captivated by video games as "more than half of all

baby boomers and almost four in 10 members of the "mature generation" (those presently over

the age of 61) play games online" (Wyld, 2008). Given this interest, using online tools to support

learning seems as worthy of research and development as it does timely.

Concerns with Using Games for Learning

In development, answers to questions about the usefulness of games in learning do not

come easily. To create virtual environments that attempt to use game-based methods to support

learning, those designing the online space must consider a vast array of instructional design

issues similar to the decisions a classroom teacher makes in designing lessons for face-to-face

instruction. The designer considers common characteristics of educational design such as

content, audience, activity, and assessment as essential components for creating the structures

with which players will interact. For development, the project must include methods for not only

addressing these issues in the design of instructional activities, but also implementing methods of

ongoing formative project evaluation. "One reason that assessment of simulations and games has

been slow to become a universal part of the design process is because it adds an extra, time-

consuming step. Designing ways to collect data on student learning in simulation and gaming is

particularly difficult because of the open-ended nature of these activities" (Chin, Dukes, &

Gamson, 2009).

Although the marriage of online games and learning seems to be a good fit, it only takes a

brief glance at history to remember the claims made by radio, film, television, and the stand-

alone computer in light of what they are today. "As the foundations of the underlying learning

theories changed from behaviorism to cognitive learning theory and eventually social

constructivism, and new technologies such as computer-assisted instruction and web-based

learning environments emerged, ever more optimistic promises were made about the capacity of

educational technology to improve education across all levels in diverse contexts" (Reeves, 2006). As with their predecessors, educational video games deserve the scrutiny of research as well as the test of implementation to determine their affordances and constraints in light of tools that support learning. Intended to function in part as an online game, the Zon project is being developed to provide a virtual environment that supports the learning of Chinese language and culture. As such, how Zon is conceived and implemented is an important question for a focused investigation on issues of game and instructional design.

Introduction to Zon

This research focuses on Zon, a project from the Confucius Institute at Michigan State University, which is designed to support the learning of Mandarin Chinese language and culture. According to the Zon handbook (CIMSU, 2010),

> Zon is a multiplayer, online learning environment designed to teach Chinese language and culture through game play. As a web-based site, Zon provides real-time, on-demand connection to interactive learning activities and authentic cultural information. Zon users are provided with the ability to interact with engaging story-driven plot lines, online language tutors, and fellow players towards the goal of learning about Chinese language and culture. (p. 3)

Zon is constructed as a browser-based, isometric-view multi-player online role playing game in which players assume the persona of a tourist visiting China. As a virtual environment, Zon provides access to activities and interactions that may not be present in the player's physical environment, allowing interested learners to engage with information and communication tools that support connections to content and other participants. Zon is also described as an MMORPG

allowing large numbers of players to interact with both game elements and fellow players in a collocated virtual space.

The Zon environment consists of a series of scenes in a simulated version of Beijing, for example, an airport, a teahouse, and a convenience store. In each scene, a player encounters and interacts with *Non-Player Characters* (NPCs) and with a variety of game objects such as automated teller machines, furniture, telephones, and mailboxes. The scenes are constructed to allow players to move through a variety of simulated situations that they might encounter in an actual visit to China. Players also have opportunities to experience more serendipitous occurrences of interaction, such as chats with fellow players and Zon staff. Thus, "Zon is designed to teach Chinese language . . . by giving the learners opportunities to interact, providing them with authentic language materials and giving them a chance to "virtually immerse" themselves into target culture" (CIMSU, 2010, p. 4).

Research Questions

The question driving this research is as methodological as it is conceptual: How can design research be used to inform ongoing game development? Embedding methods in the game development process that allow designers to continuously reflect upon their ongoing project while contributing to later stages of construction requires the use of methodology that creates iterations of data analysis and formative evaluation that flow through the process rather than hinder progress and impede investigation. Design-based methods attend to this necessity for reflective yet proactive research.

