Designing and Developing Game-Like Learning Experience in Virtual Worlds: Challenges and Design Decisions of Novice Instructional Designers

Turkan Karakus Yilmaz
Ataturk University, Turkey

Kursat Cagiltay
Middle East Technical University, Turkey

Abstract

Many virtual worlds have been adopted for implementation within educational settings because they are potentially useful for building effective learning environments. Since the flexibility of virtual worlds challenges to obtain effective and efficient educational outcomes, the design of such platforms need more attention. In the present study, the aim was to investigate design issues and the concerns of novice instructional designers who were developing a virtual learning environment with a gaming approach. Active Worlds (AW), an immersive virtual environment, was selected as a platform to develop virtual world projects that presented instructional materials. Twenty-three novice instructional designers participated in this study. Data were collected through observations, interviews, document analysis, and a questionnaire. The results indicate that the novice instructional designers were most challenged when attempting to incorporate motivational and assessment features in their project designs. They ignored collaboration opportunities of the design platform. They also accepted that they could not achieve to provide a feel of real game. The results suggested that design and development in virtual worlds has many challenges but a broad experience for novice instructional designers.

Keywords: *Instructional design; Novice instructional designers; Instructional design education; Virtual worlds; Active Worlds*

Introduction

In recent years, the use of virtual worlds in education has increased dramatically, as they have been claimed to be effective settings for distance education and collaborative learning. These environments engage users by allowing them to partly create their own learning settings and then to play a role within those settings. Liu and Rutledge (1996) emphasized that designing an interactive environment is a very arduous and complex process. Because the aim of interactive media is to offer more than static information, designers must consider interaction features, help and feedback components, and pedagogical and graphics aspects of the software (Papert & Harel 1991). With a number of affordances, virtual worlds allow many instructional methods to be applied (Amichai-Hamburger & McKenna, 2006; Barab, Thomas, Dodge, Carteaux & Tuzun, 2005; Berns, Gonzalez-Pardo & Camacho, 2013; Duncan, Miller & Jiang, 2012; Kim, Lee & Thomas, 2012; Okutsu, DeLaurentis, Brophy & Lambert, 2013; Soukap, 2004). On the other hand, virtual worlds have a flexible structure that might cause learners lost their attention or

confuse on which piece of knowledge that they need to focus (Dickey, 2005a; Ho, Rappa & Chee, 2009). Therefore, more structured and goal-based designs might be helpful to engage students learning.

In this respect, game based approach might fit well in virtual worlds with its fantastic graphics, interactive objects and communication tools. However, it must be investigated that what turns virtual worlds to a game and whether there is any challenge while creating a game-like learning environment in virtual world. This study was designed to reveal what sorts of challenges arose while instructional designers were attempting to design a virtual world educational setting in a gamified way and to examine their design decisions. The results of the study will contribute to our understanding of instructional designers' challenges while approaching a new case of instructional design and how a virtual world might become a game based environment via instructional designers' decisions.

Background of the Study

Virtual worlds have become one of the most important platform types among computer-based learning environments. In the last decade, virtual worlds proliferated because they were used for distance education as well as socialization. Many virtual world platforms allow users to create learning environments. For example, in the Active Worlds (AW) platform there are more than 600 large-scale worlds, each with its own server (Active Worlds, 2016). Thousands of other types of learning platforms also exist on the main server of AW (Active Worlds 2016). Such virtual worlds accommodating various type of knowledge representation have changed our perception of learning environments (Dickey 2005a). Those environments changed the profile of the younger generation of students, who now have different demands than older learners (Tuzun, 2007). Because younger learners demand game-like environments, educators have begun to see virtual environments as motivational learning tools.

Although virtual worlds are not real games, they allow users to design game like environments. Virtual worlds also allow learners from different cultures or countries to collaborate and communicate. In addition, this type of environment utilizes learner-centered strategies (Kebritchi & Hirumi, 2008), as well as independent (Dickey, 2005a) and self-directed learning (Heid & Kretschmer, 2009). Yet another benefit is that virtual worlds offer learners real-world experiences within virtual communities (Nelson & Erlandson, 2008). Virtual worlds can be developed in various approaches and for different purposes including exhibition areas (like museum), real classrooms, immersive demonstrations, role playing environment, simulation of events or experiments, animation of historical events and places, task based activities (Barab, Dodge, Tuzun, Job-Sluder, Jackson & A. Arici et al., 2008; Brom, Preuss & Klement, 2011; Kay & Fitzgerald, 2008). Therefore, they might be considered as one of the option for instructional designers while designing educational platforms. Thus, it is worth to investigate their shortcomings as an educational platform.

Each of those game-like and simulated environments developed in virtual worlds has a different strategy and design (Hirumi et al., 2010b). However, though the number of available applications has increased, their design involves several technical and pedagogical challenges that may limit what instructional designers can achieve with these systems. For example, Kemp and Livingstone (2006) observed that the lack of interactivity options in Second Life negatively affected the integration of its learning management systems with its immersive environment.

After experiencing a virtual zoo project, Wheeler (2009) observed some technical problems regarding its communication methods, development time, and activities. In their study, Coban, Karakus, Karaman, Gunay and Goktas (2015) showed that an effective interaction is very challenging the programmers when they want to trigger any object by the movement or hit of another object (like moving a ball after hitting it with a stick). Revealing those kind of issues might be helpful for educators and designers who need to design game-like environments.

