UNDERSTANDING PLAYER ACTIVITY IN A
GAME-BASED VIRTUAL LEARNING ENVIRONMENT

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ABSTRACT

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This study examines player activity in a game-based virtual learning environment as a means toward evaluating instructional and game design. By determining the goals embedded in project development and the availability and structure of in-game activities, the first part of this research highlights opportunities for players to engage with learning content in the environment. In the following section, server data provides the requisite information for creating a portrait of player actions in the online space. From this assessment of intentional designs compared to player activity, the study provides findings that focus on player behaviors and structural realities. Players tended to avoid opportunities to interact with learning content. They showed few examples of sustained, immersed participation in the game-based environment. The structure of the activities was such that requisite information was inconsistently available for players to complete interactions and further their knowledge of new learning content. Understanding player activity is an essential piece of the formative evaluation of ongoing project development with implications for the creation of similar game-based virtual learning environments in particular and design research in general.

T O

M Y   M O T H E R

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KEY TO ABBREVIATIONS

CIMSU ....Confucius Institute at Michigan State University

ICCLE......................................International Curriculum for Chinese Language Education

MMORPG...Massively-Multiplayer Online Role Playing Game

MOO ....MUD, Object Oriented

MUD ....Multi-User Dungeons

NPC(s) ....Non-Player Character(s)

CHAPTER 1

INTRODUCTION

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, p. 105) 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 learning environments. Among the many types of games, those that support role-playing allow the learner to assume an alternate identity within the virtual space. In these role-playing games, "players come to *inhabit* roles that are otherwise inaccessible to them" (Shaffer et al., 2005, p. 105). Within these simulated role-playing contexts, designers can integrate activities that provide learning supports such as guided investigation, remedial practice, and immediate feedback.

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" (Bryan, 2007, p. 7). And yet, even as designers construct simulated immersive environments to attempt to address specific learning goals, we know little about how individuals

interact and learn within these spaces. Understanding engagement and learning in these virtual environments is an important piece of the overall instructional design puzzle facing developers as they construct online games to support learning.

This study examines player activity and engagement in a virtual learning environment, Zon (CIMSU, 2010a), in relation to the goals and assumptions that underpin its design. As a virtual space created to support Chinese language learning by using game-based activities to involve players, Zon provides an attractive environment for attempting to understand how users interact with learning content in an online space. Investigating what players do while they are in the Zon environment gives researchers the chance to view learner actions in the context of the simulation, providing a portrait of engagement with the structures for content interaction throughout the game. This examination can provide Zon designers with information for assessing the effectiveness of the structures and activities in Zon, while also prompting important questions about the presentation of learning content in relation to game-based activities.

Chapter 2 of this dissertation provides a review of literature related to issues of online games and learning, along with an introduction to the Zon environment and the research questions. Chapter 3 describes the analysis methods used for this study. Chapter 4 presents an analysis of the available activities in Zon, focused on general results of player activity, with Chapters 5 and 6 detailing player activity organized by game functionality. Chapter 7 concludes the paper with a discussion of the results and implications for future research and development.

CHAPTER 2

LITERATURE REVIEW

This chapter provides an overview of the use of games to support learning, with a brief historical look at the phenomenon. Information on the development of online learning games and issues related to their use follows. The chapter concludes with an introduction to the Zon online game and the research questions guiding this study.

Games to Support Learning

As games have begun introducing the idea of play into instructional design, researchers have pointed out that "play is a primary socialization and learning mechanism common to all human cultures and many animal species" (Van Eck, 2006, p. 18). Games involve goal-setting and practical application of skills into new situations. Games provide consistent feedback throughout gameplay and at the end of levels of action to guide players' progress toward their goals and allow players to reflect on where they have been and where they want to go next (Gee, 2008). In addition to concepts such as motivation, failure, competition, and collaboration, Gee contends, good games provide interactivity, well-developed problems, and customization, along with the ability to create strong in-game identities, engage in activities that are "pleasantly frustrating," and continue to build on previous expertise. Well-designed games are also seen as *deep* – with elements that seem simple growing in difficulty over time in game – and *fair* but challenging, "set up in a way that leads to success and does not design in features that virtually ensure failure over which the player has little or no control" (Gee, 2007, p. 155).

Game-based learning activities and environments may facilitate other important aspects of learning, including "the experiential and fully situated nature of game learning, the

intrinsically motivating nature of key game attributes, and the provision of educationally rich contexts for the development of expertise" (Wideman et al., 2007, p. 11). Games can be designed to support learning through the construction of deeply contextual environments for activity, where players are guided in their interactions by tools embedded in the structure of the game. These structures allow for repetition and remediation of difficult concepts, practice of skills and techniques, and enrichment of new learning through novel situations.

Historical Use of Games for Learning

Using games and simulations to support learning is not new. In *Democracy and Education*, John Dewey (1916) wrote, "Where schools are equipped with laboratories, shops, and gardens, where dramatizations, plays, and games are freely used, opportunities exist for reproducing situations of life, and for acquiring and applying information and ideas in the carrying forward of progressive experiences" (pp. 161-162). Thus, creating an environment for learning activities that contains the tools appropriate to the context of the activity was an important aspect of designing instruction. Decades later, as discovery learning came into fashion, educators saw role playing and simulation as a way for students to enter a historical time period as a contemporary experiencing the events (Birt & Nichol, 1975). Games provided a simulated context for learning, and the tools used to facilitate gameplay became the structures that supported learning and focused activity. With the advent of computer technologies, players of games and simulations began to use computers to do the complex calculations needed for physical simulations, as they sought to add complexity to their simulation models (Armitage, 1981).

In the 1980's, games and simulations continued to develop, with practitioners eager to use these activities to support "higher-level learning" as described by Bloom. Teaching methods using games and simulations were successful for promoting higher level cognition and affective objectives (Percival & Ellington, 1984). With the advent of networked technologies, online communities began to develop around simulated environments that used text to create environments, either through text-based narrative, or by using text characters to graphically represent physical objects such as rooms. Multi-user networks connected through their computers began to create environments for activity using text to inspire imagination and engagement in a virtual space in the original Multi-User Dungeons (MUDs). When object-oriented programming turned MUDs into MOOs (MUD, object oriented), these environments were modified by users with additional objects, focused on educational, professional, and social goals (Taylor, 2006). As technologies have developed, increasingly detailed graphics have allowed the construction of immersive virtual environments based largely on computerized images. Most of these are commercial products, however, where learning goals may not be an overt aspect of development. Developers capitalizing on the ability of these game environments to support interaction and communication have created game-based virtual learning environments whose primary purpose is instruction through activity in online worlds.

Using Online Games to Support Learning

Online games have important features that other instructional techniques do not. With a textbook, the text or graphic information is inert, whereas with an online game, information can become dynamic and interactive as it is manipulated by the user. Text and images can be malleable and moveable, reacting to learner input. In traditional tutoring settings, it is difficult

for one tutor to interact with many students at one time; a game environment can be designed to support multiple learners simultaneously in a collocated space, or many single users in multiple versions of the same virtual space (i.e., copies of the game). Virtual game-based environments allow designers to support instructional methods that use interactive structures within a multi-user environment. 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 among players. Although 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.

For foreign language instruction, which is the focus of the Zon project, online games such as Massively Multiplayer Online Role Playing Games (MMORPGs, where many players can interact with others in a virtually collocated space) can provide learning supports germane to generalized instructional design and specific to language learning.

> With enhanced social and cultural interaction in context, the affordances of socially
> constituted webs of communicative practices in the simulated worlds, and the rich
> mediating resources and embodiment of actions and concepts, MMORPGs solve the
> major challenges to foreign language education - the lack of resources, milieu, and
> incentives to learn and use the target language for real purposes. (Zhao & Lai, 2009, p.
> 407)

Given these structural and functional capabilities of online games, authors have made ambitious claims about games and simulations that use digital technologies (Gee, 2003, 2007; Shaffer et al., 2005). They assume that involvement in games will produce learning about the game environment, as well as learning that is transferable to situations outside of the game. Authors make the claim that 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" (Bryan, 2007, p. 2) of games. With this assumed 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, p. 3)

Research on Online Games for Learning

Other research projects have used iterative design-based methods to examine player activity for a variety of purposes. By inserting into the Whyville online game a disease that gave pimples to players' avatars while inhibiting the ability to chat with "sneezes," Kafai, Feldon, Fields, Giang, and Quintero (2007) "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" (p. 172). Although Whyville.net was not designed for instruction, Kafai and Feldon chose to use the environment for its wealth of users and interactions, its fidelity to and popularity among its

7

participants, 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, p. 576). Considering the overwhelming amount of information available, the authors suggested beginning by creating a system for weeding through the data to find appropriate indicators. Viewing server data by itself can provide necessary quantitative information 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, recognizing that an excess of data may be less useful than obtaining the right selection of data to answer particular questions.

In game 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, p. 555)

In addition to their potential for learning, video games in all of their formats have become an

integrated part of our culture. As Kafai (2006) reminded 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. (p. 36)

Even as children have begun to use virtual environments as a primary venue for interaction on

the Internet, adults are also being captivated by video games as "more than half of all baby

boomers and almost 4 in 10 members of the 'mature generation' (those presently over the age of

61) play games online" (Wyld, 2008, p. 26). Given this interest, using online tools to support

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

There are, however, lessons to be remembered when considering the use of online game-

based learning environments. 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, p. 52).

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.

Introduction to Zon

This research focuses on Zon, an educational video game 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 Teachers' Manual* (CIMSU, 2010b),

> 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, 2010b, p. 4)

It is important to note that, although this study focuses on the examples present in the Zon environment, the goal of this study is to contribute to our understanding of design issues present in the development of virtual learning environments, especially those that use game-based activities as a way to introduce and practice new concepts. The lessons that emerge from analyzing the design, construction, and use of Zon can be used to create and evaluate new spaces. Player activity is one piece of the overall design puzzle inherent to developing projects that seek to imbue learning content with game-like interactivity, but it is an essential step toward determining the theoretical and practical issues that flow through such work.

Research Questions

Proceeding from the theoretical perspectives on games and simulations into the research and development surrounding the use of games to support learning, projects that use virtual spaces add the dimension of having player activity collocated in an online space that is not readily observable, and therefore requires additional investigation to understand what players do in the space. As an example of a virtual environment that seeks to use game-based activities to involve players with learning content, Zon is an ideal project for this line of research into understanding player activity. To better understand what players select and interact with online, it is necessary to investigate the choices they make given the range of opportunities presented to them.

This research addresses the following questions about player activity and engagement in the Zon environment:

1. In what activities do Zon players choose to participate in relation to the structures that developers have designed to support learner engagement?

2. What aspects of the Zon environment might explain these patterns of engagement?

CHAPTER 3

METHOD

To address these questions about player activity, this research proceeded through three phases: (a) examining the assumptions about language learning and the principles of instructional and game design that guided the development of Zon, (b) investigating the activities and features found in the environment that are designed to support language learning, and (c) analyzing records of player activity to identify engagement with learning content. The first two phases help to identify both what was intended and what is present in relation to opportunities that developers intentionally created to support learning. The third phase addresses the research questions directly by presenting analyses that helps to interpret player activity in Zon.

Although the research questions for this study do not focus overtly on the first two phases of analysis, that is not to say that they are not an important piece of this research. Rather, they are necessary components that must be undertaken in order to come to a place where we are able to evaluate player activity as a reflection on the design and development of Zon. In examining both the intended design targets and the actual developed environment, we can see how Zon provides opportunities for player interaction with learning content and how these opportunities afford or constrain player activity. Players will come to the game-based environment with their own experiences and motivations, but eventually, the way that the space is structured will determine how well the game can meet players' goals.

I use the term *activity* frequently in this study. In the analysis, *activity* refers to both the choices that players can make and the actions of players making those choices. In this context, an activity is an interactive game element that players can select during gameplay. Activity also

means the act of selecting one of these game elements. Without being able to watch each movement that players make in the virtual environment, as might be possible when observing students in a physical classroom, the term activity pertains to the choices that players make that are tracked by the computerized system and logged as server data. For example, a player clicks on an interactive object in one scene and, a minute later, clicks on another interactive object in that scene. While the player's avatar might move on screen during this time, the activity referenced is the act of selection and the option being selected. Activity does not refer to the actions players make away from the game environment, nor does it include in-game actions such as avatar movement on screen. Thus, in attempting to understand player activity, this study involves both the act of selection by the player and the nature of the activity (i.e., game element) selected.

Data Sources

Data come from documents published by the Zon developers, the public server version of the Zon environment, and the database of player activity tied to the public server. Activity data for Zon players is stored on a server that records various aspects of player action in the environment. To understand these records, it is important to know how the Zon developers implement opportunities for player activity, as this contributes to how they structure the server database to encode activity. This section describes the documents that Zon developers provide to define opportunities for player activity, followed by a description of the Zon environment. Next, the server logs are described with attention to the procedures used to examine the logs. The methods used for this examination constitute the majority of the analysis work done on player activity in Zon.

Zon Documents

Examination of assumptions and goals guiding the development of Zon drew primarily

from the *Zon Teachers' Manual* (CIMSU, 2010b), the primary 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 for playing Zon. As the public document

written by Zon developers to describe Zon in detail, the *Zon Teachers' Manual* was a requisite

part of an external interpretation of the server data. Addressing the first research question

entailed summarizing assumptions about learning and game design from the Zon manual.

Zon also draws on the *International Curriculum for Chinese Language Education*

(ICCLE) from the Hanban, the Office of Chinese Language Council International (2008). Zon

developers used this resource to guide the leveled, thematic content embedded throughout the

game. The ICCLE outlines the recommended themes and topics for Chinese language learning

and provides 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).

Zon Environment

The Zon environment itself is a source of data as it contains the activities from which

players are able to select to interact with the game. This research relies on the Zon public server

as configured during February 2010, the month during which the sample of player activity was

drawn. The scenes in Zon contain a variety of activities that developers designed to support

players' learning and engagement in the environment. Thus, this analysis required examining both the individual scenes in Zon and 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 that provide players with the opportunity for engagement with gameplay and access to learning content. As previously mentioned, this involves both the act of selection by players and the type of activity embedded in the options that players choose. While interpersonal communications are a valuable aspect of the game, this analysis focused on what designers have created that is persistent in the environment and available to players at any time during their online sessions.

To do this, I cataloged and diagramed each interactive object in each scene where activity was available during the sample period. These portraits of potential interactions with content as presented by NPCs and objects were essential to understanding not only what players chose to do during play, but also what opportunities for engaging with content players selected in relation to what was available to them.

Zon Server Log

Server logs for February 2010 provided data on players in the environment. These logs contained the choices that players made when selecting activities and progressing throughout the gameplay area. To process the data from the server log, I used the database files to begin to answer questions about player activity in Zon, using quantitative log information to uncover qualitative trends for interpretation.

As Feldon and Kafai (2008) pointed 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). With the

patterns that emerged from the quantitative data as qualitative indicators of player selection, I

used these points to reflect upon developers' intended design goals. To cull information from the

raw data provided in the database, I created procedures for identifying occurrences of activity

that pertained to the specific questions for this iteration of evaluation. The process of

reformatting data allowed me to begin to recognize phenomena developing from the information.

In keeping with my focus on player activity and given the type of data available, I created

a basic mapping of the types of activity available to players. While a sequential mapping of user

activity within a scene might have provided important feedback to developers about where

players are spending their time in Zon, this was not as useful for my focus on player choice given

the available selections. I narrowed the focus of my data 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.