To address this question, I examine such an instance of iteration by using player activity data and developers' design goals to assess the current state of an online game project. I look at

how players behave in the Zon environment and how this relates to the overall goals for the project. During this evaluation, I want to know: In what activities do Zon players participate in relation to the structures that developers have designed to support learner engagement? This broad question is addressed through a series of more specific questions:

- What assumptions about language learning have guided development and what activities have been designed to support the learning of Chinese language and culture within Zon? Here, an analysis of the Zon environment details the types of activities in which developers intend for players to engage in ways that will support their learning of Chinese language and culture.

- Using samples of server data, how have players engaged with the Zon environment? This analysis shows where players actually chose to interact, with particular focus on those activities meant to promote learning and practice of new concepts.

- What aspects of the Zon environment might explain these patterns of engagement? Potential explanations for player activity focus on the intended activities in relation to the actual choices players made.

Method

Analysis of Zon Assumptions and Activities

Examination of assumptions and goals guiding the development of Zon drew primarily from the *Zon Handbook* document (CIMSU, 2010), the "official" support document for teachers and players in Zon. It provides an overview of Zon, and describes gameplay, teaching and learning in the environment, and the technical specifications necessary to play Zon. As the only public document written by Zon developers that describes their design selections and intentions

in some detail, it is a requisite part of an interpretation of the values that emerge from the server data.

An additional source used in development is the *International Curriculum for Chinese Language Education* (ICCLE) from the Hanban, the Office of Chinese Language Council International (2008). This resource was used by Zon developers to guide the leveled, thematic content embedded throughout the game. It outlines the recommended themes and topics for Chinese language learning while providing teachers and other instructional designers with content leveled into five stages of development. It illuminates the essential aspects of linguistic and cultural knowledge by presenting strategies that "act as conditions upon which learners increase their efficiency, learn independently, and develop their personal abilities" (The Office of Chinese Language Council International, 2008, p. II).

This analysis requires an understanding of each individual scene in Zon, but it also needs to view the types of activity in relation to the entire environment. To this end, I analyzed each scene for the availability of intentionally designed activities, meaning those NPCs and objects which provide players with the opportunity for engagement with gameplay and access to learning content.

Analysis of Server Log Data on Player Activity

Server logs from a week in November 2009 and the month of February 2010 provided data on players in the environment, selected for use due to the absence of game updates. These logs contain the choices that players made when selecting activities and moving throughout the gameplay area. I used the database files to answer questions about player activity in Zon, using quantitative log information to uncover qualitative trends for interpretation. As Feldon and Kafai

(2008) point out, when using mixed methods to make inferences about player activity, quantitative data is important, but "without qualitative inquiry to provide context for server-generated statistics, key aspects of the interactions are lost" (p. 577). To attend to the specific questions at the center of this iteration of evaluation, I narrowed the focus of analysis to player selection of different activities that provide access to learning content, given the different types of information and interaction from which players can choose. This allowed me to use data-driven results to represent the reality of player activity in the Zon environment.

Interpretation of Player Activity

Using the analysis from the three previous subsections, the interpretive nature of the fourth question requires reflection on the assumptions about and realities of player activity in the Zon environment. The outcomes from the analysis of player data provide necessary feedback on the design of available activities and the distribution of learning content as they relate to the actualities of player engagement. Interpretations in this section use the available quantitative results as central aspects of the formative evaluation of current Zon development.

Results

These results are taken from the analysis of player activity data from a week in November 2009 and the month of February 2010. Due to concerns over the extent and dependability of November data, it became necessary to gather additional data to be able to view a broader portrait of player activity during gameplay.

Assumptions Guiding Development

The Zon Handbook (CIMSU, 2010) provides clear statements of the developers' goals, describing their design of the online environment as built to support game-based learning

activities and multiplayer gameplay. The following points are some of the salient aspects of such a learning environment, shown along with statements from the Handbook that help to define the intentional design decisions made during development.