According to Ertmer et al. (2009), novice instructional designers tend to take information at face value, raise issues in order to blame others, focus on things they do not understand, and search for information mechanically. Despite these unfortunate tendencies, Horn and Masunaga (2006) argued that abilities can be enhanced with deliberate practice. While making judgments about the context, scientific guidance is not adequate for novice instructional designers since each educational context has many different dynamics (Gray et al., 2015). Therefore, in Instructional Design education, novices should be exposed to a wide variety of design context, in order to gain experience with multiple platform types and to find innovative ways to design them for learning purposes (Hirumi et al., 2010b).

Interactive media design training employs an immersion strategy and offers novice instructional designers a structure problem to solve collaboratively (Dabbagh & Blijd, 2010). Cheney et al. (2009) stated that whenever a new productive, social, and collaborative technology is incorporated into a curriculum, this always generates challenges to find the best way to use these for instruction. The way by which instructional designers solve design problems and apply knowledge, the processes they employ, the goals they establish, and their management, monitoring, and evaluation processes are reflection of their instructional design skills (Gustafson & Branch 2007). To understand how novice instructional designers gain expertise in Instructional Design (ID), their decision-making processes, methods, and products must be examined (Hardre, Ge & Thomas 2006). Novice instructional designers who are faced with design problems need support (Hardre et al., 2006) and explicit guidelines that are based on expert thinking (Ertmer et al., 2009). In order to best provide that support, ID educators must understand their students' approaches to problems.

In this regard, virtual worlds are an ideal testing ground for studying the decisions of novice designers. Both technical and pedagogical issues arise when designing virtual worlds to be used as learning environments. Virtual worlds are not technically difficult to design, but some of their features or limitations may not be ideally suited to implanting pedagogical components (Hirumi 2010a). This study was designed to reveal critical issues that influence novice instructional designers' design processes regarding the creation of game-like educational environments in virtual worlds. Specifically, this study investigated the following research questions:

1. What are the challenges of novice instructional designers who design and develop virtual worlds for educational purposes?
2. What are the design decisions of novice instructional designers to integrate game-like learning experience into virtual worlds?

Active Worlds (AW), an immersive virtual environment, was selected for use in this study. The participants were novice instructional designers, who were given the task of creating learning environments for different target audiences. The challenges that they faced regarding both instructional and technological features and their solutions were examined.

Significance of the Study

This study is important in several aspects. First, as stated previously, virtual worlds are popular platforms in educational settings because of their utility for creating effective learning environments. Transforming these environments into game-like platforms might be challenging. However, virtual environment must provide easy way to create better learning conditions without advance technical knowledge (Munoz-Cristobal, Prieto, Asensio-Perez, Martinez-Mones, Jorrin-Abellan, & Dimitriadis, 2015). This study exemplifies how game elements might be integrated into the design to create game like environment. Thus, educators might facilitate in providing a game experience with virtual worlds without advance technical background.

Thinking that any maestro needs to know to play some instruments to make a perfect orchestration, novice instructional designers need to gain both technical and pedagogical experience to be able to choose the optimum tools for different kind of educational purposes. Instructional designers must be familiar with the design and development process for such kind of environments. Studying the perspectives of novice instructional designers, and the challenges which they face is important, so that ID instruction can be better adapted to help novices to perform more efficiently in the future. Working with virtual worlds also offers the opportunity to test novices' competencies over a wide range of areas. Lastly, although virtual worlds have many advantages they still have some technical issues that might lead pedagogical inadequacies. Results of the study will help to guide virtual world developers to improve the pedagogical and technical features of these platforms.

As a last issue, this study exemplifies in which part of instruction, instructional designers experience challenges. The challenges that novices faced might be considered as the general issues in similar design platforms. Therefore, the study might give some insights about where the instructors of instructional design courses provide scaffolding.

Methodology

In this qualitative case study, researchers aimed to understand the challenges and design decisions of novice instructional designers while designing game like learning environment. Therefore, the context was an undergraduate instructional design course, which senior students enrolled.

Participants

The participants in the study were 23 undergraduate Instructional Technology students studying at a high ranked university in the capital city of Turkey, 8 females and 15 males, who were in their senior year and enrolled in an educational software development course. New technology has been integrated into the curriculum, as well as programming, instructional design, and pedagogical courses. Graduates of the department typically find subsequent work as instructional designers, computer teachers, programmers, or system analysts in public or private institutions. The participating students formed seven different project groups. Each researcher selected two or three groups randomly to conduct deep observations and interviews during

regular meetings. The students were free to form their groups, and the groups were not homogenous. Table 1 shows the group details and their respective project topics.

Table 1. Facilitators and Project Group Gender Distributions

Facilitator 1	Group 1 – Installing Computer Networks	Two females, two males
	Group 2 - Exploring the Library	Three females, one male
	Group 3 - Exploring the Health Center	Three males
Facilitator 2	Group 4 – Exploring the Library	Three males
	Group 5 – Biology (Cell)	Three males
Facilitator 3	Group 6 - Exploring the Museum	Three females
	Group 7 –Exploring the Basic English Dept.	Three males

The participants are called as novice instructional designers because starting the freshmen class, they have taken instructional design courses and in most of them they worked with a real target group. For example, in “Instructional Design” and “Multimedia Design and Development” courses, they worked with elementary students to develop materials for Science Education. They also experienced in web design, graphics and animation design, distance education, project development and educational sciences.

