# THE PERCEPTIONS AND EXPERIENCES OF STUDENTS AND TEACHERS IN FORMAL AND INFORMAL LEARNING SETTINGS THAT USES MUVES: QUEST ATLANTIS CASE

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY
AYŞEGÜL BAKAR ÇÖREZ

IN PARTIAL FULLFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY
IN
COMPUTER EDUCATION AND INSTRUCTIONAL TECHNOLOGY

SEPTEMBER 2011

Approval of the thesis:

**THE PERCEPTIONS AND EXPERIENCES OF STUDENTS AND TEACHERS IN FORMAL AND INFORMAL LEARNING SETTINGS THAT USES MUVES: QUEST ATLANTIS CASE**

submitted by **AYŞEGÜL BAKAR ÇÖREZ** in partial fulfillment of the requirements for the degree of **Doctor of Philosophy in Computer Education and Instructional Technology Department, Middle East Technical University** by

Prof. Dr. Canan Özgen ____________________
Dean, Graduate School of **Natural and Applied Sciences**

Prof. Dr. Soner Yıldırım ____________________
Head of Department, **Computer Education and Inst. Tech.**

Assoc. Prof. Dr. Kürşat Çağıltay ____________________
Supervisor, **Computer Education and Inst. Tech., METU**

Assoc. Prof. Dr. Hakan Tüzün ____________________
Co-Supervisor, **Computer Edu. and Inst. Tech., Hacettepe U.**

**Examining Committee Members:**

Assist. Prof. Dr. Hasan Çakır ____________________
Computer Education and Instructional Technology Dept., Gazi U.

Assoc. Prof. Dr. Kürşat Çağıltay ____________________
Computer Education and Instructional Technology Dept., METU

Prof. Dr. Soner Yıldırım ____________________
Computer Education and Instructional Technology Dept., METU

Assoc. Prof. Dr. Erdinç Çakıroğlu ____________________
Elementary Education Dept., METU

Assist. Prof. Dr. Tuğba Bulu ____________________
Computer Education and Instructional Technology Dept., METU

**Date:** September 12, 2011

**I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.**

Name, Surname: Ayşegül BAKAR ÇÖREZ

Signature:

# ABSTRACT

THE PERCEPTIONS AND EXPERIENCES OF STUDENTS AND TEACHERS IN FORMAL AND INFORMAL LEARNING SETTINGS THAT USES MUVES: QUEST ATLANTIS CASE

BAKAR ÇÖREZ, Ayşegül
PhD, Computer Education and Instructional Technology
Supervisor: Assoc. Prof. Dr. Kürşat ÇAĞILTAY
Co-Supervisor: Assoc. Prof. Dr. Hakan TÜZÜN
September 2011, 342 Pages

This dissertation aimed to investigate the use of Multi-User Virtual Environments (MUVEs) as supportive materials in students' learning process. In this respect, a MUVE named Quest Atlantis had been used by students in formal and informal learning settings. The students participated in a project that was developed based on an ecological problem resulted in fish decline in a river. As being a multiple case study research, data were collected from four separate cases, selected from three different places. Specifically, students' and teachers' perceptions were gathered, and challenges and barriers of implementations were investigated.

The research results indicated that most of the students liked learning in environments using MUVEs. Besides being intrinsically motivated towards learning science topics, the students stated that it was a good way of reinforcing what they learn in school settings. Students found MUVEs effective learning environments as it allowed them to learn with active participation; rather than being taught as it usually happens in school context.

The teachers had positive opinions about the use of MUVEs. They claimed that MUVEs have the potential to support students' learning visually and let students learn through an inquiry-based learning approach with situated information to virtual settings. According to the teachers, MUVEs allowed various skill developments of the students and it created a dynamic learning environment in which students interacted and collaborated with each other.

Even though students and teachers have positive perception about the use of MUVEs in learning setting, it is quite challenging to place these applications to learning settings, especially to formal ones. There are numerous challenges and barriers that can be faced with during the implementation process. In this research, the challenges and barriers are grouped under four main categories: 1) teacher related, 2) student related, 3) system related, and 4) technology related.

When the implementation results of formal and informal learning setting were compared, it was possible to see how the very dimensions of formal learning settings made the innovative technology-based implementations difficult. On the other hand, informal learning settings were more flexible learning environments allowing a better learning experience for the students.

Keywords: MUVE, Quest Atlantis, perception, formal learning setting, informal learning setting, multiple case study research.