The basic mapping of activity required creating spreadsheets that identified the location

of players, the different types of activity that they selected, and the frequency with which they

made such selections. By sorting the data by scene, player, or object (i.e., NPC or other item in

the environment, e.g., mailbox), it was possible to determine where players were situated during

their login period, along with the objects with which they chose to interact. Table 1 shows the

database information that I used during this process.

These values help to place player activity in corresponding locations throughout Zon,

showing where players chose to spend their time. While in these locations, activity data on what

Table 1

Database Information

database field	value for analysis
audienceType	corresponds to activity type on radial menu
itemName	identifies item that player selected
logID	sequential reference number for each player selection
logTimestamp	provides time and date information for selection
ScreenID	identifies scene where player is located
speakerID	identifies individual user

types of interactions the players select showed where the players focused their attention, made decisions among and during activities, garnered 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.

From this overview of activity, I created a visual map for each scene that showed where activities were positioned in the environment, along with accompanying tables that detailed the objects that players selected. In addition to these tables, I created lists of activities that defined the content displayed, in an effort to connect the presentation and practice of specific content through various activity types. By examining these tables, I could determine if players were accessing specific activity types or specific objects in the environment, in order to better understand frequencies.

Once I had examined the server logs, analyzing for selection frequencies by scene, player, or object, I related these findings to the information provided by the Zon developers, and to the presence of activities throughout the Zon environment. I could determine the ways in

which player activity did or did not reflect the design intentions that the developers had

implemented. I could also see, among the cumulative list of activities available, where players

chose to go and what opportunities to interact with learning content they chose.

In my preliminary investigation into the server data, I identified the actions players took

in each scene, whether that be with an NPC or object in Zon or with another player, and created

scene maps and corresponding tables to graphically represent locations and frequencies. Using

the server data, I created analysis procedures with spreadsheet templates displaying both scene

and player information and integrate frequency analyses. From this information, I was able to

interpret player activity in relation to the goals identified by the Zon developers.

CHAPTER 4

GENERAL RESULTS

This chapter begins with the first two phases of analysis, which focused on the assumptions guiding the development of Zon and opportunities that were implemented by developers and available to players. The third phase of analysis on the server data of player activity from the month of February 2010 follows. I have based my interpretations of player activity from the selections that players made of interactive game elements, giving attention to potential reasons behind such actions. My intent is to provide an analysis of actual, overt identifiers of activity that reflect the types of game elements players chose.

Assumptions Guiding Development

The first step in examining the opportunities for learning in the Zon environment and how players engaged with those opportunities is to focus on the assumptions about learning and design that guided Zon's development. The following sections outline the beliefs about how the language and cultural content can be presented to both support player learning and contribute to player interaction, and how game elements can be constructed to benefit from the potential motivating, engaging aspects of gaming environments. The decisions made during the development of Zon are based on assumptions about learning and on principles guiding instructional and game design.

Assumptions about Learning

To investigate the assumptions that underpin the conceptualization of Zon as an learning environment, I began with the *Zon Teachers' Manual* (CIMSU, 2010b), which provides statements about what aspects of learning in general, and language learning specifically, Zon was

designed to support. The beliefs about learning expressed in these statements provide a portrait of how the developers thought about the learning process and how knowledge acquisition can be improved. Relying on research literature and lessons from practice, the Zon developers identified four conditions that together impact the effectiveness of opportunities for learning, suggesting that "successful language learning can only occur when four conditions are met: 1) high quality input; 2) ample opportunities for practice; 3) high quality feedback; and 4) individualized content" (CIMSU, 2010b, p. 3). To understand these assumptions, I turned to research literature related to these goals, as a way of contextualizing how others have approached the complex learning and game design issues that are part of Zon's ongoing development.

High quality input. The first condition focuses on the assumption that, to be effective, language learning must use elements of the target culture to provide authentic examples of language input. This should include opportunities to view high quality written information and hear native speakers using the target language in authentic situations. Learners should be able to get the feel of the culture as they make choices and respond to prompts, giving them the opportunity to contribute their knowledge as a means toward advancing the activity. To enhance comprehension and facilitate understanding, learners need to experience input through a variety of channels that enhance exposure to content (Strambi & Bouvet, 2003). In addition to exposing learners to opportunities for high quality input, activity "should also attempt to promote communicative interaction and critical thinking on the basis of that input" (Bradley & Lomicka, 2000, p. 363). As a means toward achieving what they saw as the limited opportunity for high-quality input with textbooks and traditional teacher-student settings, Zon developers aimed to support cultural and language learning "by putting the learners in real-life situations and

providing them ample opportunities for authentic language and interaction" (CIMSU, 2010b, p. 4).

Ample opportunities for practice. The second condition requires that language learning activities provide learners with many opportunities to use their understanding in practical, engaging ways. They should have the chance to practice so that they are "engaged in *using* the language, not merely talking *about* language" (Purushotma, Thorne, & Wheatley, 2008, p. 1). Informal practice with conversational elements of language includes an important central component of language learning, that of "negotiation of meaning" (Tudini, 2003, p. 156), giving learners the chance to test and revise their knowledge. Through omnipresent opportunities to practice their understanding, learners are able to continuously reinforce experienced concepts and prepare for encountering new ones. In Zon, learners are able to explore the environment and practice their language skills in number of ways and "may interact with other students from all over the world and practice their newly learned language" (CIMSU, 2010b, p. 6).

High quality feedback. The third condition involves frequent, useful feedback provided to learners as a means toward assisting their ability to gauge their progress and reflect on their understanding of newly learned concepts. A key component of this feedback is that it is immediately available to learners as a means toward interpreting their own performance (Wideman et al., 2007). The level of feedback must be geared toward the linguistic needs of the learner, in a way that is both explicit and corrective, so that learners do not miss important information for self-correction (Purushotma et al., 2008). Although, at times, the feedback may be negative out of the necessity of the situation, feedback on errors should be facilitative and meaningful for that given circumstance (Doughty & Long, 2003). Thus feedback on learner

activity and responses is meant to be constructive and supportive, guiding the learner away from errors and toward correct usage and contextualized understanding. Zon developers saw the quality and frequency of feedback as being limited in traditional classrooms given the demands on teachers to interact with many students. "Especially in foreign language classrooms, peer to peer communication in the target language is very limited, often mechanical and lacks authenticity, which makes it difficult for learners to sustain interest in the communication" (CIMSU, 2010b, p. 6). A main development goal was to give opportunities to learners to reference information to check their understanding through access to game activities and to provide "opportunities to engage in communicative activities with both Non-Player Characters (NPC's) and other players from all over the world" (CIMSU, 2010b, p. 6).

 Individualized content. The fourth condition suggests the use of individualized content to create a flexible, personalized learning experience. The purpose is to provide tools that the learner can use to accomplish specific missions and that allow them to meet particular short- or long-term goals (Hu & Chang, 2007). As a means toward integrating personal experiences and interests, learning activities should be geared toward creating environments that support "the generation of individualized contexts and context- and milieu-defined relevance of meaning" (Pachler, Bachmair, & Cook, 2010, p. 222). The concern when individualizing the learning experience is that learners are still able to receive adequate guidance given the personalized nature of their situation (Doughty & Long, 2003). Zon was founded on this need, as the developers believed that since "learners are equipped with different levels of cognitive and psychological needs, . . . learning should be highly individualized and customizable in order to

motivate all students, meet their diverse learning goals and styles, and accommodate their individual psychological and cognitive needs" (CIMSU, 2010b, p. 7).

Guiding Principles for Instructional and Game Design

Along with these assumptions about learning, Zon developers were guided by a number of instructional and game design principles, although these principles were less explicitly laid out and justified in the Zon manual than were the assumptions about language learning. In this section, I posit a set of design principles held by Zon developers, these principles following from their assumptions about language learning and from assumptions about instructional and game design.

From their assumptions about learning, Zon developers argued that learning activities should be embedded in compelling situations that motivate and engage learners toward high quality input in the context of authentic activities, should provide opportunities for practice and assessment of knowledge through high quality feedback to guide learner reflection and self-evaluation, and give learners access to a personalized experience through individualized content. For design, assumptions can be expressed as set of principles to guide design: (a) constructing authentic activities for player interaction, (b) building goal-driven contexts into the game environment, (c) creating opportunities for practice and assessment of learning content, (d) providing mechanisms for ongoing feedback to players, and (e) facilitating personalized, customizable experiences for players.

Authentic activities. Related to his ideas reasons for learning through games and simulations, Dewey supported the concept of authenticity of learning activities as a goal of instructional design (1938). Knowledge acquired in the context of authentic activity is more

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likely to be learned in a way that is more readily transferable to new situations. Simulated

contexts that mirror real-world environments enhance the opportunity for learners to understand

new concepts in a way that facilitates the connection to prior and future learning (Dede, 2009).

Unlike the instructional space of the classroom, the simulated context of the game world allows

learners to experience their engagement as it is situated in meaningful interactions connected to

their goals for activity (de Freitas & Oliver, 2006).

Encapsulating authentic activities for experiencing learning content within the structure

of a guiding narrative creates the type of compelling situation for using knowledge that supports

learners' intrinsic motivations and ongoing engagement. Learner activity is involved in an

existing storyline that provides the context for interaction and creates a new story that embeds

the learner in a new reason for continuing their participation. The narratives that drive activity

can help learners to organize their understanding and recall information, provide example

behaviors and purposes for actions, and immerse them in a context for connecting their learning

to external structures and events (Iuppa & Borst, 2006). Narratives also serve as a bridge

between individual efforts and the meaning behind the authentic activities that comprise the

events of the arc of the ongoing storyline (Prensky, 2001).

The *Zon Teachers' Manual* highlights the importance of learners interacting with

authentic activities and information. "Zon provides real-time, on-demand connection to

interactive learning activities and authentic cultural information" (p. 4). In the game world of

Zon, learners exist in a virtual space built as a simulation of an authentic environment that

provides a context of 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" (p. 4).

Interactive learning tools enable learners to enter text and make choices as a method of communicating in the game environment. The learners can engage with authentic game elements that respond to their selections as they move through the different scenes. Through the use of "these interactive learning tools, students will be able to experience Chinese culture through living in a variety of virtual worlds that reflect the progression of familiarizing with and settling down in a country" (CIMSU, 2010b, p. 17).

Goal-driven contexts. An essential aspect of game design is that player activity should occur within a context that provides players with a reason for their interactions (Shaffer, 2006). Connecting what the game is asking of players to the decisions that the player makes is an important part of creating authenticity relative to the game space. Context can be seen as the "motivational wrapper" that "situates activity" (Squire, 2006, p. 24) and drives involvement.

Infusing the game environment with compelling reasons for interaction is achieved, in part, through the development of an overarching narrative that helps to drive player activity. "Interaction with a digital artifact has a temporal flow" (Löwgren & Stolterman, 2004, p. 137) that supports the dramatic nature of gameplay in a situated narrative. Along with the environmental and activity contexts, the presence of the embedded story gives purpose to player engagement and reinforces the reasons behind the choices players are asked to make. "Narrative spaces are mapped throughout an environment, and the narrative is constructed by the relationships between space and events" (Dickey, 2006, p. 2). Throughout the ongoing narrative,

the player should have the opportunity to make choices with consequences for their continued

progress in the game (Iuppa & Borst, 2006).

Zon addresses this need to provide compelling reasons for learners to interact with

content through the use of activities that form episodic stories embedded within the greater

narrative of a tourist visiting Beijing. Activities are connected with each other as learners move

from one to the next, completing each interaction as means toward achieving a goal. In Zon, the

activity used is identified as *Task*. "*Tasks* are one of the main ways of engaging the learners in

meaningful language learning activities" (CIMSU, 2010b, p. 19).

Context is provided in the form of a simulated environment for player interaction that

situates activity in a simplified version of Beijing. The role which the player assumes, that of a

tourist traveling to a new country to experience a new language and culture, is also a vital part of

constructing the context for engagement. A player can envision their actions as they relate to

real-world results, imagining how their choices would impact similar situations. As with the

instructional goals behind creating an authentic experience, the game design goals also support

the creation of an interactive environment that surrounds the player with images and information

meant to bring purpose to activity.

Zon starts to build its narrative before players begin gameplay. As players create their

game accounts and construct their avatars, they are informed that they are assuming the role of

tourists who are about to visit China, starting with their arrival at the Beijing Airport. During the

introductory tutorial, players are reminded of the story driving their activity and asked to involve

themselves with a narrative meant to support their learning and give meaning to their decisions.

In the same way that learning depends on being connected to the meaning reinforced by the

activities embedded in an ongoing narrative, so to does gameplay rely on the temporal nature of a continuing saga to drive player engagement.

Opportunities for practice and assessment. Along with authentic activity and contexts, learners should have the opportunity to practice their understanding of newly-acquired knowledge through a process that provides feedback on their progress and assessment of their ongoing learning. With regard to language learning, this means that the use of language-related knowledge in practice activities should not be based solely on repetition, but needs to include opportunities for learners to engage with experiences that reinforce both meaning and usage (Wright, Betteridge, & Buckby, 2006). To support opportunities for practice and assessment, activity design requires that player engagement is geared toward completing actions and accomplishing goals related to the context of the game. Practice in the game space refers to the performance of knowledge-based skills, whether those are geared toward discrete learning objectives or are driven by game-related purposes.

In Zon, learners practice their understanding of language and cultural content through interactions with game objects such as NPCs. In dialogues with these characters, learners can reinforce newly-acquired knowledge as it connects to communicating ideas and achieving game-related goals. Zon seeks to provide learners with 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" (CIMSU, 2010b, p. 6).

Mechanisms for ongoing feedback. Feedback exists as an important piece of reflection on activity, as a way for learners to evaluate their performance and understanding of concepts. As

Shaffer pointed out, this reflection-*on*-action occurs when the activity is complete, but with timely feedback occurring during the time that learners are engaged, reflection-*in*-action can happen "within the span of time in which decisions and actions can still affect the situation at hand" (2006, p. 96). Connected to this practice and feedback is the idea that assessment "should be a seamless, continuous part of the activity" (Young, 1993, p. 48). Game design requires that feedback and assessment opportunities are integrated into activity. "Players must receive feedback not only on interaction effects ... but also on success or progress towards completing game tasks" (Garzotto, 2007, p. 30). Feedback should be constructive, in a way that shows where performance is "incomplete, inconsistent, or unparsimonious" (Malone, 1980, p. 166) but also how players can adapt their actions to be more successful.

Zon provides gameplay feedback in the form of meters that show players how much of the game environment they have uncovered, along with data on how much money they have to spend and how much energy their avatar has at its disposal. These displays give players necessary information that assists in their decision-making process about where to spend their time and what activities they should select in order to reach gameplay goals. Similar to instructional reasons for providing feedback, players can use game information to assess their performance and make choices about where they need more practice.

Personalized, customizable experiences. A personalized gameplay experience is an important design goal for individualizing the learning content and the opportunities to interact with that content that are available to players. Games can provide a personalized experience in a way that is different from activity in the formal classroom (Squire, 2006). Games can be used to give individual players varied access to content that is appropriate to their current learning needs

and structured to meet their goals. The game environment can be manipulated by the player as a means toward individualizing their experience, as a way of participating in a type of cooperative design with the game developers in order to create "learning experiences personalized to individual needs and preferences" (Dieterle, Dede, & Schrier, 2007, p. 253).