- Player activity is driven by realistic narratives that use authentic language to engage players with learning content: "Tasks are one of the main ways of engaging the learners in meaningful language learning activities" (p. 19);

- Players interact with activities and information to inform their ongoing learning and test their understanding through practice: "Zon provides real-time, on-demand connection to interactive learning activities and authentic cultural information" (p. 4);

- Players have ample opportunities for ongoing assessment and immediate feedback related to their progress in the game: "The Examiner, who is present in most of the scenes, also functions as a "culture expert" and tests the learners' cultural knowledge" (p. 6);

- Players exist in a virtual environment built as a simulation of authentic environments, providing a context for ongoing and meaningful activity: "Zon is designed to teach Chinese language in both Foreign and Second language settings by giving the learners opportunities to interact, providing them with authentic language materials and giving them a chance to "virtually immerse" themselves into target culture" ;

The design of Zon is based on the intent to provide an environment that is driven by an embedded narrative, filled with opportunities for practice and feedback, and built to simulate authentic, realistic interactions and contexts that the player would find in China. The assumption underpinning this design is that players are, in fact, engaging with the interactive, content-rich

elements of the game, while accessing feedback to guide their individual progress and making

future gameplay decisions based on their individual learning needs.

Overview of Zon Activities

As an environment that creates a simplified simulation of places found in Beijing, the

scenes, and the activities within these scenes, attempt to replicate real world places to the extent

that they make sense to players as part of gameplay. An overly complex setting could potentially

overwhelm learners and lessen the impact of important opportunities for learning, while an

environment that lacks necessary details would not have the transferability available in more

authentic representations of reality. Developers walk a fine line in creating activities that support

a wide range of learners through leveled, thematic content but resisting the urge to fill the

environment with the vast array of symbolic and sensory messages available in the real world.

An example scene in Zon

To describe the activities available to players and how these options relate to the goals

defined by the developers, the initial scene, the Airport, gives an example of opportunities that

players have to engage with content and gameplay while in Zon. The types of options described

here are available throughout the Zon environment using a variety of content and activity

depending upon the thematic basis for the scene.

In the Airport interior, players encounter Customs officials, bank and store employees,

and other travelers as part of the available interactions (see Figure 1). Players access content

related to language points and cultural information through the radial menus attached to these

NPCs and other objects in the scene. It is within these interactions that the primary presentation

of learning content on Chinese language and culture occur. The scene provides the context, but

Figure 1: Airport scene

without engaging with the game elements, players would see little of the content available to

them. They would miss opportunities to experience essential aspects of the language, important

cultural facts about China, and narratives that drive gameplay. As in the real world classroom,

learners need to involve themselves with activities in order to benefit from the learning

opportunities embedded within them.

In the Airport scene, the player can access content focused on the theme of "Travel and

Transportation" by clicking on the radial menu of the Female Police Officer NPC (see Figure 2)

at the Airport Exit and choosing the Observe option to access this screen. When the player clicks

on Observe over the Airport Police Officer, the pop-up displays additional information about the

learning content presented through vocabulary and language information specific to interactions

with that NPC (see Figure 3). This particular interaction includes language points related to the

topics of directions, numbers, colors and salutations and provides a sample conversation, in text

and audio, that exemplifies these topics and language points.

Figure 2: Airport Police Officer

Theme:	Travel and Transportation
Topics:	directions, numbers, colors, salutations
Unit:	Airport Exit

Vocabulary

guǎi 拐 turn
nǎr 哪儿 where
shì 是 used as "verb to be"
qī 七 7 seven
zài 在 be; preposition.
    (located) at; in.
zuǒ 左 left

bānchē 班车 regular or
    scheduled bus service
búyòngxiè 不用谢 You are
    welcome.
hào 号 number; day of a month
jǐ 几 how many; what; for what
    extent or degree