# ÖZ

ÇOK KULLANICILI SANAL ORTAM KULLANAN FORMAL VE İNFORMAL EĞİTİM ORTAMLARINDA ÖĞRENCİ VE ÖĞRETMENLERİN ALGILARI VE DENEYİMLERİ: QUEST ATLANTİS DURUM ÇALIŞMASI

BAKAR ÇÖREZ, Ayşegül
Doktora, Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü
Tez Yöneticisi: Doç. Dr. Kürşat ÇAĞILTAY
Ortak Tez Yöneticisi: Doç. Dr. Hakan TÜZÜN
Eylül 2011, 342 Sayfa

Bu doktora tez çalışmasının amacı, çok kullanıcılı sanal ortamların öğrencilerin öğrenme sürecinde destek eğitim materyali olarak kullanılmasını incelemektir. Bu bağlamda, Quest Atlantis olarak bilinen bir eğitim materyali kullanılmıştır. Öğrenciler bir parkta yaşanan ve nehirdeki balık ölümleriyle sonuçlanan bir çevre problemi ile ilgili projeye katılmışlardır. Bir çoklu-durum çalışması olan bu araştırmada, veri dört farklı ortamda yapılan uygulamalardan toplanmıştır. Öğrenci ve öğretmen algılarının yanısıra, bu uygulamalar esnasında yaşanan zorluklar da bu araştırmanın inceleme alanları arasındadır.

Araştırma sonuçları birçok öğrencinin bu tür bir ortamda öğrenmekten hoşlandığını ortaya koymuştur. Öğrencilerin bu süreçte içsel motivasyonları yüksektir ve öğrenciler bu tür ortamların okulda öğrendikleri konuları pekiştirmeleri açısından faydalı olacağını düşünmektedirler. Öğrenciler, ayrıca, bu ortamların etkili olduğunu, kendilerine öğrenme esnasında aktif rol alma olanağı tanıdığını ve bunun okul ortamındaki öğretim yaklaşımından oldukça farklı olduğunu belirtmişlerdir.

Öğretmenler de bu ortamların kullanımına yönelik pozitif görüş bildirmişlerdir. Öğrencilerin öğrenmelerine görsel destek sağlamanın yanısıra, öğrencilerin sanal ortam içine yerleştirilmiş bilgileri sorgulamaya dayalı öğrenme yöntemi ile öğrenmelerine olanak sağladığını vurgulamışlardır. Öğretmenlere göre, bu ortamlar öğrencilerin farklı becerilerini geliştirme potansiyeline sahiptir ve öğrencilerin iletişim ve işbirliği içerisinde öğrenmelerine olanak sağlayacak dinamik öğrenme ortamları sunmaktadır.

Her ne kadar, öğrenciler ve öğretmenler pozitif algıya sahip olsalar da, bu tür ortamların kullanılması sırasında, özellikle formal eğitim ortamlarında, zorluklar yaşanabilmektedir. Uygulama esnasında ortaya çıkan bu farklı zorluklar dört grup altında toplanmıştır: 1) öğretmenlere ilişkin, 2) öğrencilere ilişkin, 3) sisteme ilişkin, ve 4) teknolojiye ilişkin.

Formal ve informal eğitim ortamlarında yapılan uygulama sonuçları karşılaştırıldığında, formal eğitim ortamlarının bileşenlerinin bu tür uygulamaları nasıl zor hale getirdiği görülmektedir. Öte taraftan, informal eğitim kurumlarında yapılan uygulamalar, bu ortamların daha esnek uygulama imkanı sağlaması açısından, öğrenciler için etkili deneyim imkanı sunmaktadır.

Anahtar kelimeler: Quest Atlantis, algı, formal eğitim, informal eğitim, çoklu-durum çalışması.

To my husband,

Mehmet Ali ÇÖREZ,

with great thanks for his endless support, patience and encouragement

# ACKNOWLEDGEMENTS

Making PhD was not an easy process, as anybody having the same experience can understand me well. However, luckily, there have been people around encouraging me throughout this process. In this section, therefore, I want to thank to everyone who supported me in my PhD process and completing my dissertation.

First of all, I want to thank to my advisor Assoc. Prof. Dr. Kürşat Çağıltay by introducing me this interesting research topic, games in education, and giving beneficial advices throughout the process. I also would like to thank to my co-advisor, Assoc. Prof. Dr. Hakan Tüzün, for supporting and being helpful with especially technical issues. I express my sincere appreciations to my dissertation follow-up committee members, Prof. Dr. Soner Yıldırım and Assoc. Prof. Dr. Erdinç Çakıroğlu, for providing with very enlightening suggestions about my dissertation. I also sincerely appreciate Assist. Prof. Dr. Tuğba Bulu and Assist. Prof. Dr. Hasan Çakır for attending my dissertation committee and for giving rewarding comments.

Having my PhD degree in Middle East Technical University was such a good side of this process. I really enjoyed for participating in the classes, and hereby, I would like to thank to all the professors of the Education Faculty whom I have learned a lot. I would also like to present my special thanks to Prof. Dr. Yaşar Özden, Assoc. Prof. Dr. Zahide Yıldırım, Assist. Prof. Dr. Cengiz Aşkun, and Dr. Hasan Karaaslan.

I would like to present my appreciation to Dr. Sasha Barab and other Quest Atlantis project team members. Thanks to providing with a learning environment like QA and giving a chance to the people interested in using it.

I had a chance of being in University of Wisconsin-Madison for two semesters and there I met with Assist. Prof. Dr. Michael Thomas. I would like to thank to him for his endless encouragements and guidance about my dissertation, although I was not his student. I also would like to thank to Assist. Prof. Dr. Constance Steinkuehler with whom conducting research was such a good experience.