Zon provides this type of individualization as a way to motivate and engage students by addressing their personal styles and accommodating their individual needs. "This individualized and customizable environment provides the learners with a unique environment that mingles the elements of authenticity with advantages of technology" (CIMSU, 2010b, p. 7). By using technological affordances able to address changes in the state of the player's experiences, Zon is designed to deliver content that relates to where the player has been and what the player has done, in an effort to guide where the player will go next and support their changing needs. Activities are made available through an overt organization that scaffolds content so that players can make informed selections that meet their level of understanding and their immediate and future goals.

Through the use of authentic activities that contextualize interactions with language and cultural content, learners in Zon are involved with an ongoing narrative that gives cohesion and meaning to their actions. The Zon environment is designed to provide situated opportunities to practice and assess newly-acquired knowledge, in an environment that displays the feedback necessary for learners to evaluate their progress and continue their engagement. Zon also personalizes the learning experience through the individualization of content and gameplay. The ideas about learning that guide the instructional design of Zon are also reinforced in the principles that support the design of its game-based elements.

Both instructional and game design are most successful in reaching their goals when authentic activities are situated in an environment that combines a meaningful story and realistic interactions that support ongoing practice and assessment with useful feedback. As envisioned, the Zon environment is meant to address these requirements toward its goal of creating opportunities for learning about Chinese language and culture in a game-based virtual space. In the next section, I examine how the Zon environment is constructed as a means toward reflecting on how well Zon is able to meet its design goals.

Overview of Zon Activities

The second phase of analysis moves from the assumptions that guided development to the activities and environments available to players in Zon. Here I focus on the actual opportunities players can select to interact with learning content or game elements. I begin by explaining the environment using an example scene and then expand that explanation to include the range of activity types. I end this section with a description of how the learning content is organized within the game.

When players enter Zon, they are presented with the opportunity to interact in different scenes that represent stylized virtual versions of Beijing. They begin their journey in the Airport scene, which contains most of the types of activities they will face throughout the game. They interact with NPCs and other objects by clicking on radial menus showing available activities. Choosing from these menu items allows players to participate in various content formats and activity structures that developers have created to facilitate gameplay. The activities are constructed in way that provides players with opportunities for interacting with authentic

information by making choices and entering text as a means of practicing their understanding and individualizing their learning experience.

An Example Scene

The initial Airport scene provides an example of the activities available to players and how these options relate to the goals defined by the developers. 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. Figure 1 is a screenshot of the Airport scene.

Figure 1: Airport scene

For interpretation of the references to color in this and all other figures, the reader is referred to the electronic version of this dissertation.

In the Airport interior, players encounter Customs officials, bank and store employees, and other travelers as part of the available interactions. Players access content related to language

points and cultural information through the radial menus (i.e., circular menus that display available options to players; see Figure 2) attached to these NPCs and other objects in the scene.
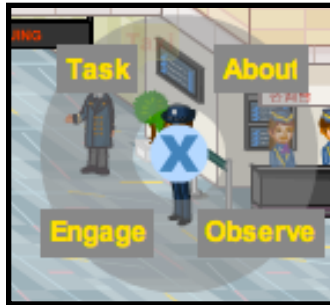
Figure 2: Radial Menu

It is within these interactions that the primary presentation of learning content on Chinese language and culture occur. The scene provides the context, but 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. Toward this goal, the interactive elements of Zon provide options for players to uncover new information to assist their ongoing study of China and Mandarin. Thus these activities are created with the intent to provide access to opportunities for high-quality input on the part of players, allowing them to practice their understanding of language and cultural information.

In the Airport scene, the player can access content focused on the "Travel and Transportation" theme by clicking on the radial menu of the Female Police Officer NPC at the Airport Exit and choosing the *Observe* option to access this screen (see Figure 3). 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 4). 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.

Observe provides authentic, high quality content organized in a way that individual players can

access to meet personal needs.

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
bùyòngxiè 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

Figure 3: Airport Police Officer

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

accessed through an NPC's radial menu, which appears when clicked. 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 (phonetic

transcription of Chinese Hànzi characters), and an audio track in Chinese of the sample dialogue

(see Figure 4). 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 Hànzi, 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.
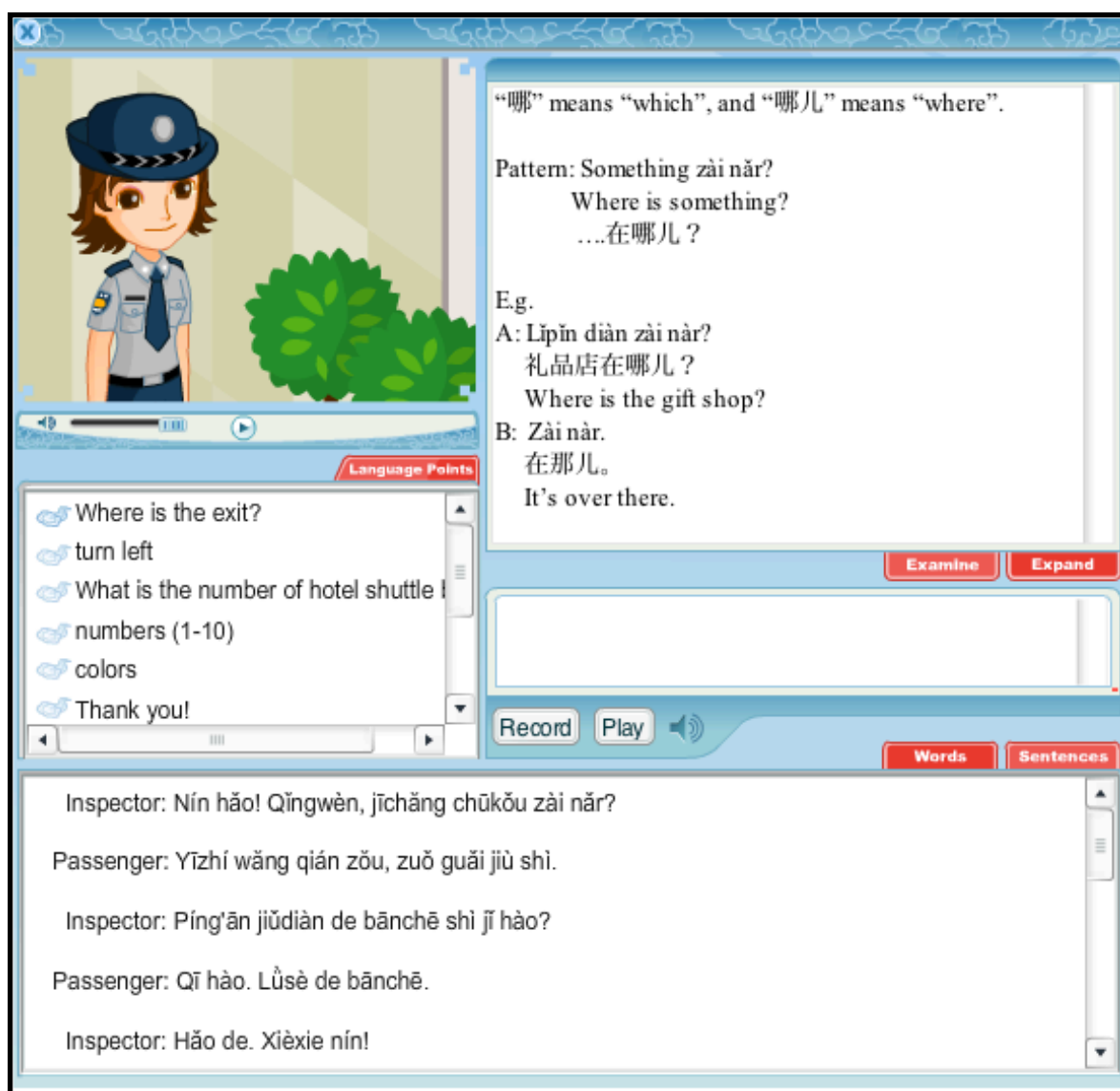
Figure 4: Observe window

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 Hànzi characters, pinyin, and English, along with an audio pronunciation (see Figure 5). 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.
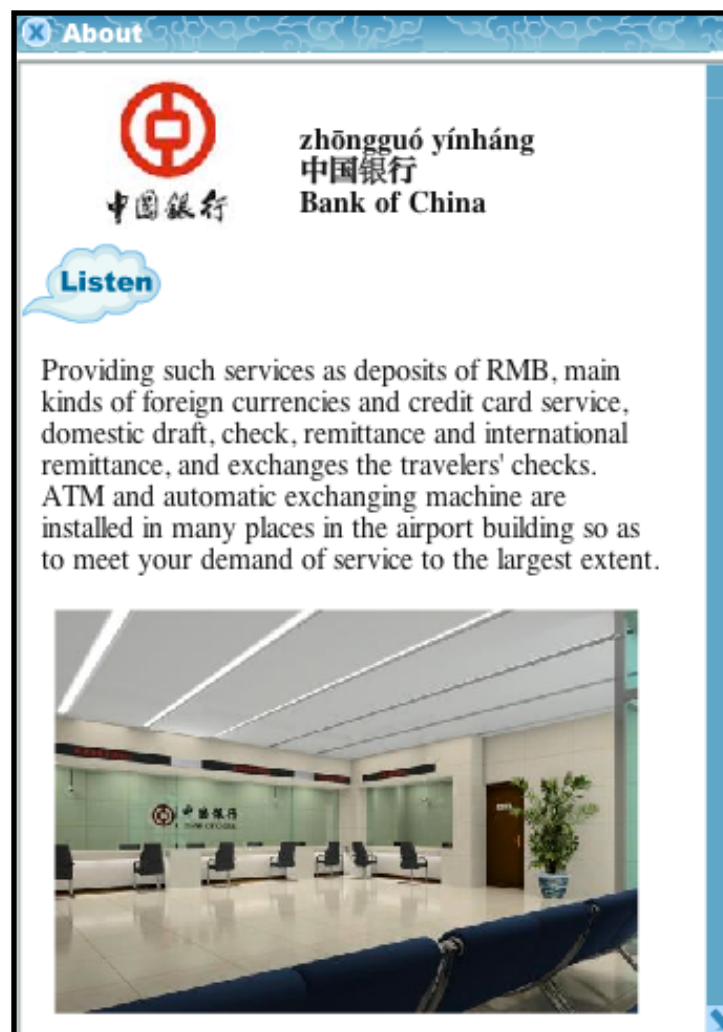
Figure 5: Example *About* window from Airport Bank

In the Airport scene, players begin their interaction with the Zon environment. They enter as an avatar representing a tourist in Beijing, and by selecting options on the radial menus above objects and NPCs, they can access cultural and language content that is thematically relevant to the airport environment and structurally leveled to support the stages of language conceptual development as identified in the Hanban curriculum. The Airport also presents many of the activity types that players may encounter in other scenes, familiarizing them with the organization and functionality of the game.

Zon Activities

In addition to the activities described in the overview, Zon included other activity types that were available to players during the sample period and accessible through the radial menu. These 23 activities are shown in Table 2. The *Zon Teachers' Manual* (CIMSU, 2010b) provides descriptions for some of these activities, but in addition, I have added descriptions to show my practical understanding of how each element is implemented in the environment. The activities are grouped according to how they are used in the environment, with those activities related to the presentation and practice of learning content shown separately from activities that either further movement or progress gameplay through non-content-based activity.

Across the various scenes in Zon, most learning content is presented through the activities *About* and *Observe*. Typically, the *About* activity displays content related to issues of culture, including facts about China and Chinese customs. The *Observe* activity presents language learning content to players in a structured format that allows them to interact with grammar, vocabulary, mechanics, and usage information.

Table 2

Zon Activities

activity	manual description	use in gameplay
content-based activities		
About	provides the cultural background knowledge of the subject of *Observe*	information detailing item; typically includes the Chinese and English names, sometimes includes sample audio file and text description in English
Apprentice	designed as a task, and users are required to fulfill the task according to what they have learned in *Observe*	*Task* designed to support practice of learning content from *Observe*; none of these apprentice activities are complete
Engage	users carry out their purchase, currency exchange, ordering food, and other activities	this very broad category incorporates many types of activities where the player interacts with objects and NPCs; there is no standard format for this type of interaction
Explore	offers students a cluster of words related to the *Observe*; students can either learn or review these words as a group	includes exercises to practice learned content found in the *Observe* selection
Learn	contains instructive videos related to the subject of the dialogue in *Observe*	pre-packaged video content to supplement *Observe*
Observe	the major source where users learn about Chinese language skills in Zon	the majority of interactive information about the object or NPC; provides player with the ability to select content by word or sentence, listen to audio examples, and investigate grammar and usage information
Play	Game arcade provides both language-based and non-language-based mini games	self-contained game-based activities for practicing specific concepts
Read	Users can click "read" on the newspaper in their inventory and view the instant weather information of Beijing, China; find the latest sales or notices of Zon community; learn more about China from the cultural column and the authentic dairies from Chinese young journalists.	allows player to access text-based content from an object in the environment or an item in their inventory

Table 2 (continued)

Zon Activities

activity	manual description	use in gameplay
Talk	not provided in manual	used to access a scripted conversation with an NPC related to gameplay activity
Task	provide the learners with structured objectives built around specific goals, requiring the learners to explore the map and engage in certain activities	used to identify a step in a line of task-based engagements; player interacts with steps of a task in order to complete a prescribed activity
Watch	Zon TV includes cultural channels and linguistic learning channels	pre-packaged video content
Zon Live	not provided in manual	used to identify temporary in-game activities related to holidays or other thematic events

other activities		
Chat	for the text-based chat, the learners need to click on the avatar of the other players and select the "chat" option	text chat, player-to-player
Drink	not provided in manual	inventory item is used to provide Energy to player
Eat	not provided in manual	inventory item is used to provide Energy to player
Enter	not provided in manual	used to enter a scene
Leave	not provided in manual	used to exit a scene
Take	not provided in manual	places object in the player's inventory

Practice opportunities designed to reinforce the content presented in *About* and *Observe* are provided through reinforcement activities such as *Engage*. For example, in the Airport scene, the Examiner NPC gives players a quiz through *Engage* 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 players are 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.

Additional opportunities to work with learned content are available throughout Zon by choosing menu options *Apprentice*, *Explore*, *Learn*, *Play*, *Read*, *Task*, *Watch*, and, in certain instances, *Zon Live*. 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 the opportunities to practice understanding of content, *Engage* occurs most frequently in Zon, with interactions such as dialogues with NPCs in Chinese or culture-based quizzes from the Examiner, presented primarily in English.

Returning to the four assumptions about learning that guided the instructional and game design of Zon's ongoing development, it is clear that different activity types are meant to address the conditions that need to be met with creating opportunities for learning to occur. Zon exposes players to high-quality input through dialogues during *Engage* or through audio tracks in *About* and *Observe* recorded by native speakers. *Task* and *Engage* options give players the opportunity to practice their understanding of cultural and language content, and receive feedback through the game responses to their choices. The open nature of gameplay allows for a *sandbox* experience found in entertainment-sector games where players can explore the environment on their own without the obstructions of playing "on a rail," where players must conform to one path as they progress. This allows players to individualize their experience through activity selection, supporting varied paths to reach specific goals. Through its design, Zon seeks to

address these important assumptions about learning as a way to provide a gameplay experience that is both fun and educative.