Language Points

1. Where is the exit? 方位：XX在哪儿？
2. turn left 指路：左拐，右拐，一直往前走
3. What is the number of hotel shuttle bus? 是
4. numbers (1-10) 数字1-10
5. colors 色彩：红，红色，红的
6. Thank you! 短语：谢谢，多谢
    回答：不（别）客气。
7. Bye! 再见，回答：再见

Each set of vocabulary and language points is presented through an Observe interaction

that is accessed through an NPC's radial menu which appears on-click. Players can choose to

view information on a variety of topics and presented in an Observe window where they are

given language points in English and Chinese, a sample dialogue written in pinyin, and an audio

track in Chinese of the sample dialogue (see Figure 3). Clicking on a particular language point in

English provides an expanded description of grammar and usage information connected to that

example. The sample dialogue in pinyin is also clickable by word or sentence, giving the player

the option to view the English meaning, the Chinese characters written in calligraphy, and an

audio example of the pronunciation in Chinese. An audio option is also available for the player to

record their pronunciation of sample vocabulary and replay it as a manner of comparison to the

prerecorded audio tracks.

Figure 3: Observe window

The About option on the radial menu also contains content related to language, but when

there is information beyond example vocabulary, it is typically dedicated to providing cultural

information. For most NPCs and objects, there is an About option on the radial menu, which

links to a pop-up window with the name or purpose of the item selected. The About shows the

text in Chinese characters, pinyin, and English, along with an audio pronunciation (see Figure 4).

Some of the About options also provide images or video clips detailing additional information to

accompany the text and extend the description of the object or action.

Figure 4: example About window from Airport Bank

Initial mapping of server content

Using two files from the server database, I was able to determine what variables were available for analyzing the Zon environment that would allow me to view temporal and spatial information about player activity. The Activity Log file contains a record of player selections made while playing Zon. The Screen Items database file details the information necessary for corresponding the audienceID value in the user activity log with the eventual Flash item it will launch in Zon. Values are either numbers or text and provide either spatial information that shows player location and activity or temporal data that situates the activity in a timeline for the login session.

These values place activity in its appropriate locations throughout Zon, showing where players choose to spend their time. While in these locations, activity data on what types of interactions the players select shows where the players focus their attention, make decisions among and during activities, garner information, or any of the other types of interactions available to the Zon player through the radial menus that appear on cursor rollover of objects and NPCs.

Opportunities for activity

The current activities available to Zon players include 23 types of activity that are accessed through the radial menu that appears on objects and NPCs. The Zon Handbook provides descriptions for some of these activities, but some are simply used to progress gameplay activities, such as Drink, Eat, Enter, Leave, Take, and Talk. The choices that are related to accessing and practicing learning content are About, Apprentice, Engage, Explore, Learn, Observe, Play, Read, Task, and Watch.

Interaction with Learning Content

Looking at examples of activities as they are used in various scenes in Zon, it is clear that content is mainly presented through About and Observe. These two options provide the majority of content that is reinforced by its use in practice activities such as Engage. For example, in the Airport scene, the Examiner NPC gives players a quiz based almost entirely on the information found in the About options throughout the scene. In the Airport shop, the player can engage with the NPC in a conversation about shopping that mixes initial conversational vocabulary in Chinese with translations and more difficult terms in English. If the player is unfamiliar with the vocabulary and grammar, they can find this information in the Observe for the same NPC. By

tying practice activities to the embedded interactions in a scene, the developers have created a reason for players to become familiar with new language skills and access new content.

Opportunities to practice learned content are available throughout Zon by choosing menu options Apprentice, Engage, Explore, Play, and Talk. Each of these interactions give players a chance to use language and culture to complete activities, play stand-alone games, or hold conversations with NPCs in English and Chinese. Of these, Engage is used most frequently in Zon, with interactions such as dialogues with NPCs in Chinese or culture-based quizzes from the Examiner, presented primarily in English.