PhD process was not merely full of academic issues, however. I can never pass over the support by my family members and friends. My greatest thanks would be to my husband, Mehmet Ali Çörez, for his endless support, understanding and patience. I also want to thank to my parents, Serpil Bakar and Ömer Bakar, and my sisters, Duygu Bakar and Gözde Bakar, for making the life easier by giving their support.

I would like to thank Aslıhan Kocaman-Karoğlu, my close friend and my colleague, for understanding and encouraging me throughout the process and making valuable contributions. I also want to thank to my other friends, Gülenay Vardarlı-Korgan and Duygu Kaşıkçı for their support. Finally, I want to thank to Nuray Temur-Gedik, Emine Erbayar-Şendurur, Polat Şendurur, Levent Durdu, Halil Ersoy, Türkan Karakuş, and all other friends from METU for their valuable comments.

# TABLE OF CONTENTS

APPENDICES

# LIST OF TABLES

# LIST OF FIGURES

# LIST OF ABBREVIATIONS

**#:** Number

**%:** Percent

**AW:** ActiveWorlds

**BoE:** Board of Education (Talim Terbiye Kurulu Başkanlığı)

***f*:** Frequency

**M:** Mean

**MUVE:** Multi-User Virtual Environment

**MoNE:** Ministry of National Education

**MS FrontPage:** Microsoft FrontPage

**n:** Group size

**NGO:** Non-Governmental Organization

**NPC:** Non-Playable Character

**PhD:** Philosophy of Doctorate

**QA:** Quest Atlantis

**SD:** Standard Deviation

**SES:** Social Economic Status

**SL:** Second Life

**SPSS:** Statistical Package for the Social Sciences

**WWW:** World Wide Web

# CHAPTER 1

# INTRODUCTION

This section is an introduction to the problem on which the study is focused. Background of the problem, research questions, purpose of the study, and significance of the study are all introduced in this chapter. Additionally, the definitions of the terms and concepts used throughout the study are explained in this section.

## 1.1. Background of the Problem

The era we are now experiencing is known as the information age. Coming after the industrial age, the characteristics of this era have directed people, societies and the world towards a change. This "systemic change" started with the shift from industrial age to information age in 1950s and it means a paradigmatic transformation occurring in the entire world (Reigeluth, 1994, p. 3). The rapid growth and quick dispersion of knowledge and information, and the extensive development and use of technological innovations have influenced almost every parts of human life.

This shift from industrial age to information age has caused changes in many parts of human life. With the rapid development and growing use of computer and Internet technologies, the importance that information carries, the speed of knowledge sharing, the way people communicate etc. have changed dramatically. Internet technologies made it possible to share knowledge and information cross-border very easily among people all over the world, which causes the increase in the amount of and the quality of information.

This change has also affected many other dimensions of human life. In order to keep up with the speed of this alteration, renewal in most areas (economic, social, cultural etc.) was required along with this shift (Reigeluth, 1994). The terms “knowledge sharing”, “communities of practice” and “globalization” have emerged and has been gaining importance continually. Collaboration, team work, cooperation, communication have become ideal in the business sector, all of which depend on knowledge and information sharing.

In any way, all systems had to undergone this change process. Inevitably, education has also been affected from this alteration since it is one of the most important dimensions of human life and of societies. The change in education was necessary since the education system of any country is to bring up the new generation of the society. In order to be able to keep its existence among all other developing nations, countries need to be able to have citizens who have the capabilities of what the era necessitates. Moreover, education is very crucial factor for any country in terms of affecting the economic, social and cultural improvement and change. In common sense, education is not limited with schools; rather, lifelong learning has been gaining importance.

This transformation has not only affected societal systems but also individuals. Due to the shift, the expectations from individuals have also changed. Currently, the qualifications for people in workplaces include, but not limited to, being able to work in collaboration with others, to be active in their work, to apply effective communication skills and to express his/her opinions while learning from others. This emphasizes the importance of education one more time since the individuals are brought in with these qualifications through educational practices.

Therefore, even in developed countries, alteration in education systems occurred parallel with the other changes in society such as economical needs and technological developments. In a similar way, a need for a change aroused for Turkish education system. Respectively a reform has been carried out: The primary school curriculum had been adjusted according to the new requirements of society. The details are explained in the following section.

### 1.2. The Recent Curriculum Reform in Turkey

As explained earlier in this chapter, there are several reasons behind this curriculum reform. One of the reasons is the fact that being in the information age necessitates the adaptation of educational systems to what the era requires (Board of Education (BoE), 2005). In other words, new generation needs to be educated according to requirements and expectations of information age. The other reason is the regulations as a candidate country trying to become a member of European Union (EU) (BoE, 2005; Koc, Isiksal & Bulut, 2007). Former Turkish curriculum stayed behind the requirements of the country and as BoE claims the quality of our education system and its universal acceptability is open to judgments. Therefore, in the way of entering the EU, Turkish education system needs to be improved and catch up with the quality of education as in most of the EU countries.

Considering these reasons, the Ministry of National Education (MoNE) introduced a new primary school curriculum in 2004, which was piloted in 2004-05 educational year. Having been designed based on the constructivist approach, the new curriculum has brought a shift from teacher-centered education to student-centered education. Moreover, it emphasized the importance of equipping students with skills which are critical thinking, problem solving, creative thinking, communication, inquiry, ability to use computer and the Internet technologies, and effective language use (BoE, 2005).