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 6). This map shows the location of different stages of content by their scene location within Zon; players can choose to display the content levels individually or all at once. These correspond to activities found within the different scenes of the Zon game environment. The Guide tab within the Zon environment provides additional information for the player as follows:

> This is the difficulty guide for the levels in Zon. The stages of difficulty range from one to five, with five being the highest difficulty. Using this map, you will be able to guide yourself through each level, accessing the language that is appropriate to the difficulty of content that you are comfortable with. (CIMSU, 2010a)

This map displays an overall portrait of the language learning content available to the player. It is important to note this map as it is one of the methods meant to support players ability to search for language-related levels and themes in various scenes, using color-coded stages to signify increasingly difficult levels of content. As evidenced in Figure 6, a relatively small portion of in-game content was provided for new learners of Chinese. If Stage 1 and 2 content

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intends to support initial conceptual understanding, it is only present in a few scenes, before the

content present reaches the more difficult, more experienced levels.
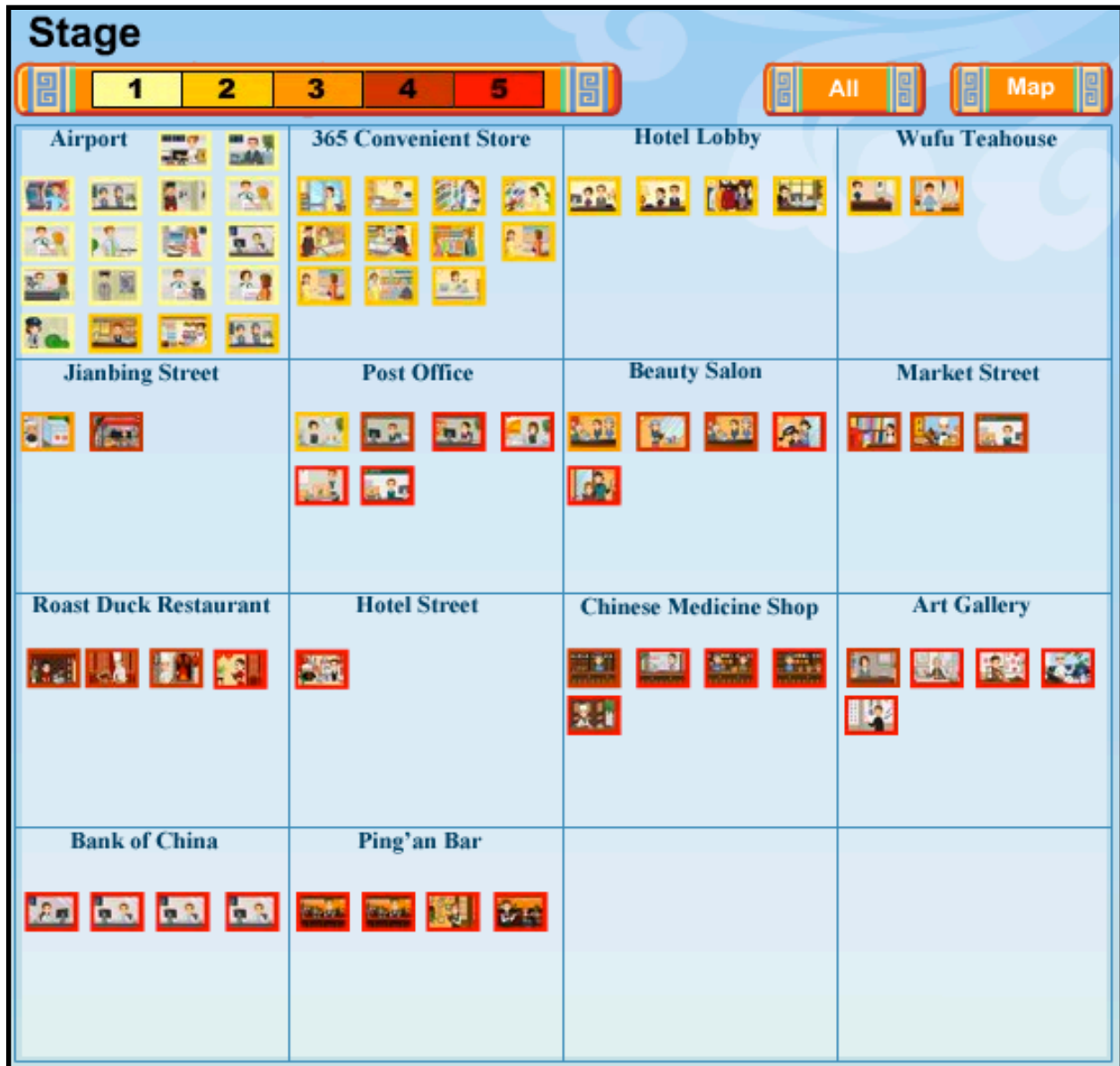
Figure 6: Stages of Learning Content

Player Activity During Sample Period

The third phase of analysis focuses on player activity as evidenced by the data in the

server logs. Results related to player activity can be analyzed most readily by individual players,

groups of players, or by individual scenes. Observations about individual players are useful for

determining the frequency with which players accessed different activity types, most importantly

those activities that allow players to interact with learning content, as identified in italics on

Table 2. Groups of players are useful for finding overarching trends given differing patterns of

player activity, while individual scene data can help to examine situations which occurred in just

one or a number of scenes.

This analysis focuses 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 records related to one activity. The following

analyses of players and scenes use this instance measure of activities that give players access to

content related to language and cultural points, either as presentation or as practice. I removed

measures of gameplay activities not related to learning content or driving gameplay as they do

not identify interaction with the language and cultural activities that are at the center of

participation in Zon.

It is important to note that player activity here refers to the choices that players made in

relation to the available opportunities, as shown on the radial menus of each interactive object,

and as recorded in the server data logs as identifiers of player selections.

Activity by Players

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

activity in Zon, I started with an overview of player selections during the sample period. Table 3

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

available in Zon during February 2010.

The majority of activity is centered around four activity types: *About, Engage, Task*, and *Observe*. Of these, *About* and *Observe* are important because they are the primary methods of

Table 3

Overall Activity Choices

activity	frequency	percent
About	4853	36.1%
Engage	3281	24.4%
Task	1664	12.4%
Observe	1560	11.6%
Play	501	3.7%
Talk	476	3.5%
Zon Live	300	2.2%
Learn	271	2.0%
Apprentice	216	1.6%
Read	191	1.4%
Watch	78	0.6%
Explore	43	0.3%
Total	13434	100.0%

content presentation. *Engage* and *Task* represent the most significant instances of practice with content and involvement with the overarching game narrative.

During the sample period, 424 players logged into the Zon environment. The number of content-related menu items selected by an individual player ranged from 1 (by 26 players) to 456 (by 1 player). This range shows some variety in not just the amount of time that players spent in the environment, but the amount of engagement they had with content-related activities. This led me to look for patterns of involvement in player data to determine how players were engaging with activity types, by identifying trends based on the frequency of selections that players made of learning content.

Given the data available from the server logs, precise durations for the amount of time players spent on each activity were not available. The data do permit observing the types of activities that players chose and looking for trends within groupings of players based on frequency. To search for these trends, I grouped players according to frequency of activity selection so that I could analyze these groups for types of activity. Table 4 shows these groups of players divided into quartiles, along with the range of frequencies represented by the groups. This shows how active players were during the sample period, with 75% of players choosing to interact with content-related activities less than 33 times during the one month period. As reference, the mean frequency is 31.8, with a median of 12 and a mode of 2. Only slightly over 25% of players participated above the monthly mean.

Table 4

Player Groupings by Frequency of Activity

group	frequency range
first quartile	1 to 4
second quartile	5 to 11
third quartile	12 to 32
fourth quartile	33 to 456

Another way to view player data is to look for patterns based on dates and frequency of selecting content-based activities. The server data for these players needs to go through various levels of analysis, first categorizing for content-based activities versus general gameplay, then coding instances of players selecting content-based activities, followed by analyzing those instances through various lenses. Within the fourth quartile there is an active subset of players, those users who selected over 100 content-related activities during the sample period. Of the

13,499 instances of players selecting content-related activities during the sample period, these most active players accounted for 40% of those selections, although this group only accounts for less than 6% of the population of players during the sample period at 24.

The data for the most active players during the sample period can be viewed by week, as shown in Table 5. Note that the number of players refers to the players who logged into Zon, and the number of logins refers to the amount of separate days when they logged into Zon, which could be up to seven per player, up to a potential 168 logins. Instances refers to the number of discrete selections of content-related activities by players during gameplay.

This group of 24 players was most active during the first week of the month, dropping steadily throughout the following weeks. During the first two weeks, a *Zon Live* activity tied to

Table 5

Content-based Selections by Week: Most Active Players

week	players	logins	instances
week 1	15	29	1908
week 2	13	27	1564
week 3	13	36	1494
week 4	10	19	530

the Chinese New Year holiday asked players to complete an in-game scavenger hunt that was only peripherally related to any cultural content. Players could access the *Zon Live* activity (i.e., the New Year's scavenger hunt) during the first two weeks of the month, from the 2nd to the 13th. Although the *Zon Live* activity was no longer available, the third week showed similar activity patterns to the previous week.

The amount of activity can also be viewed by day of the week, as shown in Table 6, with the player, login, and instance information similar to those shown in Table 5.

Table 6

Content-based Selections by Day of the Week: Most Active Players

day of the week	players	logins	instances
Monday	13	20	1010
Tuesday	8	11	541
Wednesday	11	16	915
Thursday	9	10	456
Friday	15	20	926
Saturday	12	15	686
Sunday	13	19	962

The sample period was exactly four weeks, beginning on a Monday, the first of February. Notably, the results displayed on these tables show a lack of clear preference for particular days of the week, or a considerable difference in engagement based on the in-game event.

Table 7 presents an expanded view the most-active players interactions during the sample period, displaying how many days each player entered Zon compared to their overall instances of interaction. With the exception of the most active player, User 9127, players do not show patterns of prolonged immersion in the environment over the entire sample period; however, there are instances of continuous engagement with content-based activities that last for several days, with players logging in daily or within a day of their previous login. Of the 25 players, nearly half are involved in the environment and content-based activities for a period of three or more days.

Another phenomenon displayed in the most-active players data was the range of time spent in the environment related to the amount of interactions with content-based activities.

Table 7

Content-Based Selections by UserID: Most Active Players

| | | M | Tu | W | Th | F | Sa | Su | M | Tu | W | Th | F | Sa | Su | M | Tu | W | Th | F | Sa | Su | M | Tu | W | Th | F | Sa | Su | |
UserID	freq	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	days
17905	102	0	0	0	56	9	14	14	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	5
17809	104	0	0	0	0	40	0	0	0	0	0	0	12	0	0	0	0	0	0	52	0	0	0	0	0	0	0	0	0	3
18052	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	106	0	0	0	0	0	0	0	0	0	1
17940	110	0	0	0	0	0	0	0	80	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
17984	111	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	39	21	0	0	0	0	0	0	0	0	0	7	0	5
18063	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	104	10	6	0	0	0	0	0	4
18066	126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	119	0	0	0	7	0	0	0	0	2
16245	149	149	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8054	150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	79	0	2
16358	153	0	0	0	0	0	0	134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	2
10775	171	0	0	0	19	11	0	0	0	0	0	0	0	0	4	50	0	0	0	0	0	68	0	0	0	0	0	0	19	6
14860	184	0	0	0	0	0	0	0	0	0	0	0	62	79	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
18101	196	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131	29	5	0	31	4
13718	198	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92	18	14	16	44	0	7	7	0	0	0	0	0	0	7
17875	222	42	124	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
17915	225	0	0	0	0	222	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
17948	226	0	0	0	0	0	0	0	36	0	190	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
17793	288	0	0	0	0	0	72	9	0	0	0	0	29	79	0	41	0	6	0	52	0	0	0	0	0	0	0	0	0	7
17876	330	0	172	134	0	6	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
17991	333	0	0	0	0	0	0	0	0	0	0	0	0	0	96	231	4	1	1	0	0	0	0	0	0	0	0	0	0	5
17927	333	0	0	0	0	0	43	16	0	0	0	0	69	83	26	17	0	33	0	46	0	0	0	0	0	0	0	0	0	8
17890	353	0	0	184	169	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

Content-Based Selections by UserID: Most Active Players

		M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	
UserID	freq	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	days
17949	370	0	0	0	0	0	0	0	72	68	0	0	0	0	230	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
16339	386	17	0	0	0	0	0	0	72	47	0	0	0	0	5	0	28	0	0	104	50	60	0	0	0	0	0	3	0	9
9127	456	42	57	4	0	0	0	0	14	31	87	7	16	0	33	11	1	12	3	30	0	2	15	21	5	0	27	38	0	20
totals	5504	250	353	378	244	288	132	263	249	99	307	7	188	246	468	479	62	87	176	328	181	181	32	27	143	29	122	127	50	

note: freq = frequencies

Some players chose to fill their sessions with lengthy periods of interaction, while others chose shorter periods over more days. No clear pattern emerges that exemplifies a specific type of player behavior, be that longer sessions of play over fewer days or shorter sessions continued over a longer stretch of days.

Activity by Scenes

During the sample month, players interacted with learning content in 15 different scenes. Table 8 shows the frequency with which all players interacted with content-related activities in each of available scenes. The initial scene for new players, the Airport, led directly to the Hotel Street, from which players could choose to move into the Hotel Lobby or proceed to Jianbing Street or buildings on the Hotel Street. Most notably, player activity drops off significantly after involvement with the Airport scene. In fact, a large portion of players never leave the Airport. The further removed a scene is from the Airport, the less active players are with those opportunities.

Summary

In this chapter, my analysis of the assumptions that guide Zon development along with the available opportunities for player engagement described what developers have created for players to interact with language and cultural learning content. I followed this with overall data that showed what players actually chose to do when in the Zon environment during the sample month. In the next chapter, I investigate the content-related activity types by examining the way in which they function in the Zon environment.

Table 8

Activity Frequency by Scene: All Players

scene	frequency	percent
Airport	5419	46.4%
Hotel Lobby	1289	11.0%
Barbershop	911	7.8%
Market Street	880	7.5%
Jianbing Street	730	6.3%
Bank of China	429	3.7%
Tongrentang (pharmacy)	412	3.5%
Quanjude (restaurant)	315	2.7%
Hotel Street	303	2.6%
Teahouse	236	2.0%
Hotel Room	196	1.7%
Art Gallery	190	1.6%
Bar	164	1.4%
Convenience Store	112	1.0%
Post Office	89	0.8%
Total	11675	100.0%

CHAPTER 5

CONTENT-RELATED GAME FUNCTIONS

Players have access to two main types of activity in Zon: options that explicitly use

language and cultural content in the activity, and those that do not. This chapter focuses on the

first type of activity as it supports a main purpose of the game: to introduce players to content

and provide opportunities for them to use that content in practice and assessment activities

throughout ongoing gameplay. The *About*, *Engage*, and *Observe* options are the primary

activities for these functions, but other content-related activities contribute to these. The sections

of this chapter describe player activity by function, followed by player activity data related to the

available options.