The Setting

The study was conducted in the context of an educational software design course. The study lasted for 14 weeks. Each week, the students attended a traditional class (2 hours) and met with their facilitators to discuss their projects. Besides, for the first four weeks, they attended lab sessions (2 hours per week). In the first two lab sessions, they played several computer games and wrote reflections about the educational aspects of those games. Those games were Dimenxian (a 3D game for learning coordinate system), Contraptions (A 2D puzzle game based on physical rules), a modified Tomb Raider game for learning biology. Those games were selected by instructor and course teaching assistants because of their educational aspects and variety of game genres. For the latter two weeks of their lab work, teaching assistants introduced Active Worlds (AW), which is the 3D virtual world development platform. They explained technical features, how the student should access it, how to design within it, and how to make connections between objects and Web components. Each group obtained a basic account from Active Worlds. With this account, they could use available objects and build their learning environments.

In order to design and develop their game-like virtual worlds, a particular instructional design model was followed by the students. This was the FID^{2}GE, which stands for Fuzzified Instructional Design Development of Game-like Environments (Kaplan-Akilli & Cagiltay 2007). The model includes intertwined analysis, design and development, implementation, and evaluation phases. In the analysis stage, the participants defined their goals; reported the results of needs, content, context, learner, tool (AW) and game analysis; defined their instructional approach; and adjusted it to their design. In the design and development report, they reported all of the details of their design, along with their motivational, assessment, and feedback decisions; defined their clear-cut scenarios; adjusted their scenarios with their instructional approaches; reported maintenance and distribution issues; and presented an introduction about implementation and evaluation issues. The students also prepared short reports on their pilot studies, for which they used both paper-based and computer-based prototypes. In the

implementation phase, they evaluated their products regarding whether they had met their project goals, and they eliminated usability problems. They reported on this phase in a final report. In that final report, they discussed changes made in their scenarios and the plans they formulated during the development process.

All of the groups were encouraged to develop a game-like environment to introduce one part of the university campus (the library, medical center, museum etc.) to people who are new to the university. So in evaluation of each phase they need to work with freshmen. Two of the groups preferred to develop different environments, which focused on biology and computer networks.

In the AW setting, each group had a particular virtual place to create their own world. The AW user interface includes three parts. In the interactive 3D interface part, the students created 3D objects and wrote simple scripts to make them perform a task. Users can walk and move in the 3D environment, and see those objects. They can also interact with them by clicking on the objects. The second part of the interface is a Web browser with which students may upload or download a variety of resources, or interact with databases. When users click on an object, the content of the browser might change, if it was coded. Most of time, this feature provides information about the objects or events that occur in that particular area of the virtual world. Lastly, the AW includes a chat tool that allows real-time communication with the other AW users. Users can chat with other players or with any support person. Users must be in the same virtual world to see each other and their messages. A snapshot of the AW entrance is shown in Figure 1.

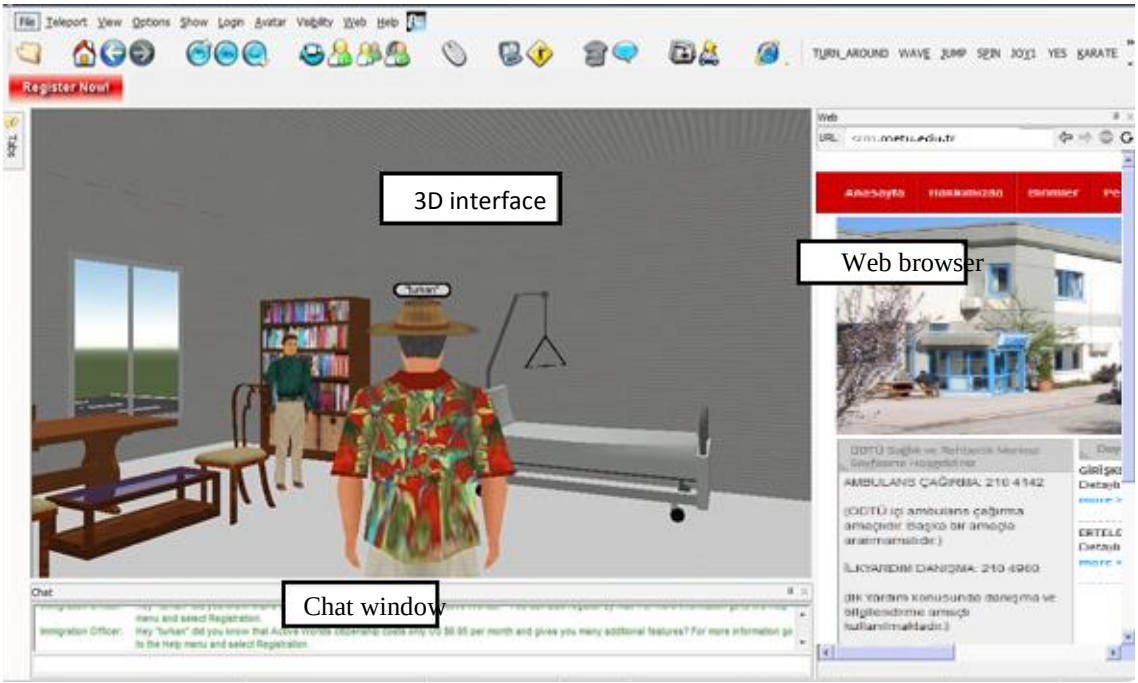

Figure 1. A Snapshot of an AW Window

Instruments and Data Gathering Procedures

The data collection process took three months. This three-month period was divided into the analysis, design and development, and final stages in accordance with the structure of the

course. The researchers collected a total of 24 group-meeting observation notes during the semester. Each meeting was lasted about half an hour. The researchers participated in all of the classes and used their observations from these sessions. An additional special session was also held to discuss virtual world issues. The groups wrote their first group reflections based on their AW experiences. Then, the class discussed the experiences. The groups' reflection papers about the tool were collected as an instrument, and the group discussion was recorded in that session.