Since the constructivist approach emphasizes that students create their own knowledge structures based on the experiences they have, providing them with a variety of rich learning environments is very important. New curriculum supports this fact and suggests teachers using a variety of supportive materials in their courses (BoE, 2005). Additionally, it is stated in the new curriculum that schools need to be equipped with computer and Internet technologies so that the use of those technologies by students and teachers should be encouraged. In other words, with this new constructivist curriculum, learning is not limited to the borders of the schools, classrooms and textbooks; rather, students should be provided with a variety of learning opportunities. It is necessary to support students and to make it possible for them to continue learning even outside of school. Considering the recent educational system in Turkey, it is possible to say that textbooks are still the major classroom materials. On the other hand, there is a need to support students with other types of materials in order to provide with rich learning opportunities and different ways to construct knowledge.

In Turkey, considering the general structure of schools the students are not provided with a variety of learning materials that enables practicing the theoretical knowledge, allows learning by doing and ensures active student participation. In other words, there is a lack of materials available to support students while they are learning. However, these learning opportunities are, in fact, so important in a constructivist learning environment considering the importance of diverse experiences in knowledge construction. Therefore, Multi-User Virtual Environments (MUVEs) can be regarded as one of those learning environments as being computer-based technologies and having the potential to ensure active participation and to support students with educational practices out of school settings. This study is based on this problem and aims to investigate the potential of MUVEs as supportive materials to be used in Turkish educational system, as additional learning materials to textbooks.

### 1.3. Multi-User Virtual Environments

Multi-User Virtual Environments (MUVEs) are 3D online virtual environments where users interact with each other and with computer-based objects (Nelson et al., 2005). MUVEs "enable multiple simultaneous participants to access virtual contexts, to interact with digital artifacts, to represent themselves through "avatars" to communicate with other participants and with computer-based agents, and to enact collaborative learning activities of various types" (Ketelhut et al., 2005, p. 2). Among the characteristics of MUVEs listed by Chen, Yang and Loftin (2003) are that they center the curriculum on real-life problems, allow communities of practices emerge, let students involve in inquiry learning activities, and ensure knowledge construction where the students are active and collaborate with each other.

As a popular media among youth, MUVEs offer the opportunity to meet and interact with others cross-nation. For example, Second Life (SL) can be counted as one of the most favorite MUVEs since it has millions of users all over the world. After stepping in this giant virtual environment, people visit virtual worlds, do shopping, and even have business-related meetings. In other words, they experience a virtual life with their avatars in a world that looks like reality. Users have motivation to spend time and money on this environment. Regarding this impact on the society, inevitably, these types of environments have taken attention of educators and, since then, field specialists have been conducting research on this issue to see the potentials of these online portals. Although not designed for educational purposes, SL has also been used to support face-to-face classes or even to distribute online learning. It has not only been used on university level, but also on earlier stages. Nevertheless, these types of MUVEs (specifically SL) have been criticized by enabling students move out of the educational context easily, to communicate other people misbehaving and to interact with malicious content, because it is free and there are also other people around using the same places for different purposes (Pence, 2007; Harris & Rea, 2009; Antonacci & Modaress, 2008). In other words, it is a fact, for many people, that schools should be a formal place including formal educational activities. If you do not have enough budget to buy a private land in these 3D worlds to be used in educational activities, then you cannot prevent other people disturbing your educational activities. Considering that most of the government schools do not have so, SL did not meet the expectations of a group of educators.

Therefore, other examples of MUVEs emerged designed only for educational purposes (such as River City on the leadership of Chris Dede - Harvard University; Quest Atlantis on the leadership of Sasha Barab – Indiana University); much more safer places than SL by allowing only teachers and groups of students to join the virtual worlds to practice educational activities. Both have been used in schools and after school settings abroad. However, there is no specific MUVE designed in Turkish for educational purposes and it is not common to see MUVES used in Turkish classrooms. MUVEs as learning materials stands promising considering current technological improvements, the new curriculum reform and the need to extend the learning opportunities for students.

### 1.4. Purpose of the Study

The use of computer and Internet technologies has been increasing and widening. As different from the previous years, most of the students meet with these technologies in a variety of places at their early ages, and most importantly, the majority of them have the opportunity to use these technologies before/during their school lives and have experiences with them. Recently, most of the students have e-mail accounts, use social networking sites (like Facebook), and play games online on their computer or in Internet cafés. Moreover, the studies show that students not only have fun while using these technologies but they also learn (Barab et al., 2007b).

With the execution of new curriculum, teachers are supposed to employ a variety of learning activities in their classes, and one of those applications might be using MUVEs both in and out of classroom settings. Considering the reform conducted in Turkish curriculum, this study examines the use of a technology-based educational tool; specifically a Multi-User Virtual Environment named Quest Atlantis. The purpose of this study is to investigate what happens during the implementation of a MUVE in classroom setting as a supportive material. Moreover, the purpose is to examine the implementation challenges and to determine if there are any barriers for this kind of implementation. Moreover, this study looks at the perceptions of students and teachers and it aims to see the interaction patterns among students and teachers using such a technology-based tool.