As in Chapter 4, the analyses here use instances of activity, which represent the number

of times that players chose to interact with a certain gameplay option, rather than raw counts of

how individual steps within an activity. Unlike earlier tables, those in this chapter present

information showing activity data related directly to language and culture content. Table 9 shows

information for all players in each of the scenes with the instances of selection frequencies and

the percentage of content-related activity attributed to the activities *About*, *Engage*, *Task*,

Observe, and Other, a category that combines the remaining content-related activity types of

Apprentice, *Explore*, *Learn*, *Play*, *Read*, *Task*, *Watch*, and *Zon Live*.

As Table 9 shows, opportunities for activity in each scene varied greatly in terms of

options available to players. The four content-related options comprising the majority of all

player activity during the sample period were available as options for players in varying amounts

Table 9

Content-Related Activities by Scene: All Players

Scene	About		Engage		Task		Observe		Other	
	Instances	%	Instances	%	Instances	%	Instances	%	Instances	%
Airport	872	14.89%	1756	29.98%	1400	23.90%	874	14.92%	955	16.31%
Hotel Lobby	137	8.87%	638	41.29%	147	9.51%	106	6.86%	517	33.47%
Barbershop	806	88.47%	26	2.85%	n / a	n / a	79	8.68%	n / a	n / a
Market Street	202	22.95%	384	43.64%	n / a	n / a	51	5.80%	242	27.61%
Jianbing Street	263	29.95%	120	13.67%	n / a	n / a	15	1.71%	479	54.67%
Bank of China	300	74.07%	18	4.40%	n / a	n / a	25	6.17%	62	15.36%
Tongrentang (pharmacy)	324	82.44%	13	3.31%	n / a	n / a	54	13.74%	2	0.51%
Quanjude (restaurant)	236	74.92%	24	7.62%	n / a	n / a	53	16.83%	2	0.63%
Hotel Street	103	10.01%	34	3.30%	n / a	n / a	31	3.01%	861	83.68%
Teahouse	72	7.59%	91	9.60%	52	5.49%	21	2.22%	710	75.10%
Hotel Room	43	4.45%	n / a	n / a	65	6.72%	n / a	n / a	859	88.83%
Art Gallery	0	0.00%	90	54.55%	n / a	n / a	75	45.45%	n / a	n / a
Bar	76	46.34%	n / a	n / a	n / a	n / a	31	18.90%	57	34.76%

Table 9 (continued)

Content-Related Activities by Scene: All Players

Scene	About		Engage		Task		Observe		Other	
	Instances	%	Instances	%	Instances	%	Instances	%	Instances	%
Convenience Store	0	0.00%	n / a	n / a	n / a	n / a	112	100%	0	0.00%
Post Office	0	0.00%	56	24.78%	n / a	n / a	33	14.60%	137	60.62%

Note: n/a = activity option not available in scene; 0 = activity option not selected

in each scene, with some options not available in an individual scene. This highlights the lack of common opportunities in each scene, limiting the range of interactions available to players.

To better understand what these activities mean in relation to the purposes they support in gameplay, the next step is to organize the activities by their function. The activities can be grouped into three categories based on what they provide to players in the form of activity (i.e., their function in Zon): (a) presenting content, (b) practicing and assessing content knowledge, and (c) driving gameplay through interaction with content. Presenting content relates to showing language or cultural content to the player in various forms. Practicing and assessing refers to the opportunity for players to use their knowledge of the content to complete activities and self-assess their understanding. Activities that drive gameplay are those that function to move players to new scenes, introduce new content, or provide activities for interaction with other game elements.

Presenting Content

Presenting language and culture-related content to players is a key function in Zon. Although I discuss content in Zon as language or culture-related, such distinctions are not meant as categorizations for each discrete chunk of information presented to players. Often content blurs between these two descriptions, including aspects of both. Presentation of content occurs somewhere between *entirely in English* at one end of a continuum and *entirely in Chinese* at the other, typically using a mixture of English and Chinese. In addition, while certain activity types are often used in a certain way throughout Zon, there are several exceptions to any generalization about which activity types present content in what manner, with some activities providing similar functionality to other options with different titles and methods for displaying content.

The option that presents content and was most commonly accessed by all players was *About* (36.0% of content-related activity). *About* provides players with basic information about the object or NPC on which they have clicked, including a significant amount of information for players to use for identifying objects and understanding cultural context. This information consistently includes a name or description in Hànzi and pinyin, along with an English translation. In addition, *About* may include additional information in English, either through text or video, and typically related to cultural information about the item. Thus the *About* option provides both cultural information related to the object and scene, and basic vocabulary in Chinese.

The second most-accessed presentation option was *Observe* (24.3% of content-related activity). Although the *About* activity presents basic vocabulary terms in Chinese, the *Observe* activity presents the majority of the language-related learning content to players in a format common to audiences of language-teaching software and structured to allow players to view content in a several ways. The content is presented through mixed use of Chinese and English.

The pop-up window for each *Observe* (see Figure 4, p. 25) displays grammar information in the form of examples, along with a contextual dialogue related to the scene and the grammatical content. It provides language content in the form of main Language Points and gives players the chance to listen to audio recordings of the sample dialogues in which they can hear audio examples of each Language Point or Conversation, by word or sentence. A player can select additional content that expands on the definition or contextual information for using the vocabulary. Grammatical structure is reinforced through examples but is not presented in any systematic format other than in how the *Observe* pop-up window is designed. There is also the

option for the player to record a sample audio clip of their own voice to replay in comparison to the audio sample provided.

In addition to the themes identified in each *Observe* window, players can also access information on language-related themes through the Stage map accessible on each scene which also shows which *Observe* options are available in which scenes. Content in each *Observe* and each scene are organized by contextual themes and developmental levels, which are tied to the stages of language learning presented in the Hanban curriculum.

Explore, *Learn*, and *Watch* also present content using a mixture of English and Chinese. *Explore* shows additional vocabulary with audio pronunciation related to the NPC on which it is available. *Learn* uses a video clip with examples of culturally-specific concepts related to the theme of the scene, such as understanding how to order food in a restaurant in China. *Watch* also uses video, providing examples of Chinese culture and phonetic instruction. The video clips in *Learn* and *Watch* are from other educational materials not designed for Zon, but related to the thematic concepts being presented.

Presentation functionality displays language and cultural content through text and audio formats. Players can experience content at their own pace and can return when necessary. Within and across scenes, the content presented connects to activities that provide practice toward understanding usage and feedback through evaluation dialogues with NPCs.

The *About* option is the main presentation of cultural information, with individual vocabulary words in each and the *Observe* option is the main presentation of language-based content and is the requisite place to experience new information for language learning. Given the

importance of accessing the *About* and *Observe* activities as the venue for potential learning, an important aspect of analysis is the prevalence with which players choose them.

Results: Presenting Content

Players could review particular content by selecting *Observe* and *Explore*; they could view video clips in *Learn*, *Watch*, and *About* options that can be stopped and restarted using video controls. The server data showed when and where players selected one of these options, providing data on instances and frequency of choices made. Data related to selecting video clips within the pop-up window were not recorded in the player database; therefore the information provided by the server is related to selecting the overall activity. It did not show what players did once they opened any of the presentation activities.

Considering the activity of all players during the sample period, they chose options that present content in 60.3% of their selections. Table 10 shows the breakdown of the selection of *About* and *Observe* options by scene, along with an Other category that combines *Explore*, *Learn* and *Watch*. Instances refers to the number of times the activity was selected and frequency is relative to the selection of other presentation functions.

About selections are present in every scene and were selected more than any other presentation function in nine of the 15 scenes. *Observe* choices were available in all but one scene, and were selected most frequently in four of the 14 scenes. The remaining presentation activities were chosen with the highest frequency in one scene, the Hotel Room, which contained the *Watch* activity on the television in the room.

Player selection of language content in *Observes* was relatively low in comparison to the other content-based options, as shown in Table 9. It was also low when considering the rate with

Table 10

Selection of Presentation Function by All Players

Scene	About		Observe		other	
	instances	frequency	instances	frequency	instances	frequency
Airport	872	49.94%	874	50.06%	n/a	n/a
Hotel Lobby	137	56.38%	106	43.62%	0	0.00%
Barbershop	806	91.07%	79	8.93%	0	0.00%
Market Street	202	48.10%	51	12.14%	167	39.76%
Jianbing Street	263	78.51%	15	4.48%	57	17.01%
Bank of China	300	79.79%	25	6.65%	51	13.56%
Tongrentang (pharmacy)	324	85.26%	54	14.21%	2	0.53%
Quanjude (restaurant)	236	81.10%	53	18.21%	2	0.69%
Hotel Street	103	67.32%	31	20.26%	19	12.42%
Teahouse	72	77.42%	21	22.58%	0	0.00%
Hotel Room	43	32.82%	n / a	n / a	88	67.18%
Art Gallery	0	0.00%	75	100%	0	0.00%
Bar	76	71.03%	31	28.97%	n/a	n/a
Convenience Store	0	0.00%	112	100%	0	0.00%
Post Office	0	0.00%	33	100%	0	0.00%

note: n/a = not available in scene/not applicable

which it was selected with regard to other presentation functions, as shown in Table 10. With the exception of the Art Gallery, Convenience Store, and Post Office scenes, players chose the *Observe* option far less frequently in individual scenes than they did other content-related activities. In 12 of the 15 scenes, players chose *Observe* less than once in five selections of content-related options.

For example, in the Airport scene, player choice of presentation activities accounted for less than 30% of interaction with content-related options. There was a relatively low occurrence

of interaction with *About* and *Observe* selections, given that *About* occurs 29 times and there are 18 different *Observes* in this scene.

Although players were significantly involved with content presentation activities in certain scenes, they avoided presentation activities in others. As with much of the data from this analysis, player activity varied greatly, revealing few patterns signifying prototypical behaviors. This was certainly the case with the *Observe* activity.

In scenes such as 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 activities such as *Engage*, *Task*, and other content-related activities. Of the four activities identified as primary providers for important opportunities to interact with content, *Observe* was selected the least amount in raw percentage over all scenes.

The expectation, from a language learning perspective, would be that players access *Observe* content to a substantial degree in order to immerse themselves in the requisite information for understanding a new language. During the sample period, players did not access this content to a significant degree to permit of immersion in the target language.

To understand the prevalence of player selection of activities that present content, it is important to analyze the data in relation to the selection of activities that afford opportunities to practice and assess that content. The next section presents an overview of this functionality, followed by the results from the server data of player activity. I then analyze how players chose presentation options in relation to practice and assessment activities.

Practicing and Assessing Content

The *Engage* option launches an NPC dialogue in which players select from multiple-choice responses that progress the dialogue, move the player to another location, give the player an item, or ask the player content-related questions. The *Engage* selections provide opportunities for players to interact in Chinese, using a combination of English and Chinese in the dialogues. *Engage* was the most common type of practice activity available to players.

The Examiner NPC was present in the *Engage* option in 12 of the 15 scenes, and through the *Engage* option, provided a brief quiz that checked player knowledge of language and cultural content, giving a final score and a reward of Zon Dollars upon completion. Other *Engage* activities also gave the player the option of checking their understanding by practicing game content through dialogues with NPCs, although this option was not scored in a quiz-type manner.

When the NPC providing the *Engage* option was the Examiner, the dialogue was constructed as a quiz testing the player's knowledge of information and vocabulary. Players were given multiple-choice options to answer each question. If they selected the appropriate response, they moved to the next question. If they selected the incorrect response, the same question was asked again. To progress through the assessment, players eventually had to select the correct responses to each question, although there was no penalty for errors. If players completed each question, either through an initial correct response, or incorrect responses followed by a correct selection, they finished the quiz and received a number of Zon Dollars matching the number of questions, regardless of whether they incorrectly answered questions on their first attempt. Because there was no overall scoring system within the game at the time of the sample, players could not review their scores after completing the *Engage* activity.

The *Apprentice* and *Play* activities also provided opportunities for players to practice their understanding of content with a small amount of feedback. Players could access *Apprentice* to use content related to a specific career opportunity by participating in brief games designed to reinforce use of particular vocabulary. *Play* launched a set of seven stand-alone games meant as practice for language content related to colors, Hànzi characters, shapes, numbers, and word order in a sentence. (The additional seven functional games had no specific cultural or language-based content and two were not functional at the time of the sample.)

The practice and assess activities were designed for players to use the content they experienced in the presentation activities, with the opportunity to reflect on their understanding through dialogues and games providing evaluative feedback in the form of responses to correct or incorrect player selections. In as much as they are related to the scenes in which they are present and attached to the NPCs or objects on which they are selected, these activities contributed to a connection with gameplay by reinforcing themes and connecting to information presented elsewhere in the game.

Results: Practicing and Assessing Content

Engage, Apprentice, and *Play* allowed players to interact with activities that used their knowledge of the language and cultural content they experienced elsewhere in Zon, along with any prior knowledge which they brought to the game. Table 11 shows the breakdown of these activities by scene, with instances referring to the number of times the activity was selected and frequency presenting a percentage relative to the selection of the other practice and assessment functions.

The *Engage* activity occurred in two different modes, Examiner and non-Examiner, both of which provided the opportunity for players to practice and assess their knowledge. To understand the selection of the *Engage* activities that are presented in 12 of the 15 scenes, Table 12 shows the number of instances players selected Examiner and non-Examiner *Engages* in each scene, displaying the instances that players chose the Examiner *Engage*, the number of other *Engage* options available, and the average number of instances that players selected the other *Engages*.

Table 11

Selection of Practice and Assessment Function by All Players

scenes	*Engage*		*Apprentice*		*Play*	
	instances	frequency	instances	frequency	instances	frequency
Airport	1756	84.3%	87	4.2%	240	11.5%
Hotel Lobby	638	95.7%	n/a	n/a	29	4.3%
Barbershop	26	100%	n/a	n/a	n/a	n/a
Market Street	384	83.5%	76	16.5%	n/a	n/a
Jianbing Street	120	69.4%	53	30.6%	n/a	n/a
Bank of China	18	62.1%	n/a	n/a	11	37.9%
Tongrentang (pharmacy)	13	100%	n/a	n/a	n/a	n/a
Quanjude (restaurant)	24	100%	n/a	n/a	n/a	n/a
Hotel Street	34	100%	n/a	n/a	n/a	n/a
Teahouse	91	100%	n/a	n/a	n/a	n/a
Hotel Room	n / a	n/a	n/a	n/a	n/a	n/a
Art Gallery	90	100%	n/a	n/a	n/a	n/a
Bar	n/a	n/a	n/a	n/a	57	100%
Convenience Store	n/a	n/a	n/a	n/a	n/a	n/a
Post Office	56	100%	n/a	n/a	n/a	n/a

note: n/a = not available in scene/not applicable

Although the Examiner NPC with an Engage option was present in all but three scenes, when there were other Engage dialogues available to players, on average, players chose those *Engages* more often than the Examiner *Engage* in four of the seven scenes, with an 82.1 average

Table 12

Engage Instances by Scene

scenes	Examiner instances	non-Examiner *Engages*	average instances of other *Engages*
Airport	178	8	195
Hotel Lobby	52	4	146.5
Barbershop	26	0	n/a
Market Street	23	3	117
Jianbing Street	20	2	50
Bank of China	9	1	9
Tongrentang (pharmacy)	13	0	n/a
Quanjude (restaurant)	24	0	n/a
Hotel Street	34	0	n/a
Teahouse	22	2	34.5
Hotel Room	no Examiner	0	n/a
Art Gallery	45	2	22.5
Bar	no Examiner	0	n/a
Convenience Store	no Engage	0	n/a
Post Office	13	0	n/a

note: n/a = not applicable

per scene compared to 38.3 for the Examiner. In the Convenience Store, the Examiner provides an *Observe*, but no *Engage* option.