At the beginning of the semester, the groups were given an instructional design questionnaire related to their projects. The groups answered several questions, such as: How did they form their project team; how did they select a pilot study site; what kind of tools did they use; what kind of model did they choose; etc. The answers from the seven groups were collected and analyzed. Their answers about selecting an instructional environment development tool and about issues that they took into consideration during the planning process were also evaluated.

Toward the end of the semester, an open-ended questionnaire that inquired about their instructional design decisions was distributed to the students. The questions focused on the materials, the tool used to develop those materials, and the strategies that the students used to design the instructional elements.

At the end of the semester, voluntary students were invited to participate in individual interviews, and six students participated in these interviews.

Each of the seven groups submitted three reports on their projects during the semester: the analysis, design, and final reports. These 21 reports were examined to analyze the participants' design decisions, their explanations concerning motivational issues, scenarios, and their interactions with the tool (AW). All of the reports were written considering a report template, which was prepared by instructor. Template titles were definite but what groups had written under the titles was flexible. Reports of project groups were also used to see what novices designed in their minds and how much of that designs was put into practice in the development platform. The researchers compared the draft of the projects on the reports and the projects developed on the virtual world. Table 2 displays the project development process and data collection times.

Table 2. Project Development Process and Data Collection

Term	Data Collection Tool	Total Data
Analysis	Group meetings	6 group meeting records
	Observations	3 class observation notes
	Analysis Report (A)	7 group reports
	Questionnaire	23 students
Design and Development	Group meetings	15 group meeting records
	Observations	5 observation notes
	Design & Development Report (D)	7 group reports
Final Stage	Group meetings	15 group meeting records
	Observations	4 observation notes
	Individual interviews	6 volunteers
	Final Report (F)	7 group reports
	Developed game like learning environments	Products of 7 groups

Data Analysis

All of the interviews, observation notes, the open-ended questionnaire, and the reports were coded by two researchers. Both researchers were experienced with the course and qualitative studies. In the pilot study the inter-reliability of the data were like below (see Table 3).

Table 3. Inter-reliability Scores of Each Instrument

Type of the data	Percentage of agreement
Observation	.80
Questionnaire	.82
Reports	.63
Group meeting interviews	.83
Individual interviews	.83

During the observations and group meetings, the researchers realized that the students' concerns tended to mainly revolve around instructional, motivational, and assessment issues, and also the technical challenges of the AW environment. Therefore, these main titles and issues defined the basic codes. Each main title was evaluated in terms of the challenges posed, the advantages seen while using AW as a distance learning tool, and how the novices dealt with these issues during their project.

Findings

The results showed that there were three issues in game development; integration of the learning content with game, motivation and fun factors, feedback and rewarding. For each issue, both of the research questions are addressed.

Integrating Learning Content with Game

Most of the project groups developed their learning environment on the structural basis of drill and practice. In fact, most of them initially attempted to design their scenarios as a real game; but after a while, they realized that it was impossible to program this 3D environment as a real game. Then, all of the project groups used the goal-based scenario model of Schank et al. (2001) to create a game like experience. They created a story about the project topic and presented a mission to the user. While the novice instructional designers were designing missions for the users, they planned the instructional materials to appear in a step-by-step manner to limit the users' actions. This means that the users had to follow a specific route to investigate and solve problems in the 3D world. To guide the players, the students designed several short messages and questions in the 3D and the Web settings of the project. Some project groups also used additional paper-based materials to obtain background knowledge from the users and to control the users' actions.

Table 4 shows in which novice instructional designers challenged in integrating learning content with the game and which strategies they used to overcome this issue.

Table 4. Instructional Issues that Arose During the Projects

Challenges in creating a game with learning content
Lack of content interactivity in the immersive part
Split attention between different parts of the environment
Difficulty concerning the learner-centered design
Instructional integration strategies
Drill and practice questions
Goal-based scenarios
Step-by-step routing
Using short messages and questions
Using additional paper-based materials

The novices had some problems integrating the Web component with the 3D setting of the environment. Although the users moved around in a 3D environment (as avatars) and collaborated with other people, they had few opportunities to interact with 3D objects. For example, interacting in a virtual chemistry laboratory does not mean that the players were able to hold some virtual chemical substances and mix them to see the results. The novice designers had to use the Web feature of AW to inform the users about their progress. Thus, they used more than the 3D setting to provide content-learner interaction. Nowadays, immersive platforms have provided 3D objects (like big screens), in which a user can open Web browsers within the virtual platform. However, even in this case, a user would need to search Web browser objects by walking around the 3D platform to see the Web content.

Generally, projects based on virtual worlds are designed with goal-based scenarios, and users are supposed to solve problems in the world by searching within an immersive environment, on Internet search engines, or using other kinds of sources. Thus, a learner-centered design could be achieved, because the learners have the opportunity to use a wide variety of sources to create their own answers. However, in the projects in this study, the participants tried to develop environments in which the users could find all of the resources that they needed to solve a problem within that learning environment. This might be an easy way for learners to play; but it also limited them to the content in the learning environment, and they had to follow a specific path to reach the learning objectives.