### 1.5. Research Questions

What are the perceptions and experiences of students and teachers in formal and informal learning environments that use MUVEs?

#### 1.5.1. Sub Questions

1. What are the perceptions of students using MUVE?
    a. How do they perceive their experiences that they have while using MUVE?
    b. How do they compare learning experiences in MUVE with learning in traditional classrooms?
    c. What are the characteristics of MUVE that need to be changed/improved?
2. What are the perceptions of teachers/facilitators about using MUVE as a supportive educational material?
    a. How do they perceive the use of MUVE as a technology based educational material?
    b. How do they evaluate students’ learning in MUVE?
    c. How do they perceive their role during the implementation of MUVE?
    d. What are their’ suggestions about using MUVE in classrooms?

3. What are the challenges and barriers of using MUVE as a supportive educational material in formal and informal educational settings?

**1.6. Significance of the Study**

This study aims to investigate the use of MUVEs in educational settings. First of all, the use of games and MUVEs in educational settings is a hot topic and relatively new one in the field. There are studies being conducted all over the world, however, more research is needed to experiment the use of this kind of technology tools in education. There are still not enough number of studies exists investigating the use of computer games and MUVEs as engaging learning activities (Warren, Dondlinger & Barab, 2008). Moreover, in Turkey very few studies have been conducted in this area, and most of them were short-term studies. This study is the first dissertation conducted in Turkey and it took comparatively long time of investigation. It also shows the results of a technology-implementation study in real classroom and out of school settings.

New Turkish curriculum encourages the use of technological tools, specifically of computer and Internet technologies, to strength the learning process of students. This study is significant as being an example of using such a tool and showing what happens when these tools enter into the learning environments. Moreover, this study provides information about the implementation challenges and barriers of a technology-based environment in educational setting in Turkey. Teachers and other educators may benefit from the results of this study while using and designing similar learning environments for students.

The study looks at the perceptions of students and teachers about the use of a MUVE for educational purposes. Teachers had a chance to see what happens in implementation of such kind of application in their classes, which may help them design similar activities in their professional life later on. Also, teachers and students themselves gained an idea of learning and entertainment could be together and students could learn through a MUVE while having fun.

To draw a detailed picture of this technology-implementation study, five case studies were conducted both in schools and an after school setting. Using a variety of data collection tools, this study is significant in terms of investigating what happens during the implementation process of a MUVE in educational settings (such as the interaction among students, their behaviors during the learning process).

The literature and current studies show that the use of Quest Atlantis based MUVE results in successful learning of students. Although the implementations were conducted with new virtual settings designed by the researcher in Turkish and according to the requirements and instructional goals of Turkish curriculum, this study shows the applicability and/or usability issues of this environment in our country. Since all countries have their own characteristics and attitudes, it cannot be assumed that very same results will occur with the use of these environments in all over the world. This study sheds light on this issue as well.

### 1.7. Definition of Terms

The terms with which the readers may not be familiar are explained in this part. Especially, the definitions of QA related terms are explained in detailed.

**ActiveWorlds (AW):** The platform through which people can develop 3D virtual worlds. Quest Atlantis environment was built on ActiveWorlds (AW). The development of virtual worlds is easy since AW does not require advanced coding. However, it is at the same time difficult to find out the items and place them in the virtual area. The interface of QA software looks like AW. Users (either citizens or tourists) can log in (with different authorization rights) to the environment and walk around the worlds that they have right to access.

**Bulletin Board:** A forum like platform where the users can post electronic messages and read/reply what others write on particular topics.

**Buoy:** The individual who helps people on the implementation process and support them with giving technical support. These people are responsible for the implementers of QA in their local district and acts as a bridge between the developers of QA and the implementers (Tüzün, 2006).

**Computer and Internet Technologies:** Any type of technology based application working on computer and Internet media, such as games, e-mail software, social networks etc.

**Formal Learning Environments (FLEs):** FLEs are learning environments where there is a structured curriculum to be applied and specific academic objectives to be accomplished. FLEs are schools managed either by government or private organizations. In these settings, the learning is obligatory and the students must take some level of education.

**Game-like environments:** The term “game-like environments” is used as referring to computer games and MUVEs in the scope of this study.

**Informal Learning Environments (ILEs):** These learning environments are those in which activities are centered according to students’ needs and expectations, most of the time. ILEs include places such as boys and girls clubs, non-governmental organizations and community clubs. The aim of ILEs are not only to help students involve in reinforcing activities but also make them participate in social and fun activities. The difference of ILEs from FLEs is the fact that there is no strictly planned schedule in the former.

**Q-Pack:** It is the bag that each QA user has. It helps users collect virtual items like maps, stones, books etc. that may be used in quests.

**Q-Pod:** The home page of each QA user is called as q-pod. It is shown in 2D part of the QA interface. Through this tool, the users can follow the available quests, contact with friends, send e-mail etc.