In addition to the Examiner *Engage* activities, the non-Examiner *Engages* presented additional types of interaction with NPCs that allowed for practice and self-assessment of content knowledge. The functionality that each provided falls into four categories. Of the 22 non-Examiner *Engage* activities, six provided content-related information, 12 allowed players to purchase inventory items, 2 permitted players to exchange travelers' checks for Zon Dollars, and 2 facilitated storyline progress within the game, functioning similar to interactions discussed in a later section on activities driving gameplay. These dialogues used English and Chinese in varying amounts, with 2 entirely in English, 2 entirely in Chinese, and 18 using a mixture of Chinese and English.

Interplay of Presentation, Practice, and Assessment

There is a connection between the presentation activities and the practice and assessment activities inherent in the design of Zon. Practice activities reinforce and assessment activities evaluate content. The theme of each scene ties together the content within the scene, so that players can view and interact with language and cultural content in an encapsulated space. Although the content used in a scene may be used elsewhere in the game, the expectation from a design standpoint is that the interconnected nature of the content in each scene requires players to interact with presentation, practice, and assessment activities within that scene. The gameplay designers expected the content of the *About* and *Engage* activities to be tied together, meaning that players would likely access the options with similar frequencies, availing themselves of content that is connected through presentation in *About* and practice in *Engage*.

For example, it is often the case that vocabulary and cultural information from the *About* activity are practiced through interaction with the NPCs that provide *Engages*, most commonly the Examiner NPC. A look at the overall player data related to content-based activities (see Table 3, page 33) shows that players selected *About* and *Engage* more than any other activities. They chose *About* 4853 times throughout the scenes and *Engage* 3281, suggesting that players are both accessing the information necessary to learn new cultural and language information and answering questions about that information with the Examiner NPC and in other *Engages*.

Upon closer inspection, however, this may not necessarily be the case. When viewed by individual scenes, it appears that players chose the *About* and *Engage* options with varying frequencies in each scene, as seen in Table 9. Table 13 shows the connection between *About* information and *Engage* questions from the Examiner NPC in the Airport scene. The first column lists the question, the second shows the NPC that has the answer in its *About* option, and the third shows how many times each of these NPCs was selected. This table is presented as the primary example, with similar data tables for the remaining scenes provided in Appendix A.

Of the eight NPCs that need to be visited to answer the eight questions asked by the Airport Examiner, only one, the bank, was selected. In a twist on this phenomenon, even if players had tried to find the answer to Question 8, it is never provided in the Airport Scene. The correct multiple choice selection is Hong Kong, which is mentioned in the *About* at Info Kiosk 2, but never identified as a special administrative region.

In another example (see Appendix A), in the Market Street scene, players accessed the Examiner 23 times, but of the 202 times that *About* was accessed, only three selections were made on an NPC which contained an answer to the Examiner's questions. In the Teahouse,

players chose the requisite *About* selections seven of 72 times. Throughout the 12 scenes that

contained Examiner NPCs that required players to use

Table 13

Examiner Engage Questions Connected to About: Airport

Examiner *Engage* question	answer	corresponding NPC	*About* instances
1) How many terminals does BCIA have in operation now?	3	Customs Desk 2	0
2) At the airport duty free shops, you can find a variety of commodities with national reputations. Which of the following is a type of well-known Chinese tea?	Xinyang Maojian	Man Upstairs	0
3) Which of the following things you can do (sic) at Beijing International Capital Airport?	All of the Above	Man Upstairs; Bank; Info Desk Girl Right	0; 33; 0
4) In China, you want to get some information about weather, which number should you dial?	112	Phone 2	0
5) Where can you buy phone cards in China?	All of the Above	Phone 3	0
6) What is the country code of China?	86	Phone 1	0
7) True or False: Beijing time is standard throughout China	True	Info Desk	0
8) There are two special administrative regions in China. One of them is:	Hong Kong	answer not provided in scene	n/a

note: n/a = not applicable

information from *About* selections to answer the questions, players repeatedly failed to access the

necessary options.

Interestingly, the data show sizable variations in how players chose to view and practice

cultural and language content. We can see that the overall results showing significant activity in

About and *Engage* may be misleading. In fact, when viewed by scenes and individual options, it

becomes evident that players did not select activities that allowed them to experience content that they would then practice in another activity.

In the Airport, Hotel Lobby, Market Street, and Teahouse scenes, players selected the *About* option less often than *Engage*. This alone is not a clear indicator of players failing to access the location of content necessary to complete activities. It is upon looking at individual examples of content connected between *About* and *Engage* that the phenomenon becomes apparent. In these situations, players chose to access *Engage* without selecting the corresponding *About* items that provided the content related to the *Engage* questions.

Unfortunately, this was not always due to player choice. The availability of options in the Zon environment also played a role. Players had the option to select *Engage* on the Examiner NPC in only 12 of the 15 scenes, and only 7 of the 15 scenes contained additional *Engages* for practicing through NPC dialogues. In addition, in six scenes, the answers to the *Engages* were not provided in the scene, either located elsewhere in the game or not at all, creating an inconsistency in gameplay for players attempting to find answers. Without available activities or the information necessary to correctly respond in quizzes and dialogues, players were unable to practice the content presented elsewhere in the scenes.

The phenomenon of players not selecting *About* and *Engage* activities that contain related content cannot be attributed solely to design of the environment. Even when players had the option to be introduced to new content through *About* and to practice their understanding of that content through *Engage*, they did not consistently avail themselves of the opportunity. For example, players never accessed the *About* option in two scenes, the Art Gallery and Post Office, where they selected the Examiner NPC's *Engage* activity. This is just one illustration of the fact

that players did not consistently access the connected content between *About* and *Engage* activities, but others appear in additional scenes.

This phenomenon was not limited to those scenes where *About* was selected less than *Engage*. Even in scenes where *About* was selected relatively frequently, players were not necessarily selecting the *About* options that provided learning content necessary for correctly completing *Engage* dialogues. In the Barbershop, players accessed the *About* selections connected to the Examiner's questions 15 times out of the 806 times that they chose *About*. On Jianbing Street, players chose the necessary *About* information 45 times out of 263 selections of *About*.

The results of interactions with *About* and *Engage* illuminate an interesting phenomenon during the sample period: the prevalence of players avoiding content-related activities that are the foundation of the learning opportunities in Zon. This is most evident in the quizzes on cultural points that were accessed through the Examiner *Engage* option, where the majority of questions were based on information in the *About* options in the same scene. As seen in the data related to the content presented in different *About* options and used in *Engage* dialogues, players rarely chose to access the *About* selections that contained the information necessary to correctly answer the questions in the quizzes even when they chose to complete the *Engage* activities presented.

There is the possibility that players came to the activity with the requisite prior knowledge, but the fact that players could 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 learned

content. From the viewpoint of the instructional designer, there is no way to check learner understanding, and, equally as important, no means to assess learning and redirect student errors toward successful use of newly learned content.

Server data from *About* and *Engage* can be used to show where engagement with learning content is occurring, evident in situations where players access the *About* options necessary for answering Examiner and other *Engage* questions. It is not possible, however, to determine how players were able to complete *Engage* dialogues even in situations where they viewed important background information. 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 unclear.

What is clear is that players chose to interact with different types of presentation and practice of learning content to varying degrees throughout the available scenes. Although *About* options occur in every scene, there is a high level of variability in the amount of instances for which players choose investigate the names of items or additional cultural information. Although players may know the English terms for the objects or NPCs, without accessing the *About* option, they cannot determine the Chinese language names related to each. Similarly, the *Engage* activity provides the opportunity to self-assess learning, and again, *Engage* is selected with great variability.

Discussion of Presentation, Practice, and Assessment

The avoidance of content is revealed through the mismatch between *About* and *Engage* activities. It is evident in the way in which players moved through content-related dialogues with NPCs without choosing to view the information that would permit them to interact successfully with these conversations in a meaningful way that tests their understanding. Players proceeded without availing themselves of important cultural and language-related content, playing the game by moving through the virtual environment, but missing one of the main goals of experiencing information that can lead to learning.

How and when content is presented are both important considerations for designing where players will meet and practice language-related content. The avoidance of content theme raised in the analysis of *About* and *Engage* also emerged when looking at player selection of the *Observe* option, necessitating future inquiry into the way in which content is presented. And, as *Observe* presents language information important to completing content-based practice exercises, this also raises the connection to the *Task* activity as an opportunity to use language-related content in requisite opportunities for advancing knowledge of language information.

At this point in the development of Zon, what is important about the low prevalence of players selecting *Observe* is the limited attention that players are paying to language content. As an instructional designer, this begs the question of whether players are disinterested in the content. Considering explanations for this type of behavior, a primary concern for developers should 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 activities based on the first and second stages of the ICCLE curriculum.

Another explanation for avoiding content could be that players find little need to access 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 such at receiving Zon dollars, 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 next chapter presents another type of content-related activity: opportunities that drive gameplay. These options, or drivers, use the learning content to advance the storyline and support continued immersion in Zon by giving players reasons to and chances for interaction.

CHAPTER 6

ACTIVITY DRIVING GAMEPLAY

Activities that function as drivers are those structures that facilitate player interaction with game content, with functionality such as introducing new scenes and NPCs. Options driving gameplay will either move players to new situations or provide the option for players to interact with new objects. Both functions potentially present the opportunity to uncover new activities through which content can be presented, practiced, or assessed.

In a role-playing game, a well-designed driver facilitates gameplay in a way that is connected to the narrative that flows through the story. The idea behind an embedded driver function is to provide the chance for players to move through activities and scenes in a way that is purposeful, meaning that it is related to the theme of the scene and is tied to the assumed tourist role that the player has in Zon.

Activities that drive gameplay also involve players with the money and energy aspects of the game. Money is used to purchase in-game items that then appear in the player's inventory and can be used for various purposes. Food and beverage items give the player more energy, which is the dynamic value representing how long a player can remain active before having to eat or drink items in their inventory. Although the *Eat* and *Drink* options, along with other activities such as *Enter*, *Leave*, and *Take*, facilitate gameplay, they do not necessarily involve interaction with learning content, and are not further discussed here.

As a way to guide gameplay and increase involvement in the learning environment, Zon provides two levels of drivers meant to reinforce the storyline and provide reasons for continued interaction in the game. The first is implicit in the game itself and related to participation in Zon,

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that of the overarching narrative of becoming a tourist, involving oneself in learning activities, and gaining an increased understanding of Chinese language and culture.

The second level is that of the individual activities within Zon, such as the *Task* activity, that create opportunities for players to interact with brief narrative story lines that promote interaction and present or practice content. *Task* was designed as brief episodes in a connected narrative through which players could experience Zon and engage with culture and language-based content. *Task*, along with the *Read*, *Talk*, and *Zon Live* options, provide various methods for furthering gameplay.

The three *Task* lines present during the sample period were episodic tasks, meant to accomplish short-term goals and practice learned information. The *Task* activities furthered the tourist storyline while providing a purpose for interacting with new NPCs and visiting new scenes. These *Task* lines followed a pattern common to role-playing games, in which players complete steps of a mission or quest in the process of achieving a greater goal and receiving appropriate rewards for their actions. *Tasks* embedded interactions in 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 different types of activities.

The newspaper icon in the player's inventory accesses the *Read* option, which is used to announce in-game activities and remind players of additional options throughout the game. *Talk* is an NPC dialogue in English meant to give clues and reminders about gameplay options. During the first two weeks of the sample period, *Zon Live* challenged players with an in-game scavenger hunt based on cultural information about the Chinese New Year holiday. Of these

activities, *Talk* and *Zon Live* were logged in the player activity server during the sample period and are available for analysis.

Along with *Task*, these activities provide options for interacting with game elements in ways that progresses gameplay and introduce players to new scenes and NPCs. Of note is the fact that players may also come to Zon with external drivers influencing their gameplay. They may be part of a formal course with a teacher who is having them play Zon. They might want to learn Chinese for an upcoming trip. These examples of purposes that drive gameplay highlight the fact that, beyond the overtly designed elements that developers include in the game for the purpose of spurring gameplay and involving players, the very same players may have other motivators that influence their involvement. Although I do not research this aspect of gameplay in this study, it would be an important consideration for developers and researchers to understand as part of the overall instructional and gameplay design process.

It is important to note that, although the design of the environment is key to the fidelity of the project toward its intended goals, it is not the only piece. Players themselves bring much to the environment. Their motivations, their prior understanding, the wealth of their experiences with similar types of learning, content, and gameplay all serve important roles in their success or failures to achieve their goals through gameplay, and meet the design expectations of the developers. This study did not focus on these aspects of the players, but rather used their activity to highlight important issues for game and instructional design. This is not to belittle the impact that the players and their individual agency have on their resulting gameplay. In future work, an important theme for reflection on the development of game-based virtual learning environments

can and should be pursued from the perspective of the players, including their knowledge, motivations, and experiences.

Results: Activity Driving Gameplay

Players selected *Task*, along with *Read*, *Talk*, and *Zon Live*, with greatly varying frequency in the scenes where they were present. Table 14 shows the selection of activities driving gameplay found in each scene, displaying the instances that each was selected. Instances refers to the number of times the activity was selected and frequency is relative to the selection of other driving activities.

During the sample period, there were three task lines in Zon, two in the initial Airport scene, and one that started in the Hotel Room and ended in the Teahouse. In one Airport *Task* line, the player could help a fellow traveler by purchasing and delivering a coffee before receiving a small monetary reward. The other Airport *Task* line involved several steps through which the player had to find missing luggage and then trade travelers' checks for Zon Dollars. By completing this *Task* line correctly, the player could receive free transport via shuttle bus to the next scene, the Hotel Street. Otherwise, the player needed to determine how to obtain enough Zon Dollars to pay the taxi driver for the same trip.

Interestingly, both *Task* lines in the Airport required players to go to the Bank and trade travelers' checks from their inventory for Zon Dollars, but only one of the *Task* lines told players how this could be accomplished, without requiring the player to actually perform this interaction in order to progress through the interaction. The third task line that began in the Hotel Room required the player to retrieve an item from an NPC in one scene and deliver it to an NPC in another scene, a delivery-type game mechanic used to bring players into a new setting.

Table 14

Selection of Activities Driving Gameplay by All Players

scenes	Task		Talk		Zon Live	
	instances	frequency	instances	frequency	instances	frequency
Airport	1400	88.1%	190	11.9%	n/a	n/a
Hotel Lobby	147	47.0%	145	46.3%	21	6.7%
Barbershop	n/a	n/a	n/a	n/a	n/a	n/a
Market Street	n/a	n/a	n/a	n/a	n/a	n/a
Jianbing Street	n/a	n/a	n/a	n/a	147	100%
Bank of China	n/a	n/a	n/a	n/a	24	100%
Tongrentang (pharmacy)	n/a	n/a	n/a	n/a	19	100%
Quanjude (restaurant)	n/a	n/a	n/a	n/a	n/a	n/a
Hotel Street	n/a	n/a	52	44.8%	64	55.2%
Teahouse	52	100%	n/a	n/a	n/a	n/a
Hotel Room	65	100%	n/a	n/a	n/a	n/a
Art Gallery	n/a	n/a	n/a	n/a	25	100%
Bar	n/a	n/a	n/a	n/a	n/a	n/a
Convenience Store	n/a	n/a	n/a	n/a	n/a	n/a
Post Office	n/a	n/a	n/a	n/a	n/a	n/a

note: n/a = not available in scene

During the sample period, nearly half of the players began the Airport task line that would allow them to leave via the free shuttle to Hotel Street, but only half of these players completed the task line successfully, and even fewer chose to interact with the next task line, which begins in the Hotel Room. In the Airport scene, *Task* was chosen almost one-quarter of the time in relation to other content-related activities. This number dropped off considerably, to *Task* being selected once in 10 choices in the Hotel Lobby and less than that in the Hotel Room and Teahouse.