By means of the chat window, the players could talk to other people, and within the immersive environment, they saw each other as avatars. In the group reports, although collaboration issues were always emphasized, the groups never incorporated collaborative learning strategies into the designs of their projects. In their designs, the players were conceived as individuals, and interaction and knowledge-sharing activities were ignored. The participating novice designers might have ignored this because of the AW's natural collaborative structure, which relies upon avatars and the chat tool. However, a collaborative learning strategy should cause the users to compete or interact with each other to achieve their learning objectives. In this environment, due to the system limitations, two avatars (representing real players) cannot interact, compete, or collaborate spatially. Thus, the participating designers did not attempt such collaboration, because it was not possible technically. Another reason might be that the designers wanted to control all of the actions of the users automatically. They may have believed that even if they could provide interaction, they could not monitor the users' interactions to provide appropriate feedback or to evaluate them.

Designing Motivation and Fun Factors

One of the most important motivational generators that the novice designers sought to program into their virtual learning environments was competition. This competition could be against either a time limitation or the other players. Learner control was another feature that the novice designers emphasized. They wanted to provide several choices and challenges to the users to permit this learner control.

To provide motivation in their designed environments, some project groups preferred to use fantastic stories, even though their target groups were mostly higher-education students. For example, for the university Health Center game project, the students created a story about an epidemic occurring on campus, and they told the users that they should suspect that they are ill. Their mission was to find out whether the user was sick or not while exploring the Health Center. The project group which developed a computer network installation guide used a real-life story based upon the premise that the players want to apply for an information technology job. To convince the boss of their qualifications, the players had to install a network. To design an environment which looks like a game, the groups used different strategies. For example, to pass from one place to another or to collect some objects, the players had to enter a number, which was shown in the 3D setting, into a textbox shown using the Web feature. Or, they provided some questions and feedback on a Web page. Thus, the novice designers tried to use the Web feature actively. In some projects, the learners could see their progress posted on a Web page, on which the designers provided some colorful objects to show which missions were completed. Table 5 displays a summary of the motivational and fun elements.

Table 5. Motivation and Fun Elements Used in the Projects

Challenges in creating motivation and fun elements
Difficult to provide a challenge
Difficult to give a reward in the 3D setting
No feeling of play
Lack of opportunities to utilize cultural differences
Choosing a topic that could be attractive in the immersive environment
Integration of motivation and fun elements
Extraordinary stories
Real-life stories
Providing game-like activities via the Web feature
Showing progress of students via the Web feature

The novice designers believed that challenge was an important strategy to provide motivation in the 3D setting, but they neglected to use cognitive challenge. For example, in the report of the Library project group, they said they made the users explore the entire library to find three hidden books on virtual shelves which were placed very far away from each other. Thus, the designers could provide a challenge spatially, but not cognitively. Although the virtual worlds do not limit the movement and playing time of the users, one of the project groups wanted to incorporate a time limitation. They were able to do this with the Web feature, but it was not possible to program a time limitation into the 3D setting of the game.

Almost all of the novice designers reported that the Web feature dependency was a drawback for motivation. In one of the observation sessions, a student reflected on this and said, the "*immersive part is nothing without the 2D part [Web part]. Players just walk around in the virtual*

world if they are not engaged in some operations by means of the 2D part." Another student supported this view and said, "*…our game project could not provide real entertainment. This is not a game in our minds, and to make it educational, we have to use the Web part.*" Before starting the projects, the novice designers thought that they could develop a game in the design platform. During the individual interviews, one of the students said: "*… we are going to schools for teaching practice. The 10th and 11th graders do nothing. They just play Flash-based games. They do not want to participate in computer lessons, and it is difficult to make them concentrate in this environment* [AW project]*… This is the biggest handicap of this environment."* The novice designers' concerns about motivation were especially focused upon engagement. On the other hand, after encountering some design examples, they admitted that the AW environment can provide a fantastic environment. They particularly liked the quality and variety of the objects.

Designing Feedback and Rewarding Issues

As seen in Table 6, the novice designers had to provide a student assessment model in their designs. Assessment was assumed as the reward of the games. However, NIDs occasionally give place to assessment and feedback components in their products. This might have been due to a lack of strategies to monitor the players. In a few cases, the designers created questions which the players had to answer in order to continue to other parts of the learning environment. However, the designers could not provide quality challenges for the players in the 3D setting, apart from using some visible/invisible objects and teleports. For example, in the Library project, the players were supposed to find three books in the library, but the designers could not find a technical solution to control how many books were found by the students. Another problem was guiding the players because the AW environment is a huge platform. The novice designers provided several guiding objects to make the players follow a correct path to solve problems. Since monitoring the users was not possible unless they interacted with the objects, assessing their actions and providing feedback was a challenge for the novice designers. Another difficulty was that the users could continue their trip in the 3D setting, even if they made mistakes. This means that for the novice designers, designing assessment, feedback, punishment, and reward systems was not easy in the 3D setting.