**Quest:** The engaging educational activity which is prepared on a variety of subject areas and is designed based on academic standards. Each quest is also related to QA Social Commitments. To make students engage in educational activities, quests are embedded in the virtual worlds in QA so that the students come across with different ones while wandering around 3D area.

**Quest Atlantis (QA):** It is sometimes referred to as a computer game and sometimes as a Multi-User Virtual Environment. Developed on ActiveWorlds platform, Quest Atlantis serves for teachers and students as a technology-based instructional tool by including activities supporting a variety of subject areas.

**Quester:** The user who uses QA. The questers are not only the students involved in educational activities but also the teachers, the researchers etc. However, in this study, quester is the term used in the name of students.

**Social Commitments:** The quests are designed based on seven Social Commitments. Social commitments are the issues constructed by QA team and they serve as a baseline to make QA users better citizens in their social environment.

**Taiga:** The name of one of the virtual worlds in QA and it is constructed on the narrative of Taiga Park. There is a river flowing through the park and the number of fish population has been decreasing due to an environmental problem. Students enrolling in this activity try to find out the reason of this problem.

**Teacher Toolkit:** A tool provided for teachers to help them manage QA classroom activities. Teacher toolkit can be reached through a link on q-pod. Only the teachers (the people who have been given teacher rights) can access this tool.

**Multi-User Virtual Environment (MUVE):** Resembling the real life, MUVEs provide users with online environments, where they can manipulate their avatars using either mouse or keyboard and they can interact with the virtual objects. In QA users can experience the virtual environments by either from first person- or third-person view and can communicate with other users online.

**Non-Governmental Organization (NGO):** It means “voluntary group of individuals or organizations, usually not affiliated with any government that is formed to provide services or to advocate a public policy” (Encyclopædia Britannica, online dictionary).

**Virtual World:** Computer-generated 3D virtual space which is usually a simulated version of the real-world.

**Virtual Village:** Virtual village is a part of the virtual world of QA. Although those are the virtual environments as virtual worlds, they are named as village due to being smaller than worlds. In other words, virtual worlds in QA are composed of virtual villages.

### 1.8. Overview of the Dissertation

Chapter-1 is an introduction to the scope of this study by explaining the background problem, research questions and purpose of the study. Definitions of the terms used throughout the dissertation are also provided in this section. Chapter-2 discusses the literature by investigating the use of MUVEs and games in educational settings. Especially the use of Quest Atlantis is examined in detail. Chapter-3 gives comprehensive information about the methodology of the research, and the methods of data collection and analysis. Additionally, information about each case included in this study is provided in this chapter of the dissertation. Chapter-4 presents the results of the data analysis organized considering the research questions. Comparison of the results across cases is also explained in this chapter. As the final chapter, Chapter-5 presents the findings of this research by making comments and comparing it with other studies from the literature. It also discusses the implications of this study, and makes suggestions for future research studies.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1. Introduction

This chapter discusses the theories and other research from the literature relevant to the scope of this study. It starts with the description and details of constructivism on which the study has been grounded. After that, the use of educational technology as constructivist tools has been explained. As technology-based tools to be used in educational contexts, MUVEs and games, specifically QA, have also been discussed in this chapter.

## 2.2. Constructivism

Throughout the history, learning theorists have come up with different explanations about how people learn. In the early 1900s, behaviorism was proposed by John B. Watson. This theory "equates learning with changes in either the form or frequency of observable performance" (Ertmer & Newby, 1993, p. 55) and it emphasized the importance of stimuli and responses while explaining how learning occurs (Kang, 2004). After that, in the 1950s, cognitivism came into existence with an emphasis on mental structures and memory which was not taken into consideration by behaviorists as they explained how learning occurs. Then, what followed was constructivism became popular in educational research studies in 1990s. What constructivists put into the explanation of learning process was the individual (i.e. the learner) and his/her experiences, as being different from behaviorism and cognitivism. According to Airasian and Walsh (1997) the entrance of constructivist perspective, as an innovation, into educational settings was because of the belief that "what we have been doing in schools has failed to meet the intellectual and occupational needs of the majority of our students; schools seem not to be promoting a sufficiently broad range of student outcomes" (p. 446).

Constructivism has its roots in the early works of L.S Vygotsky, Jean Piaget, John Dewey, Immanuel Kant and Thomas Kuhn. Constructivism is different from the others in that both behaviorism and cognitivism are grounded in an objectivistic paradigm, which means "the world is real, external to the learner" (Ertmer & Newby, 1993, p. 62). According to these theories knowledge is constant and it is independent from the learner. In other words, knowledge stands out of the learner and needs to be transferred into learner's heads through any method that in fact does not consider the learner's characteristics and the social milieu around him/her. On the other hand, constructivism assumes that there is more than one reality and it may be perceived by the individuals in different ways regarding their previous experiences and beliefs of the learners. Constructivism elucidates how learning occurs with the active participation of learners who have their own experiences and who are a part of the social environment surrounding them.