Discussion of Activity Driving Gameplay

Looking at players' selection of *Talk*, *Task*, and *Zon Live during* the month of sample data provided a sense of how player interaction progressed within and across scenes. These activities were defined and developed in Zon to involve players with gameplay in various ways, although none were implemented to the extent that the presentation, practice, and assessment functions were embedded in the environment. The purpose of the other activities, *Talk*, *Task*, and *Zon Live*, was to further gameplay through interaction with new content and practice with experienced content by moving players into new scenes and new situations.

Although many players chose to interact with the two task lines starting in the Airport scene, a considerable number of players chose not to continue the narrative presented in the *Task* option, meaning that they started but did not complete it. Once players left the initial Airport scene, only one additional task line was available to them–the delivery task starting in the Hotel Room and ending in the Teahouse. Players chose this task far less frequently than the initial two *Task* lines.

Task is not the only activity used to progress gameplay by introducing players to new scenes and activities; the other driving activities are available to varying degrees and are tied to scenes and NPCs to provide information and opportunities for interaction with other game elements, such as Inventory items. Developers sent emails to Zon accounts to inform players about *Zon Live* events occurring during the first two weeks of the month, enticing players to engage with the activity for in-game rewards, so players may have planned to participate or may have stumbled upon the activities while in the Zon environment for other purposes. Even given this fact, *Zon Live* events drew less than three percent of activity during the sample period.

Because of their connected nature, *Tasks* present the opportunity to observe patterns of continued activity in a way that other activities may not. The length of interaction in connected episodes can be useful for exposing trends that show the ebb and flow of activity relative to availability throughout Zon. Unfortunately, *Task* activities were only available in 4 of the 15 scenes and only three connected lines were provided. Even if players were drawn to the role-playing features of Zon as driven by the the narrative aspect of *Tasks*, these players would soon find their purpose for engagement had disappeared after the initial scenes.

These three *Task* lines are episodic in nature, compartmentalizing the activities into brief encounters with learning content and gameplay options. The episodes are only loosely tied to the overarching narrative of Zon, that of being a tourist who is exploring a new country while using a new language and learning about a new culture. Players are only briefly involved with the story through these tasks and must create their own connections between the environment and their chose activities. To move from mere involvement with Zon, players must encounter tasks that bring them deeper into the game, immersing them in opportunities to learn and practice, eventually leading to a more substantial investment in the game and their own progress (Davidson, 2003).

CHAPTER 7

DISCUSSION

The research questions guiding this study focus on the activities with which players choose to interact in Zon. The first question looks at which activities players select in relation to what Zon developers had designed to support learning engagement and the second uses the analysis of these selections to reflect on the aspects of Zon's design that could help to explain player engagement. The results that arise from this analysis of player activity are evidenced in the server logs and contextualized by the opportunities available in the various Zon scenes. Together, these data provide important feedback for developers and give researchers clearly identified phenomena to discuss when reflecting on how players interact with the Zon environment. Three major findings emerge from these results in relation to learning content, activity and engagement, and the design of activities.

With respect to how Zon provides information and activities intended to support learning, it is evident that players tended to avoid accessing content that would help them learn new language and culture information and complete in-game activities. Although players accessed some of the activities that presented learning content in the *About* and *Observe* options, they did not consistently select those activities that were tested elsewhere. Without interaction with the appropriate content, players will not experience the information necessary for them to complete other in-game activities and improve their understanding of Chinese language and culture.

This lack of ongoing, immersed participation is another finding from the analysis, relative to the types of activities provided to support player engagement. The majority of players did not enter Zon on a regular basis and did not show patterns of sustained interaction over periods of

days or weeks. Although a small number of players did engage with game activities during several sessions, most did not. Again, without the support of consistent interaction with new content, players will be unlikely to learn new concepts and reinforce their understanding of previously introduced information.

As for how the design of the environment contributes to player activity, the third major finding was the inconsistency between how content was presented and how it could be practiced. The mismatch between the Examiner questions and the information to answer them prevented those players who may choose to engage from uncovering the correct information to complete the dialog. Although this finding is not indicative of every situation in Zon, it highlights an area of concern for the design of the online game.

These three findings are related to activities available to players and what they chose to select. They are influenced by the assumptions about language learning that informed how Zon is designed, but are ultimately a combination of what players bring to Zon and what they find there. The results described in this research are a result of the interplay between players' experiences, goals, and motivations and the designed opportunities for interaction within Zon. In this research, I focused on investigating how the structure of Zon can support learning, but who the players are is another important area in future study.

The issues present in this research exist at the intersection of several domains, including instructional design, multimedia design, and computer programming. In the next section, I discuss how the game-based virtual learning environment can be designed and implemented, and in the section following that, how to understand player activity in such environments. After that, I reflect on the implications that this work has for the design and development process of virtual

learning environments, and for design research itself. I follow this by detailing limitations to the overall study, and finish with a summative conclusion of this work.

Implementation of the Learning Environment

Zon seeks to support player activity by providing a simplified simulation of physical environments using Chinese language and culture embedded in game-based activities. The goal is to use this learning content to increase player knowledge through the presentation, practice, and assessment of intentionally-provided information. If content is provided through engaging, supportive activities situated in authentic opportunities for interaction, then developers can expect to see increased levels of player understanding of content.

How activities are implemented in the environment determines their success at achieving learning goals. In their implementation of Zon, the developers were able to create a range of opportunities for interaction that embedded language and cultural content into gameplay activities. Options for new learners were limited, however, as introductory content as beginner levels was available in only a few scenes. These lower-level activities lacked the type of meta-information important for starting to build an organized, informed understanding of how the language works. In a game-based learning environment, players need opportunities to build appropriate schemas for making sense of their experiences with unfamiliar content. This is vital in the case of beginning learners, but it is also important that experienced players are supported as they attempt to internalize content and self-assess their understanding through omnipresent opportunities for evaluation and error correction.

The findings from my investigation of Zon provide important lessons for developing game-based virtual learning environments. Players avoiding content, lacking sustained

engagement, or encountering inconsistencies in content remind designers about the importance of embedding authentic, purposeful activities into gamplay. These should require ongoing interaction with content as an integral aspect of gameplay and need to present content in a logical, consistent, and scaffolded manner. As a lesson for designers, it is not enough that the design goals from project planning convey the desire to situate player experiences within a space that replicates authentic opportunities to interact with new concepts. It is the application of these intentions that must be actualized in the learning environment.

My intent with this research was to explore how analyzing player activity could be used as a means toward understanding the ability of a designed environment to facilitate interactions with learning content given its virtual structure. This is not just about how Zon functions. It is a clarification of how design that intends to integrate game-based activity and instructional content should be enacted when attempting to create a virtual space to support learning. As shown in this study, it is not enough to have well-intentioned goals and well-defined curriculum when constructing a learning environment. The process must also involve thoughtful attention to an ongoing pattern of reflection and revision toward honing the ability of the structured activities to produce intended results.

Understanding Player Activity

As mentioned previously, although this research focused on player activity in the particular environment of Zon, it suggests guidelines germane to the development of other game-based virtual learning environments. When attempting to understand player activity in such a virtual environment, developers cannot observe players in action as teachers or researchers can do in a classroom. The analysis of various factors, including copious amounts of server data

from activities embedded into a virtual learning environment, reinforces the necessity of a process for reflection on design. Developers must build thoughtfully-enacted procedures for creating and refining game elements into their process for building online activities to support learning. The overarching challenge is to create environments where activities have a game-like quality in that they help to immerse players in the context of the gameplay, causing them to remain involved and to persist in the environment.

Players come to a game-based virtual learning environment for various purposes, be it in support of other, more formalized learning situations, or by their curiosity about the content of the game. What players do while in the environment is important information for designers to know when reflecting on the ongoing development of the game space. As a learning environment, the instructional aspects of activity, including presentation and practice of content, require an understanding of the path players-as-learners are taking through the current structure of available opportunities, for effective reflection on the design to occur.

Considering the range of potential reasons for players to enter a virtual learning environment, it remains clear that players need game-supported reasons to interact with the learning content as a means toward completing practice activities. From a gameplay perspective, there must be structures that require players to access this information. Developers must avoid situations where players can move through the environment, buy and consume items, complete conversations with NPCs, play stand-alone mini-games, or interact with other players without ever needing to access the learning content presented in the game. Without activities that require players to internalize and reuse information in a new situation, players can circumvent activity

while "playing the game," albeit in a cursory manner that does little to support interaction with new content.

Knowing the activities with which players are interacting is vital information for developers as it highlights potential issues for instructional design that can be researched through content analysis, player observation and/or interview, and player assessment. Is the content necessary for learners to succeed in other activities presented in a learner-centered manner? Is content leveled and categorized in ways that are appropriate to player knowledge and ability? Do players have opportunities to reinforce and assess their knowledge of newly-learned concepts? These types of questions should be the next step for designers to consider after they have analyzed player activity. They need to reflect on how they design goals are met through gameplay interactions to determine if and how they are supporting access to appropriate content and providing engaging and educative activities for players.

Understanding player activity also involves determining ways to spur players into new situations and different interactions. Increased participation in interconnected narrative tasks can increase the time that players spend immersed in the environment for meaningful interactions and help to ensure that players access and use the learning content required for successful development of language skills. Without a meaningful narrative, players may never begin to inhabit the role of their character that gives them reasons to explore the game space. Curiosity may bring self-starting learners to the environment, but lack of purpose and structure may drive them away. If the role-playing aspect of narrative-driven gameplay becomes relatively moot, players will need to invent their own narrative to connect ideas and concepts in a meaningful and useful way.

For understanding player engagement and activity in Zon, it was important to look not only at the nature of available tasks, but also at the behaviors of groups of players. Analysis of the most active players during the sample period provided insight into the nature of the players whose patterns of gameplay exhibited opportunities to become the most immersed in the environment. When developers look at this most active subset of players, they can begin to determine information on player behaviors. The implication here is that understanding the complete portrait of player activity requires that developers view data related to different groups of players through multiple lenses to find evidence for answering important design questions. Data provide information that can be analyzed by date, day of the week, or individual user, showing important feedback for scheduling in-game activities or understanding player behaviors.

Knowing what players do in the online space is an important step toward understanding how learning occurs in these online game environments. Seeing player choices with respect to the activities with which they interact provides feedback about engagement with content meant to introduce information and reinforce conceptual understanding. Examining the relationship between how content is structured when presented to players and how players ultimately involve themselves with that content allows designers and developers to reflect on how their goals for the game are being met.

Implications for the Design and Development Process

This research yields important lessons for the design and development of game-based virtual learning environments. Although such online spaces may provide the ability to create fictitious replications of authentic situations, it is not enough just to simulate physical realities and drop players into that place. To engender the sustained interaction with game elements that

results in ongoing, productive engagement with learning content, designers should enact an overt, iterative process of reflection and refinement of the environment. Opportunities for interaction with game elements and instructional content must not only be a structured in a thoughtful manner, but must be continuously assessed as part of an ongoing formative evaluation of the project.

For example, understanding how the activities in the game work together to create a supportive network of possibilities is vital for determining the ability of the space to meet its goals. As part of an environment creating a simulation of places found in Beijing, the scenes in Zon, and the activities within these scenes, attempted to simplify real-world places for players. An overly complex setting might 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 to create activities that support a wide range of learners through leveled, thematic content but resist the urge to fill the environment with the vast array of symbolic and sensory messages available in the real world. Knowing how this balance is achieved in the designed environment is a constant focus of iterations of possible revisions to the game.

Every developer, regardless of role on the project team, needs to know the current state of player activity toward understanding the effectiveness of their design. For example, if most players are only staying in the game environment for small amounts of time and are rarely returning for another session in a few days of their previous session, what does this mean for the developing conceptual understanding through sustained interaction with learning concepts?

Finding answers to questions about patterns of player activity helps to plan revisions for future developments for the online environment.

It is also important to know to what extent players are knowledgeable about opportunities to interact with learning content in the environment. If gameplay is too ambiguous, players frustrate more easily, potentially causing them to abandon the game. If learning content is too ambiguous, either in presentation or in practiced use, then players may find it more difficult to make important connections between concepts. Doyle identified ambiguity as an important aspect of understanding student actions in relationship to academic work (1983). For game-based virtual learning environments, this implies that it is vital to determine if players are able to understand the content being presented. If the relationship between the gameplay activities and the content being presented within them seems artificial, players may be unable to make a clear connection between activity and meaning. If the implicit and explicit expectations of the learning environment are too ambiguous, then players may find themselves lost in a virtual world that does not provide the supports they need to understand how to interact. Toward the goal of connecting gameplay options with the content they are meant to introduce and reinforce, developers must examine player activity data toward answering questions about how learning can be successfully supported.

To begin to answer these questions, developers must use multiple sources of data to reflect on the effectiveness of their designs. Information about player activity provides an important piece for solving complex questions about all facets of the design process. Vital to development and design-based research, iterative and applied reflection should be part of formative evaluation throughout the project lifecycle. Player data culled from the server is a

necessary part of this reflection on design. The procedures of reflection and analysis used here, as well as the lessons learned from the process, can be used with other online learning games to inform ongoing work and future iterations of design, development, and research

When looking at server data related to player activity, the intent is to continue to interpret not just the numeric values representing these choices, but also the relationships between the types of activities that a game provides. Content-based activities that require players to practice knowledge introduced in presentation interactions provide the means for successful learning. Having a foundational understanding of how players are interacting with these types of activities will inform the design revisions that developers choose to make in future iterations of their game.

Phenomena that emerge from focused analysis can be used to recognize whether players choose to interact with activity types meant to support specific game mechanics or modes of interaction. For example, analysis could show that players overwhelmingly choose to complete narrative-driven progressions of activity within the game. This would speak to the belief that a narrative structure comprised of lines of tasks is important to engagement. As a mechanism often used in game design, especially in role-playing games, narrative-driven tasks attempt to create an immersive identity for players, given them a specific character to embody. 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, 2007, p. 266). Linked to the contexts within the game environment, the narrative will reinforce the player's role as a character and drive their involvement in the ongoing storyline.

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 that also

creates authentic purposes and activities to support learning. Designing a role-playing environment that has characters involved with an overarching story must also coordinate with the learning content and structure of presentation and practice activities. The storyline should provide embedded interactions that give the player a reason to uncover new information and learn new content. A primary focus for developing these types of engaging, authentic, ongoing narratives should be on constructing lines of tasks that engage players with NPCs, move players into new environments, and surround their activity with meaning, thereby allowing for the introduction and reinforcement of learning content as a seamless element of interaction.

Implications for Design Research

As a part of the development team for Zon in the second and third years of its ongoing lifespan, I had the opportunity to work with designing activities for content presentation and practice, with a focus on game-type functionality such as feedback, opportunities for revision of process, chances to solve complex problems, and interactivity of game agents. I was also a researcher, experiencing the procedural and management issues related to doing design-based research. I often needed data on things happening in Zon to better understand where to go next in development.