Another type of activity, Task, is used sparingly in the initial scenes, and is designed to embed content practice in gameplay that furthers the tourist storyline while providing a purpose for interacting with new NPCs and visiting new scenes. Tasks surround interactions with a continuous narrative designed to move players to new content while requiring them to use their newly acquired knowledge of Chinese language and culture in practice activities. During the sample period, there are three task lines at use in Zon, two in the Airport scene, and one that starts in the Hotel Room and ends in the Teahouse.

These lines of activity follow a pattern common to games where players complete steps of a mission or quest in the process of achieving a greater goal and receiving appropriate rewards for their actions. Interestingly, both Task lines in the Airport require that players have gone to the Bank and traded travelers' checks from their inventory for Zon Dollars, but only one of the Task lines tells players how this can be accomplished, without having the player actually perform this interaction. In one Task line, the player can help a fellow traveler by purchasing and delivering a coffee before receiving a small monetary reward. The other Task line involves several steps

where the player must find their missing luggage and then trade their travelers' checks for Zon

Dollars. If the player completes this Task line correctly, they can receive free transport via shuttle

bus to the next scene, the Hotel Street. If not, the player will need to determine how to obtain

enough Zon Dollars to pay the taxi driver for the same trip. The third task line requires the player

to retrieve an item from an NPC in one scene and deliver it to an NPC in another scene, a

common game mechanic used to bring players into new setting in order to present new content.

Organization of Learning Content

The Hanban text *Chinese Language Proficiency Scales for Speakers of Other Languages*

(The Office of Chinese Language Council International, 2007) provides the framework for the

stages presented in the ICCLE and informs the content embedded into gameplay activities. These

five stages are designed into the Zon environment as levels of content, represented through an

interactive screen within the game (see Figure 5). This map shows the location of different stages

of content by their scene location within Zon, and players can choose to see each level of content

separately or in total, as shown. These correspond to activities found within the different scenes

of the Zon game environment.

This content is the guiding framework for presenting opportunities for the player to find

more information about Chinese grammar and usage. It is in found through gameplay

interactions where players will uncover the necessary building blocks for their continued

learning of Chinese. Although language information is present in many places in the

environment, players will need to interact with specific activities to find answers to prompts in

other activities.

Figure 5: Stages of Learning Content

Player Interactions with Learning Content

Results emerge from the data in two ways: interpretations related to what occurs in individual scenes given the options available in those settings, and broader statements about engagement with learning opportunities related to the overall environment. The following examples provide evidence of both types of results, as particular observations from scenes are useful in discerning overarching trends while these broader assumptions about the data can be explained through situations which occurred in a number of scenes. This analysis of server logs focused on "instances" of activity, where one or more lines of server data indicate a player's sustained level of interaction with a chosen activity, representing one instance of interaction rather than a raw frequency of server lines related to one activity.

Examples of Player Activity

To understand the ways in which players chose to interact with options for activity in

Zon, I used an overview of player selections during the one week period. Table 1 shows the

frequency of player selection for activities related to learning content that were available

throughout Zon during the sample week in November 2009.

Table 1

Overall Activity for Pilot Week

activity	frequency	percent
Explore	18	0.09%
Watch	44	0.23%
Read	70	0.36%
Learn	285	1.48%
Play	326	1.69%
Apprentice	349	1.81%
Observe	738	3.83%
About	3746	19.44%
Task	3926	20.37%
Engage	9767	50.69%
Total	19269	100.00%

I chose to focus on scenes that provided a range of the amount and type of options

available to players. After reviewing the overall results, I chose to look at individual activity

types that stood out in comparison to my expectations related to the goals for player activity in

Zon. For example, I expected to see Observe as a prevalent selection due to its importance for

presentation of learning content. In the three scenes in Table 2 chosen for their range in amount

of cumulative actions, Observe was selected with the following frequencies given the overall

activity selections made by players in that scene.