Table 6. Feedback and Rewarding Issues that Arose during the Project

Challenges to design feedback and rewarding
Tracing user behavior
Finishing a scenario
Thinking of all the possible actions of users to guide them
Even if users make mistakes they can continue to play without any warning or punishment
Integration of feedback and rewarding
Using stable objects to provide feedback
2D feedback
Using a Website to control the users' behaviors

In the projects, the most popular feedback method was to provide small text objects to guide the users. When users entered a place, they could see a text object that told them what they can do or what they should do. The majority of the feedback was provided via the Web component. The novice designers also used the visibility and invisibility properties of the objects in 3D setting. Thus, they could provide feedback in several formats, by showing colorful objects,

requesting that the users undertake another mission, or displaying the progress of the users. To halt the progress of users, two groups wanted to provide some key words in the immersive world, by which the users could access the Web component. This, some user decisions could be facilitated with the help of those key words. However, the novice designers could not ensure that the users could see all of the key words at any one time. In this respect, the designers' automated assessment systems did not work well.

Discussion and Conclusion

Currently, there are many platforms like Active Worlds (AW) that permit 3D virtual world development. It can be argued that the novices' expectations were highly influenced by design issues relating to platforms with which they were familiar. Therefore, this study's results indicate that it is important for novices to experience several different kinds of platforms during their training so that they may more readily comprehend the goals and opportunities provided in those platforms.

Hirumi et al. (2010a; 2010b) suggested that in the education of novice instructional designers, experiencing the design issues of game-based learning should be a part of their training. Most of the novices in this study were only familiar with 3D video games; this might have caused expectations from virtual worlds that this technology could not provide. Today, children like active and competitive environments for fun play. According to the novice designers, productive learning interaction should involve more than only mouse-clicking and reading content, or discovering something just by walking around (as an avatar) in the platform. Unless more interactivity is provided, one of the major motivational issues faced by the novice designers in their projects could not be solved. Novice instructional designers spend less time analyzing the problems that they encounter and elaborate different design solutions (Perez & Emery, 1995). In this study also the novice designers' lack of applied analysis regarding the 3D part may be another reason that they did not use it very efficiently. The novice designers in this study clearly wished that real interaction features be provided in the 3D platform, just as they are in video games, which requires more complex programming. As Dickey (2006) states, the platform should not compel the instructional designers to possess talented artistic skills.

Monitoring the users was one of the biggest challenges of novice instructional designers. In particular, they found it difficult to create a chain of learning conditions, since they could not easily monitor the students in the platform. The novice designers did not consider utilizing different communication tools to obtain information from the users, but instead tried to use automated monitoring systems, which are not usual for this kind of platform. To overcome this difficulty, the novice designers would have needed to find different strategies to monitor the students, and to increase the communication between the teachers and the students. However, the novices' prior experiences did not help them to suggest new strategies for this unfamiliar platform. Thus again, instructional design novices might benefit from exposure to a variety of different design contexts to improve their contextual design skills. In this study, it was apparent that the novices could not use the three main components of the development platform effectively. Their designs for the learning environment were based upon their previous experiences with 2D development platforms and video games.

Although virtual worlds do not offer a real game environment, this idea might be taken into consideration by platform developers, so that they can design more attractive environments. Kirkley and Kirkley (2004) noted that fun can be intertwined with challenges; and virtual worlds

are gaining popularity because they are said to be useful for constructivist inquiry and as discovery environments (Dickey, 2003; 2005a; 2005b). Therefore, challenges for users might be provided in the learning tasks outside the 3D setting of the platform. To provide cognitive challenges, immersive virtual environments should be made more flexible in terms of the design programming. The novice instructional designers in this study were aware of what might be motivating for the users, since their concerns cover both core learning variables and a broad range of pedagogical issues which they found to be challenging. Platform developers should note these issues as problems that they can remedy in the future.

One of the responsibilities of instructional designers is to provide a smooth interactivity between communication tools, Web-based tools, and the immersive platform. In this study, the novice designers tried to do this in simple ways. Since they were designing very short-term learning environments, they ignored the student-student and student-teacher communication aspects of learning. They also tried to put start and end points in the platform, with a set of guiding features for the users. In the end, there were no student-centered environments in any of the projects because of this linear structure of the projects. That result revealed two issues relating to the use of this kind of platform in design education. The first is that these platforms are more suitable for long-term engagement in learning (such as for problem-solving). The second issue is that creating a learning environment, which has a linear structure, is very difficult in this kind of platforms, since the platform does not limit user actions between a start and end point. As a long-term and student-centered learning environment, virtual worlds offer many design education opportunities. In this study, the novice designers dealt with many instructional, motivational, and technical problems. However, limitations of virtual environments should not disrupt confidence and competence of designers in designing these environments (Bower, Cram, & Groom, 2010). They changed their stories and scenarios many times to achieve higher user motivation. They also assessed the various advantages offered by different 3D settings. Yet, they did not enjoy designing virtual worlds as much expected.

The limitations and opportunities provided by a development platform might influence the design process (Schaefer & Warren 2004). In this study, some technical issues were caused by the limited number of designer participants, and some of the challenges faced by the novice designers might have been caused by the limitations of their background knowledge or the quality of their project group work. First of all, most of the participants came to the course thinking that they would learn how to develop attractive games. As they encountered the provided virtual world environment, their motivation was reduced, because they could not accomplish most of their pre-formed ideas. They were not able to use all of the objects that they intended to use, and they could not provide the challenges that they wanted to pose for the users. They also had difficulty finding objects, since there was no clear organization of the objects.