Although Driscoll (2005) asserts that "there is no single constructivist theory of instruction" (p. 386); it would not be wrong to define constructivism as an epistemology which is grounded on the fact that learning is the creation of meaning from the experiences somebody have had. In constructivist perspective, learners are not regarded as black boxes, as they are seen in that way for behaviorists; rather, they are supposed to actively engage in the learning process because they construct their own meanings through experiencing the real world (e.g. the learning material). Putting the learners into the center of the learning activities, constructivism stands promising "to make a significant contribution to educational theory and practice" (Airasian & Walsh, 1997, p. 444).

Cobb (1994) mentions about two different perspectives explaining the constructivism: According to one perspective people construct meaning based on their own individual experiences – individual constructivism. On the other hand, the other perspective assumes that individuals learn in a social milieu and therefore the social context and interaction with others is important in the learning process – social constructivism.

### 2.2.1. Constructivist Learning in Practice

The integration of constructivist epistemology to instructional practices influences teachers' and students' role in the classroom environment, the way students learn and the way they are evaluated. Therefore, it is important to understand how constructivist epistemology shapes the learning process and how it influences the general characteristics of these learning environments, which are discussed in the following part of the dissertation.

Constructivism is "an epistemology, a philosophical explanation about the nature of knowledge" (Airasian & Walsh, 1997, p.444). To put it another way, it is "neither a method nor a teaching model" (Larochelle & Bednarz, 1998, p.5). Using a constructivist approach does not mean using it as an instructional method in the learning process; rather, it gives a shape to educational methods so that learning occurs in a parallel way constructivist epistemology advocates. The teaching methods, on the other hand, own the general theory of constructivist epistemology: that is "how learners come to know" (Airasian & Walsh, 1997, p. 445). In this respect, the instructional methods show changes depending on the paradigm that they are based on. For example, direct instruction as a behaviorist teaching method gives its place to inquiry-based learning that puts the learner into the center of learning process in constructivist learning environments.

In the traditional way of epistemology of learning, Osborne (1996) claims "knowledge is a success term" (p. 56). In other words, the truth was embedded in the reality which was exterior of the learners and the truth had to be the same for each individual. According to Osborne (1996), if the learner knows the expected truth, for example when they are supposed to answer a question in an exam, then he or she was regarded as successful and was counted as knower and competent. On the other hand, constructivism has changed these existing beliefs about the learning process (i.e. traditional epistemologies). How constructivist epistemology explained learning is contradictory from traditional epistemology. The words *truth* or *reality* that shows up in traditional learning epistemologies leaves their places to *viability* in constructivism (von Glasersfeld, 1993).

From behaviorism to constructivism, the issue of "how students learn" has been dealt with differently. According to behaviorist approach, learning is the transfer of knowledge from the teacher to the heads of the students. The learning process was schematized by Skinner using "The black box metaphor of behaviorism" (Driscoll, 2005, p. 34). According to this metaphor, what is happening in learners' mind is not known and not cared; therefore, it is regarded as a black box. On the other hand, in constructivism, each student may experience the world in a different way and in this process teachers take the role of a facilitator so that "their knowledge must be viable" (Bodner, 1986, p. 875).

Duffy and Cunningham (1996) mention about the main characteristics of constructivist epistemology under two items: "1. learning is an active process of constructing rather than acquiring knowledge, and 2. instruction is a process of supporting that construction rather than communicating knowledge" (p. 171). By emphasizing *active learning* and *knowledge construction*, it clearly underlies the contradiction of constructivism from either behaviorism or cognitivism, too.

While setting up a learning environment reflecting constructivist epistemology, there emerges a need to consider some critical dimensions of the learning process. Driscoll (2005) summarizes the essential conditions through which the instructional goals of a constructivist learning environment are reached. These conditions are grouped under five titles: "1. Embed learning in a complex, realistic and relevant environment, 2. Provide for social negotiation as an integral part of learning, 3. Support multiple perspectives and the use of multiple modes of representation, 4. Encourage ownership in learning, 5. Nurture self-awareness of the knowledge construction process" (Driscoll, 2005, pp. 393-394). As she pointed out, for a learning environment to be promoting constructivist way of learning, it is important to create the learning environment as relevant with the learning objectives, allow learners to be in interaction with all the other learners, the teacher and learning materials, and to let them own the learning process as they actively taking part in it and constructing their own knowledge.

Von Glasersfeld (1993) clearly summarizes how learning in a constructivist learning environment should be and what is needed for learners to learn in a viable way, as quoted below. He underlies the importance of learner activity, teacher role and the plan of the learning process. What else is important in a constructivist learning process is the need to promote students with "meaningful, authentic activities that help the learner to construct understandings and develop skills relevant to solving problems" (Wilson, 1996, p. 3).

> Knowledge is always the result of a constructive activity and, therefore, it cannot be transferred to a passive receiver. It has to be actively built up by each individual knower. A teacher, however, can orient a learner in a general direction, and constraints can be arranged that prevent the learner from constructing in directions that seem unsuitable to the teacher (Von Glasersfeld, 1993, p. 26).

Although the learning process is centered around the learners, this does not mean that the role of the teachers diminish. In fact, their role in a constructivist learning environment is "more central than in most instructional design frameworks" (Duffy & Cunningham, 1996, p. 173).