Table 2

Sample Scene Activity

scene	frequency	percentage
Teahouse	12 of 1129 actions	1.06% of activity
Hotel Street	18 of 1788 actions	1.01% of activity
Post Office	22 of 255 actions	8.63% of activity

Results such as these led me to focus on individual activity types in my analysis of player data. As another example, I looked at player activity by comparing a sample of player selections in relation to the average values for all players in order to interpret activity. Table 3 shows a sample of players chosen to represent the range of activity during the pilot week for all types of activity, not just Observe. For each player, however, it was clear that the Observe values showing the amount of times these players chose to launch an Observe during the pilot week was considerably low in relation to their total activity.

Table 3

Observe Frequency by Player

playerID	Observe frequency	percent of total activity
---21	7 of 487	1.4%
---53	0 of 2	0.0%
---36	1 of 246	0.4%
---26	0 of 100	0.0%
---63	74 of 474	0.8%

In the table, the percent of total activity for each player is below the sample average of 2.6% of selections from the overall sample of players. Although this was pilot data, as a point for

interpretation, these values suggest that these particular players chose to interact with the prescribed learning content less than was typical and significantly less than other options.

Moving to the February data to gain a better sense of how player interaction progressed across several scenes, I found this useful for exposing trends that show the ebb and flow of activity relative to availability throughout Zon. An example of this came from the Task option, which is designed to provide a structure that facilitates ongoing gameplay while giving players game-based reasons for accessing learning content and completing practice activities. In the initial Airport scene, nearly half of the players chose to begin the task line that would allow them to leave the Airport via the free shuttle to Hotel Street, but only half of these players completed the task line successfully, and even less chose to interact with the next task line that begins in the Hotel Room.

Understanding Player Activity

Through the analysis of player data and the interpretation of the various themes that emerged, player activity is best described in relation to both the available opportunities and the chosen actions for interacting with content and gameplay. Understanding how the different types of designed, intentional activities are used by players requires the numerical usage data, but it also needs to be viewed in comparison to the goals developers have for Zon as a part of the formative evaluation that can provide important developmental feedback.

Interactions with Task

From the initial February data, it is apparent that while many players chose to interact with the two lines of tasks that start in the Airport scene, there remain a considerable amount of players who did not participate in the primary elements of the ongoing story. Once players leave

the initial scene, there is only one additional task line, that of the delivery task starting in the

Hotel Room and ending in the Teahouse. Even if players were drawn to the role-playing aspects

of Zon as driven by the narrative and facilitated by participation in tasks, these players would

soon find their purpose for engagement had disappeared.

The importance of a narrative structure comprised of lines of tasks cannot be

underestimated in game design, especially in role-playing games when attempting to create an

immersive identity for players, as Zon seeks to have to in the form of the "tourist" role. Not only

does the presence of an embedded narrative give the player purpose related to gameplay, it also

"fosters motivation and serves as the organization framework for the interactive

environment" (Dickey, 2006). In the initial scene, the narrative begins by reinforcing the player's

role as tourist in a new country. The first tasks that begin to drive this storyline are focused on

finding a lost suitcase, exchanging travelers' checks for Zon Dollars, and finding transportation

to the hotel.

What is interesting about this, from an instructional design perspective, is the need for

developers to embed tasks that contribute to a well-defined, well-developed narrative. If Zon is

to create an role-playing environment, then characters must be involved with an overarching

story that instills activity with purpose. The "lost baggage" storyline begins the move toward

embedded interactions that give the player a reason to uncover new information and learn new

content. As the remainder of the Zon environment lacks this type of guiding storyline, a primary

focus of continued development should be on constructing lines of tasks that engage players with

NPCs, move players into new environments, and surround their activity with meaning. Increased

participation in narrative tasks can not only increase the time that players spend immersed in the

environment, it helps to ensure that players access and use the learning content required for successful development of language skills. Without a driving narrative, players rarely begin to inhabit the role of tourist that gives them reasons to explore in Zon. Curiosity may bring self-starting learners to the environment, but lack of purpose and structure will drive them away.