The premise behind this article might be criticized because instructional designers are not supposed to develop the environment technically. However, without technical experience, designers cannot imagine how their design will fit into the development platform. Also, in the general definitions of competencies in The International Board of Standards for Training, Performance and Instruction (IBSTPI) of the essential competencies of instructional designers is the ability to develop instructional materials. Moreover, in Turkey, the Instructional Design program covers programming and technical skills. Another criticism might be related the reason why some novices' had unfeasible designs although there are facilitators guiding them. It should also be noted that the facilitators of the project groups in this study reminded the groups to investigate the design environment very carefully, and they warned the project groups about

the feasibility of their scenarios. However, the participants did not analyze the platform until the development stage. This issue is also important to see that novices ignore the important points during the analysis process.

In this study mainly technical part of instructional design was evaluated. To build upon the results presented here, further research should be conducted with other phases and of instructional design to understand the design challenges and decisions of novices. Since the study was conducted in a course context, the participants also had limited time to solve the problems faced in their study group projects. Different platforms might also be examined to determine whether common problems occur. In conclusion, immersive games like learning environments are important platforms which should be investigated by teachers, learners, and instructional designers. They provide many decision points which might be facilitated by university training programs for future designers.

References

Active Worlds (2016). Available as www.activeworlds.com. Retrieved on 20 January 2016.

Amichai-Hamburger, Y. & McKenna, K. (2006). The contact hypothesis reconsidered: Interacting via the Internet. *Journal of Computer-Mediated Communication*, *11*(3), 825-843.

Barab, S., Dodge, T., Tuzun, H., Job-Sluder, K., Jackson, C., Arici, A., …, Heiselt, C. (2008). The Quest Atlantis project: A socially-responsive play space for learning. In B.E. Shelton, D. Wiley (Eds.), *The educational design and use of simulation computer games* (pp. 159-186). Rotterdam, Netherlands: Sense Publishers.

Barab, S., Thomas, M., Dodge, T., Carteaux, R., & Tuzun, H. (2005). Making learning fun: Quest Atlantis, a game without guns. *Educational Technology Research and Development*, *53*(1), 86-107.

Berns, A., Gonzalez-Pardo, A., & Camacho, D. (2013). Game-like language learning in 3-D virtual environments. *Computers & Education*, *60*(1), 210-220.

Bower, M., Cram, A., & Groom, D. (2010). Blended reality: Issues and potentials in combining virtual worlds and face - to-face classes. In C.H. Steel, M.J. Keppell, P. Gerbic & S. Housego (Eds.), *Curriculum, technology & transformation for an unknown future.* Proceedings ASCILITE Sydney 2010 (pp.129-140). Brisbane: The University of Queensland.

Brom, C., Preuss, M., & Klement, D. (2011).Are educational computer micro-games engaging and effective for knowledge acquisition at high-schools? A quasi-experimental study. *Computers & Education*, *57*(3), 1971–1988.

Cheney, A. W., Sanders, R. L., Matzen, N.J., & Tashner, J.H. (2009). Instructional design and Pedagogical issues with Web 2.0 tools. T. T. Kidd & I. Chen (Eds.). *Wired for learning an educators guide to Web 2.0* (pp. 85-99). Charlotte, NC: Information Age.

Coban, M., Karakus, T., Karaman, A., Gunay, F., & Goktas, Y. (2015). Technical problems experienced in the transformation of virtual worlds into an education environment and coping strategies. *Educational Technology & Society*, *18*(1), 37-49.

Dabbagh, N. & Blijd, C.W. (2010). Students' perceptions of their learning experiences in an authentic instructional design context. *The Interdisciplinary Journal of Problem-based Learning*, *4*(1), 6-29.

Davidson-Shivers, G.V. & Rasmussen, K. L. (2007). Competencies for Instructional Design and Technology Professionals. In R. A. Reiser & J. A. Dempsey (Eds.). *Trends and issues in instructional design and technology* (pp.271-286). Upper Saddle River, NJ: Merrill/ Prentice Hall.

Dickey, M.D. (2003). Teaching in immersive: Pedagogical affordances and constraints of immersive virtual worlds for synchronous distance learning. *Distance Education*, *24*(1), 105-121.

Dickey, M. D. (2005a). Three-dimensional virtual worlds and distance learning: Two case studies of Active Worlds as a medium for distance education. *British Journal of Educational Technology*, *36*(3), 439-451.

Dickey, M. D. (2005b). Engaging by design: How engagement strategies in popular computer and video games can inform instructional design. *Educational Technology Research and Development*, *53*(2), 67-83.

Dickey, M. D. (2006). "Ninja Looting" for instructional design: The design challenges of creating a game-based learning environment. *Paper presented at the ACM SIGGRAPH 2006 Conference*. Boston.

Duncan, I., Miller, A., & Jiang, S. (2012). A taxonomy of virtual worlds usage in education. *British Journal of Educational Technology*, *43*(6), 949-964.

Ertmer, P., Stepich, D., Flanagan, F., Kocaman-Karoglu, A., Reiner, C., Reyes, L., Santone, A. & Ushigusa, S. (2009) Impact of guidance on the problem-solving efforts of instructional design novices. *Performance Improvement Quarterly*, *21*, 117-132.

Gray, C. M., Dagli, C., Demiral-Uzan, M., Ergulec, F., Tan, V., Altuwaijri, A. A., ... & Boling, E. (2015). Judgment and instructional design: how id practitioners work in practice. *Performance Improvement Quarterly*, *28*(3), 25-49.