During my research, analyzing the data from the server logs, I had to use several tools (i.e., Numbers, Excel, PASW Statistics, and a calculator) and many different methods cobbled together in order to find the information I wanted. The methods worked but they were hardly efficient. Most of the procedures I developed for finding information could potentially be built into the system for adding content to the virtual environment. What became most apparent during my ongoing work with Zon was the need for a systematic process for obtaining information

necessary for analyzing relevant data and answering fundamental design questions, with a streamlined user interface that permits unencumbered investigation. Without such a system, designers and researchers are blind to the activities and needs of the players in the environment.

Throughout this research, I was reminded of the importance of using methods that match the trajectory of a project that attempts to integrate research into the development process. Unlike methods that separate the two, the construction of a learning game must be approached in a way similar to creating instructional activities as part of action research, with iterations of of research embedded throughout ongoing development. Although this makes the job of the researcher more complicated, as the target seems to be constantly moving, with well-defined questions and the ability to change procedures and foci during the work, the process can produce important findings about the success or failure of project elements. Design-based research addresses the particular demands of investigating project development as it "emphasizes direct, scalable, and concurrent improvements in research, theory, and practice" (Wang & Hannafin, 2005, p. 6).

In addition to this overarching realization about the need for design research that can address the complex nature of this manner of development, determining processes that address the resulting complexities is important. Sifting through large amounts of data in search of answers reinforced a vital lesson: data must be configured, organized, and accessible to researchers and developers in user-centered ways that allow for timely, useful feedback. Before programming the virtual tools begins, developers must ensure that their designs for databases and user interfaces will provide the appropriate information necessary for building and analyzing each component of the environment.

Through the analysis of player data and the interpretation of the various themes that emerged, player activity is defined 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. It also needs to be viewed in comparison to the goals developers have as a part of the formative evaluation process that can provide important developmental feedback. As suggestions of player intent may be founded in hypotheses, using additional layers of player data and analysis in future iterations of investigations can assist developers in uncovering potential reasoning behind player behaviors.

As an important aspect of design-based research, feedback must be timely and appropriate for it to be useful. Feedback also needs to be ongoing with concern to different variables. Daily, weekly, and monthly analysis and accumulation of data on player logins, malfunctioning content, or other issues provides researchers and developers with important information about how their designs are functioning in the environment. As classroom teachers are constantly making anecdotal observations of their classroom, so too must instructional designers and other content developers consistently check various sources for feedback data on the virtual space. Importantly, the process for accessing and analyzing the data should be built into project management and user interface design.

A necessary part of reflection during the iterations of the design and development process is to review the questions asked for future research. This is not to say that the general and overarching goals for the entire lifespan of the project would make major changes, unless inescapably necessary. These are the short-term episodes that arise during the project.

Unforeseen issues may occur, so ongoing reflection and revision are important for creating successful designs and determining concerns for discussion among developers. In Appendix B, I list some of the questions that have occurred to me during the process of writing and researching this project, with an emphasis on both future iterations of the Zon project and other learning-focused projects. My hope is that these questions can spark future research to understand the issues inherent in developing game-based virtual learning environments.

Study Limitations

There were limitations to this research that need to be considered when determining what it can and cannot tell us about the effectiveness of game-based learning environments. For this study, I chose to examine player activity as the route toward understanding what happens in the environment, which meant relying on server logs as the primary source of evidence. Although these logs captured some important data for analysis of player choices, they did not provide evaluation scores that could be used to assess player understanding of concepts. They did not show contextual information about players with respect to their background, the environment in which they play, or their reasons for coming to the Zon environment.

In addition, the decisions I made about the study impacted the types of data that I could use in analysis. Because I wanted to focus solely on what players chose to do when they entered Zon, rather than the reasons behind their gameplay, I limited my research to the observable aspects of their interactions. I wanted to know what elements of the design were selected and how these choices related to the structure and availability of game elements. My intent was to show the importance of understanding player activity as a means toward reflecting upon the

design of the game, with the purpose of implementing such iterations of reflection into the ongoing development process.

Conclusion

Through this study, I have identified important issues related to developing game-based virtual learning environments. It is my hope that through this type of investigation we can move beyond the anecdotal observation of player preferences toward a data-driven understanding of what players actually do during their time in the game-based environment. Without a clear portrait of the types of choices that players make while online, we cannot hope to understand how different opportunities to interact with content impact issues of immersion, motivation, and, ultimately, learning.

I also hope to reassert the importance of understanding the interplay between issues of game design and instructional design. Because they may, at times, be at odds in the development process, they are never mutually exclusive and should work in coordination. Just as we would consider the method of instruction to be as important as the content of instruction in the physical classroom, so should we be constantly aware of the manner in which we present content and the way in which we ask learners to interact in the game space. Without thoughtfully constructed options for activity that present content in an accessible, meaningful way, even the most engaging gameplay can only produce questionable learning outcomes.

This study is just a start, attempting to push on the instructional opportunities of online games and the potential for engagement in game-based virtual learning environments. Through this and future work, my intent is to use ongoing research, based in design, reflection, and analysis, to aid in the creation of effective methods for learning through online activity.

APPENDICES

Appendix A

Table 15

Examiner *Engage* Questions Connected to *About*: All Scenes

Examiner *Engage* question	answer	corresponding NPC	*About* instances
Hotel Lobby			
Of the following sayings about "yu" which one is NOT correct?	The carving technique "yù" includes "Imperial Court Style", Guangzhou Style and Shanghai	shop	1
"Jing Tai Lan" was invented by Chinese people.	Wrong	n/p	n/a
"Jing Tai" is the name of the time period when "Jing Tai Lan" went through a major change in design and formed its own unique style in China.	Right	n/p	n/a
Barbershop			
Which of the following is NOT true?	Hairdressing services in China is (sic) separated by barber shop for man (sic) and salon for women.	n/p	n/a
If you would like to have a shave, which word you should (sic) choose to say?	xiu mian	Cashier	15
True or False: In China, you need to make appointment before going to the salon.	False	n/p	n/a

Table 15 (continued)

Examiner *Engage* Questions Connected to *About*: All Scenes

Examiner *Engage* question	answer	corresponding NPC	*About* instances
Market Street			
Which of the following snacks does NOT belong to "soup" or "conjee" style?	Dalian huoshao	Xiao Long Bao	3
Right or wrong? Chatang is a kind of vegetable soup.	Wrong	Xiao Long Bao	3
Right or Wrong? Doufunao is a typical breakfast food.	Right	Xiao Long Bao	3
Which of the following symbolic relation (sic) between the two words is NOT correct?	tao zi - wisdom	n/p	n/a
Which of the following handicrafts has multiple functions including entertainment, civil, and military communication use?	Feng zheng	n/p	n/a
Right or Wrong? Among the "Eight-Xiangs" only Ruifuxiang sells silk fabric.	Wrong	Ruifuxiang	0
Right or Wrong? At Ruifuxiang you can also make your own Chinese-style costume.	Right	Ruifuxiang	0
Which of the following cities is not a representative city of a certain style of Ci xiu?	Shanghai	n/p	n/a
Right or Wrong? Qipao was originated from the style of Han fu.	Wrong	n/p	n/a
Right or Wrong? Qipao's design had undergone major changes during the final years of the Qing Dynasty.	Right	n/p	n/a

Table 15 (continued)

Examiner *Engage* Questions Connected to *About*: All Scenes

Examiner *Engage* question	answer	corresponding NPC	*About* instances
Modern qipao firstly (sic) appeared in the city of Guangzhou.	Wrong	n/p	n/a
Jianbing Street			
Traditionally, which of the following snacks can only be found in winter time?	Tanghulu	Tanghulu	0
There is one typical snack usually eaten when you are having douzhi, what is that?	Jiaoquan	Zhajiang	8
Which of the following traditional festival (sic) is in the 8th month of Chinese Lunar Calendar?	Mid-Autumn Festival	Zhajiang	8
What is the typical food to have in Duanwu Festival?	Zongzhi	Zhajiang	8
Right or wrong? TCM's theory is developed upon classical Chinese philosophies, and its application is mainly based on accumulated experience over time.	Right	Tongrentang	5
Right or wrong? Chinese herb medicine only uses plants as ingredients.	Wrong	Tongrentang	5
Right or wrong? Shennong was the first TCM doctor in history.	Wrong	Tongrentang	5
Right or wrong? "Zhong Cheng Yao" refers to the kind of Chinese herb medicine that has a standardized formula.	Right	Tongrentang	5

Table 15 (continued)

Examiner *Engage* Questions Connected to *About*: All Scenes

Examiner *Engage* question	answer	corresponding NPC	*About* instances
What is the name of the first modern bank in China's history? (China Trade Bank) - Examiner: Well done! You have earned 9 ZD! The End. (You've got 9 Zon Dollars)	China Trade Bank	bank	32
Bank of China			
Which item will you be UNABLE to get when you open an account in a bank in China?	Check book	counter2	25
Tongrentang (pharmacy)			
Right or wrong? TCM's theory is developed upon classical Chinese philosophies, and its application is mainly experience based.	True	zhongyi	0
Right or wrong? Chinese herb medicine only uses plants as ingredients.	False	n/p	n/a
Right or wrong? Shennong was the first TCM doctor in history.	True	n/p	n/a
"Zhong Cheng Yao" refers to the kind of Chinese herb medicine that has a standardized formula.	True	n/p	n/a
Which of the following philosophies is NOT considered as the foundation for traditional Chinese medicine?	Sichuan spice	zhongyi	0
Which of the following is the basic four-step-procedure in traditional Chinese medicine?	wang, wen, wen, qie	wenzhen	10

Table 15 (continued)

Examiner *Engage* Questions Connected to *About*: All Scenes

Examiner *Engage* question	answer	corresponding NPC	*About* instances
Which of the following may NOT be found in traditional Chinese pharmacy?	Live animals	zhongyi	0
Quanjude (restaurant)			
Which of the following is most important to ensure the good tastes of gua lu kao ya?	Eat right after it is roasted ready	cook2	3
True of False: You can choose food made from dou fu if you chi su.	True	waitress1	3
True or False: xi hong shi is another name of potato.	False	waitress1	3
What is the birth place of the dish gong bao ji ding?	Sichuan	waitress1	3
Hotel Street			
Which of the following was taught at the very beginning level of the "si shu?"	San Zi Jing	college	3
Thick ink is suitable for writing big characters. Right or Wrong?	Right	calligrapher	9
The best ink stone for practical use is made of jade. Right or Wrong?	Wrong	calligrapher	9
Which of the following is the name of the painting style designated to a "free manner"?	Xie yi	artstore	25
Which of the following statements is NOT correct about the roasting of Peking Duck at Quan Ju De Restaurant?	Crop stalks is used in the stove as the fuel.	quanjude	0

Table 15 (continued)

Examiner *Engage* Questions Connected to *About*: All Scenes

Examiner *Engage* question	answer	corresponding NPC	*About* instances
Mutton and port used to be the favorite food of the royal families. Right or Wrong?	Right	quanjude_girl	0
"Imperial Court Food" refers to the food had by royal families during the dynasty time, so it does not exist anymore nowadays. Right or Wrong?	Wrong	quanjude_girl	0
Teahouse			
Which of the following tea undergoes the least degree of oxidation during the processing procedure?	Bai cha	counter	6
Right or Wrong? Tea culture in China encompasses a range of elements that relative (sic) to various aspects of Chinese culture, thus it is not an exclusive cultural phenomenon	Right	counter	6
Right or Wrong? As tea tasting requires the matching between tea, tea ware and the surroundings, it represents the harmonious combination of people and nature.	Right	counter	6
Right or Wrong? Beijing opera is a local drama	Wrong	teamaster	3
Right or Wrong? Facial makeup in Beijing Opera is painted directly on the faces.	Wrong	teamaster	3
Which of the following facial makeup's symbolic relation between color and personality is correct?	Black - righteousness	teamaster	3

Table 15 (continued)

Examiner *Engage* Questions Connected to *About*: All Scenes

Examiner *Engage* question	answer	corresponding NPC	*About* instances
Art Gallery			
Which of the following literature works was written by Li Bai?	Qiang Jin Jiu	staff	0
Which of the following statements about classic Chinese literature is NOT true?	Du Fu and Su Shi are both well-known litterateurs (sic) excelled in song ci	staff	0
Which of the following statements is true?	Fan Zhongyan was one of the founders of the "haofang" school of ci	staff	0
Which of the following is not the material to make Seals?	Glass	sealCarvingMaster	0
What are the four most popular objects in Chinese painting?	Plum blossom, orchid, bamboo, and chrysanthemum	ChinesePaintingMaster	0
When was the Blue and white porcelain first made?	Tang Dynasty	antiqueCollectionMaster	0
In which dynasty, the Forbidden City was first built?	Ming Dynasty	antiqueCollectionMaster	0
Post Office			
About postal service in China, which of the following is NOT correct?	"yi zhan" was the transmission station only for delivering mails	notice	0
Which of the following cities was not among the first generation of modern post office in China?	Guangzhou	notice	0
True or false China uses the cm/kilo based measurement.	True	parcelMan	0

Table 15 (continued)

Examiner *Engage* Questions Connected to *About*: All Scenes

Examiner *Engage* question	answer	corresponding NPC	*About* instances
True or false EMS is an express delivery service independent of China postal service.	False	counter3	0
True or false You can subscribe to newspaper in post offices in China.	True	n/p	n/a
True or false: You can subscribe to magazines in post offices in China.	True	n/p	n/a
True or false: You will pay the same amount (sic) money for all the domestic first class mails in China.	False	counter3	0

note: n/a = not applicable; n/p = answer not provided in scene

Appendix B

Questions for Continued Research

This study helped to answer important questions about development and implementation of the Zon environment, but it also uncovered issues for future research into Zon and similar game-based virtual learning environment projects. Some of these are related to the type of data provided in the server reports, while others branch from the original questions to explore other aspects of design and development.

The limitations imposed by the data were most evident in examining the time that players spent on activities. It is important that data show end-times related to mouse clicks for closing windows or selecting from menu or dialogue items. This would allow for additional analysis into the amount of time spent on different activities, rather than just determining what players selected. Another example would be to process timestamp information using location data from the players. Server data being analyzed should be related not to the absolute server timestamp, but to time and date information relative to time zone. Player sessions could be correctly analyzed for length of time and time of day.

These issues related to the type of reported data should become part of the conversations between project developers. Just as appropriate, timely feedback is important to players in the virtual environment, it is also vital to designers and researchers. Without accessible, useful information about player activity, the virtual space is inscrutable.

It was hard to avoid thinking about questions related to future development. Would more *Task* lines produce greater interaction with *Observe*? Would gatekeeper functionality on *Engage* lead players to interact more often with *About*? These kinds of questions are based on initial

findings from the sample period, but are meant to spur potential designs in future iterations of Zon.

Other questions for consideration lead to possible revisions to the content organization and presentation. Noting the low level of involvement with *Observe* activities, is the current structure of these activities the most effective for placing content into the environment in a way that players find useful and that supports their understanding of new information? Although a question such as this opens an enormous aspect of design for investigation, without reviewing all aspects of the design, from gameplay to interaction with content, developers are working with an incomplete portrait of what is occurring in the virtual environment.

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