Interactions with Observe

One of the most striking results is the relatively low selection of the language content presented in the Observe selections. Although player activity in the Airport scene is distributed across the available options with much the same frequency that the options occur in the scene, there is still a relatively low occurrence of interaction with Observes. There are 18 different Observes in this scene, more than any other individual scene, but players only chose to access this content less than half as often as they engaged with the practice exercises that required knowledge of the learning points as requisite understanding for successful completion. In other scenes, including the Hotel Lobby, Hotel Street, and Teahouse, players chose to interact with the language learning content less frequently than in the initial scene. Overall, throughout all of the scenes, attention to Observe content was far below other options, related to both its availability as a choice, and its support in completion of practice activities such as Engage.

At this point in development, what is important about the low prevalence of players selecting Observe is the very limited attention that players are paying to language content. As an instructional designer, this sends the message that players may be disinterested in the content. Considering the most common explanations for this type of behavior, a primary concern for developers would be the potential inability of learners to understand the content and to integrate new vocabulary and grammatical structures into their greater understanding of Chinese. If

players are beginning learners of the language, their success with low level content is dependent

on their pattern recognition abilities to determine word order in an unfamiliar language, as

success in much of the practice activity focuses on correctly identifying sequence of new,

potentially unfamiliar vocabulary. Given this possibility and considering an audience of self-

motivated players who have chosen to enter Zon with the goal of learning something about

Chinese language and culture, a review of early skill development with patterns, symbology, and

basic grammar and vocabulary in the game environment, could illuminate a need for more

structured activities for initial learning based on the first and second stages of the ICCLE

curriculum.

Another explanation could be that players find little need to internalize the information

from the Observes, as the practice activities can be completed, and will provide rewards,

regardless of the player's rate of success. Creating interactions that require players to respond

correctly, with fail states that direct players toward learning content, could address this issue by

making learners accountable for performance in a more substantive manner. Success on activities

devoid of understanding of content may please players with easy rewards, but it does little

toward the goal of helping them to learn language points with any hope of transferring their

understanding into new situations. The opportunities in Zon rarely ensure that players can

receive Zon dollars or inventory items for their understanding of Chinese language or culture.

Interactions with About and Engage

This phenomenon of skipping essential content is also evident in the quizzes on cultural

points that are accessed through the Examiner Engage option. The majority of questions on these

quizzes are based on information in the About options in the same scene. What is interesting

about this is that although players chose to complete the Examiner quizzes with frequencies relative to their availability in scenes, players rarely chose to access the About selections that contained the information necessary to correctly answer the questions in the quizzes. For example, one of the questions asked by the Examiner in the Airport scene pertains to the number of terminals in the Beijing airport. None of the About options that contain this information were accessed during the sample period. Of course, there is the possibility that players came to the activity with this prior knowledge, but the fact that players can incorrectly answer the question, retry it until they get it correct, and complete the quiz for a reward without ever knowing the actual answers is cause to examine the design of these quizzes as a method for practice and assessment of internalized knowledge. From the viewpoint of the instructional designer, there is no way to check learner understanding, and, equally as important, there is no means to assess learning and redirect student errors toward successful use of newly learned content.

As server data required to assess achievement is not a current facet of the Zon logs, it is unclear as to how players faired on the Engage practice activities. Perhaps players came to the practice activities with the prior knowledge of the language points required for successful completion. Perhaps, as the Engages are currently designed to correct player errors and continue the interaction without interruption, players were able to complete these activities without comprehending the nature of the dialogue. Without additional data, this remains uncertain.

Discussion

Whatever the reasons, it is clear through the analysis of data and the process of formative evaluation that players do not often choose to interact with the learning content as a means toward completing practice activities. This is vital information for developers as it highlights

potential issues for learning design that can be researched through content analysis, player observation and/or interview, and player assessment. Is the content in the Observe selections presented in a learner-centered manner that provides the exact content necessary for learners to succeed in other activities? Is content leveled and categorized in a way that is appropriate to player knowledge and ability? These types of questions should be the next step for designers to consider after they have analyzed player activity in light of their design goals toward supporting access to appropriate content and providing engaging and educative activities for players.