Gustafson, K. L. & Branch, R. M: (2007). What is instructional design? (Ch. 2). In R. A. Reiser, & J. A. Dempsey (Eds.). *Trends and issues in instructional design and technology* (pp.16-25). Upper Saddle River, NJ: Merrill/Prentice Hall.

Hardre, P. L., Ge, X., & Thomas, M. K. (2006). An investigation of development toward instructional design expertise. *Performance Improvement Quarterly*, *19*(4), 63-90.

Heid, S. & Kretschmer, T. (2009). LLL3D's contribution to teaching and learning with 3-D MUVEs in higher education. *British Journal of Educational Technology*, *40*(3), 568-571.

Hirumi, A., Appelman, B., Rieber, L., &Van Eck, R. (2010a). Preparing instructional designers for game-based learning: Part 1. *TechTrends*, *54*(3), 27-37.

Hirumi, A., Appelman, B., Rieber, L., Van Eck, R. (2010b). Preparing Instructional Designers for Game-Based Learning: Part 2. *TechTrends*, 54(4), 19-27.

Ho, C. M. L., Rappa, N. A., & Chee, Y. S. (2009). Designing and implementing virtual enactive role-play and structured argumentation: Promises and pitfalls. *Computer Assisted Language Learning*, *22*(5), 381-408.

Horn, J. & Masunaga, H. (2006). A merging theory of expertise and intelligence. In K. A. Ericsson, N. Charness, P. J. Feltovich, & R. R. Hoffman (Eds.). *The Cambridge handbook of expertise and expert performance* (pp. 587–611).Cambridge: Cambridge University Press.

Kaplan-Akilli, G., & Cagiltay, K. (2006). An instructional design/development model for the creation of game-like learning environments: The FIDGE Model. In M. Pivec (Ed.), *Affective and emotional aspects of human computer interaction: Game-based and innovative learning approaches* (pp.93-112). Amsterdam, Netherlands: IOS Press.

Kay, J. & FitzGerald, S. (2008). *Educational uses of Second Life*. Retrieved on 7 March 2016 from http://sleducation.wikispaces.com/educationaluses

Kebritchi, M. & Hirumi, A. (2008). Examining the pedagogical foundations of modern educational computer games. *Computers & Education*, *51*, 1729-1743.

Kemp, J. & Livingstone, D. (2006). Putting a Second Life "Metaverse" skin on learning management systems. In D. Livingstone and J. Kemp (eds.), *Proceedings of the second life education workshop at the second life community convention* (pp.13-18). Paisley, UK: The University of Paisley.

Kim, S. H., Lee, J. L., & Thomas, M. K. (2012). Between purpose and method: A review of educational research on 3D virtual worlds. *Journal for Virtual Worlds Research*, *5*(1), 1-18. DOI: http://dx.doi.org/10.4101/jvwr.v5i1.2151.

Kirkley, S.E. & Kirkley J.R. (2004). Creating next generation blended learning environments using mixed reality, video games and simulations. *Tech Trends*, *49*(3), 42-54

Liu, M. & Rutledge, K. (1996). The effect of a "learner as multimedia designer" environment on at-risk high school students' motivation and learning of design knowledge. *Paper presented at the annual meeting of the American Educational Research Association*. New York, NY, April 8-12.

Munoz-Cristobal, J. A., Prieto, L. P., Asensio-Perez, J. I., Martinez-Mones, A., Jorrin-Abellan, I. M., & Dimitriadis, Y. A. (2015). Coming Down to Earth: Helping Teachers Use 3D Virtual Worlds in Across-Spaces Learning Situations. *Educational Technology & Society*, *18*(1), 13-26.

Nelson, B. C. & Erlandson, B. E. (2008). Managing cognitive load in educational multi-user virtual environments: Reflection on design practice. *Educational Technology Research and Development*, *56*(5-6), 619-641.

Okutsu, M., DeLaurentis, D., Brophy, S., & Lambert, J. (2013). Teaching an aerospace engineering design course via virtual worlds: A comparative assessment of learning outcomes. *Computers & Education*, *60*(1), 288-298.

Papert, S., & Harel, I. (1991). *Constructionism*. Norwood, NJ: Ablex.

Perez, R. S. & Emery, C. D. (1995). Designer thinking: How novices and experts think about instructional design. *Performance Improvement Quarterly*, *8*(3), 80-95.

Schaefer, S. & Warren, J., 2004. Teaching computer game design and construction. *Computer Aided Design*, *36*, 1501-1510.

Schank, R.C., Berman, T.R., & Macperson, K. A. (1999). Learning by doing. In C.M. Reigeluth (Ed.), *Instructional design theories and models: A new paradigm of instructional theory (Vol. II)* (pp. 161–181). Mahwah, NJ: Lawrence Erlbaum Associates.

Soukup, C. (2004). Multimedia performance in a computer-mediated community: Communication as a virtual drama. *Journal of Computer-Mediated Communication*, *9*(4), (Online).

Tuzun, H. (2007). Blending video games with learning: Issues and challenges with classroom implementations in the Turkish context. *British Journal of Educational Technology*, *38*(3), 465-477.

Wheeler, M. (2009). Developing the Media Zoo in Second Life. *British Journal of Educational Technology, 40*(3), 427-443.

Correspondence: Turkan Karakus Yilmaz, Department of Computer Education and Instructional Technologies, Kazim Karabekir Faculty of Education, Ataturk University, Erzurum, Turkey