In the analysis of player activity in the existing scenes in Zon, I focused on the opportunities that players have to interact with learning content as they relate to other available activities in the virtual environment. My intent was to use design-based methodology to provide a picture of what is occurring in Zon during this iteration of reflection. The question of player activity and engagement was chosen because it is timely to this stage of development, and the answers that emerge from the data are useful for making important revisions to the design as well as making decisions about where developers should focus their energies. Having a fundamental understanding of what players are choosing to do in Zon informs the types of design revisions that developers choose to make in future iterations of the game given the goals that developers have laid out in their most recent handbook.

The combination of data analysis and formative evaluation embedded in the project development timeline allows for research to inform the design process by answering important questions about player activity. Game developers who implement ongoing iterations of reflection throughout development are able to use server data to better understand what players are doing in the virtual environment while answering specific questions about game structures and

instructional designs. The example provided in this study displays how a combination of analysis and evaluation can inform current progress and future designs.

References

Bryant, T. (2007). Games as an Ideal Learning Environment *NITLE Transformations, 1*(2), 1-8.

    Retrieved from http://hdl.handle.net/10090/6565

Chin, J., Dukes, R., & Gamson, W. (2009). Assessment in Simulation and Gaming: A Review of

    the Last 40 Yeras. *Simulation & Gaming, 40*(4), 553-568. doi:

    10.1177/1046878109332955

CIMSU. (2010). Zon Teachers' Manual   Retrieved from http://enterzon.com/

Dickey, M. D. (2006). Game design and learning: a conjectural analysis of how massively

    multiple online role-playing games (MMORPGs) foster intrinsic motivation. *Educational*

    Technology Research and Development(55), 253-273. doi: 10.1007/s11423-006-9004-7

Feldon, D. F., & Kafai, Y. B. (2008). Mixed methods for mixed reality: understanding users'

    avatar activities in virtual worlds. *Educational Technology Research and Development*

    (56), 575-593. doi: 10.1007/s11423-007-9081-2

Kafai, Y. B. (2006). Playing and Making Games for Learning: Instructionist and Constructionist

    Perspectives for Game Studies. *Games and Culture, 1*(1), 36-40. doi:

    10.1177/1555412005281767

Kafai, Y. B., Feldon, D. F., Fields, D., Giang, M., & Quintero, M. (2007). Life in the Times of

    Whypox: A Virtual Epidemic as a Community Event. In C. W. Steinfield, B. T. Pentland,

    M. Ackerman & N. Contractor (Eds.), *Communities and technologies 2007 : proceedings*

    of the Third Communities and Technologies Conference, Michigan State University 2007

    (pp. 171-190). London ;: Springer.

Reeves, T. (2006). Design research from a technology perspective. In J. J. H. v. d. Akker, K.

    Gravemeijer, S. McKenney & N. Nieveen (Eds.), *Educational design research* (pp.

    52-66). London ; New York: Routledge.

Salen, K. (2008). Toward an Ecology of Gaming. In K. Salen (Ed.), *The Ecology of Games:*

    Connecting Youth, Games, and Learning (pp. 1-20). Cambridge, MA: The MIT Press.

Shaffer, D. W., Squire, K. R., Halverson, R., & Gee, J. P. (2005). Video Games and The Future of

    Learning. *Phi Delta Kappan, 87*(2), 104-111.

The Office of Chinese Language Council International. (2007). *Chinese Langauge Proficiency*

    Scales for Speakers of Other Languages. Beijing: Foreign Language Teaching &

    Research Press.

The Office of Chinese Language Council International. (2008). *International Curriculum for*

    Chinese Lanaugage Education (ICCLE). Beijing: Foreign Language Teaching &

    Research Press.

Wyld, D. C. (2008). World of Workcraft: Educating and Training "Digital Natives". *Cutter IT*

    Journal(September 2008), 26-30.