### 2.2.2. The Use of Technology in Constructivist Learning Environments

Wilson (1996) defines a constructivist learning environment as "a place where learners may work together and support each other as they use a variety of tools and information resources in their guided pursuit of learning goals and problem-solving activities" (p. 5). As he clearly stated, in order to support students in their learning process, they need to be provided with a variety of activities, tools or any other type of learning resources so that they might have more than one opportunity to use while constructing their knowledge. Considering that each learner differs in their characteristics and learning habits, this issue would make sense in a constructivist learning environment. Starting with the definition of constructivist learning environments, the use of technology as a supportive resource is covered in this part of the dissertation.

The argument of technology use in educational practices dates back to Clark and Kozma debates in 1990s. Whether technology influences students' learning or not is a hot issue that has been discussed for many years in many educational research studies. Technology use is not taken into consideration only in constructivist way of learning, but also in the others (e.g. programmed instruction, invented by B.F.

Skinner, as a behaviorist teaching method). However, the difference regarding technology use in any type of learning environments lies behind the epistemology. That is, for instance, in the behaviorist learning environments, technology was used as the transmitter of information. The students took the learning content not from the teacher but from the technological device; that was the only difference technology had made: carrying learning content into the technological tool. In other words, technology assimilated teachers; they are programmed in such a way that utilized the same teaching methods with teachers with the purpose of transmitting the content. However, in the case of a constructivist way of learning, the use of technology should ensure learning is more than communicating knowledge. As Jonassen, Peck and Wilson (1999) asserted, technology should not be used to make students "learn from technology"; rather, it should be used to let students "learn from thinking" because "thinking mediates learning" (p.2). At this point, it is important to support students in their knowledge creation process by making them think about what they learn and providing guidance accordingly. The emphasis should be on learning with technology not learning from technology.

The use of technology in constructivist learning environments includes, but not limited to, computer and Internet technologies, video, microworlds, hypermedia, problem-based learning environments, virtual environments etc. For sure, it is not only to say that each of these learning environments ensures constructivist way of learning; rather, some applications of them might support learners, if the technological tool is appropriately designed by depending on the scope of constructivist epistemology. As Jonassen, Peck and Wilson (1999) claimed, students do not always "learn from technology" in all the conditions; rather "technology can foster and support learning…if they are used as tools and intellectual partners that help learners to think" (p. 2). The ways the technology can be used in order to support constructivist learning include the use of technology as 1. "information vehicles for exploring knowledge to support learning-by-constructing", 2. "context to support learning by doing", 3. "social medium to support learning conversing", and 4. "intellectual partner to support learning-by-reflecting" (Jonassen, Peck & Wilson, 1999, p. 13).

In parallel with the purpose of this dissertation, the emphasize is put mainly on constructivist learning environments using computer and Internet technologies, specifically computer software that are designed and developed to support students in the learning process. In this respect, literature about computer games, virtual learning environments, and multi-user virtual environments are given in more detail below.

Due to the fact that QA, as an educational game, includes a 3D Multi-User Virtual Environments (MUVE) and uses the features of multiplayer online games, literature about not only games but also about MUVEs have been summarized in this part of the dissertation. Moreover, considering that QA was referred to not only as a game but also as a MUVE, including both body of literature references would shed light on QA related-research.

### 2.3. Games

There are several different definitions made about computer games (the term video game is also used with the same meaning) by different scholars. Emphasizing players' being active and differentiating playing games as something more than just sitting and watching televisions, Turkle (1984) defines video games as "something you do, something you do to your head, a world that you enter, and, to a certain extent, they are something you "become"" (pp. 66-67). As she states, video games are much more interactive media when compared to televisions. Gredler (2004), on the other hand, points out a similar characteristic of computer games by defining them as "experiential exercises that transport learners to another world" (p. 571). According to Newman (2004), video games are most complicated and prevalent type of technology that allows extensive interaction between the computer and the player. Dempsey et al. (1996) makes a detailed definition of games. Their definition indicates the importance of several important aspects like number of players, goals, rules, and competition.

> A game is a set of activities involving one or more players. It has goals, constraints, payoffs, and consequences. A game is rule-guided and artificial in some respects. Finally, a game involves some aspects of competition, even if that competition is with oneself (p. 2).

Similarly, Barab, Ingram-Goble and Warren (2009) make a detailed definition regarding game play, as quoted below. They mostly refer to the interactions, experienced by the player during the game play, such as interaction with game, narrative, other players, virtual worlds and items.

> Game play has the potential to immerse the player in a rich network of interactions and unfolding story lines through which she solves problems and reflects on the workings of the design of the game world, and the design of both real and imagined social relationships and identities in the game- and non-game worlds (p. 990).

It is widely known that the new generation is very much into new computer and Internet technologies. They have facebook and twitter accounts, and through these media they share status upgrades, videos, and pictures with their friends online. They play computer games either sophisticated or simple, either online or not, either with other players or individually, either on their personal computers or a game console. They just play computer games whenever they have a chance to do so. Moreover, through forum pages, they participate in online communities of games where they share experiences with other players. To put it another way, children have an already existing interest towards computer games. Turkle (1984) also points out that video games, for children, are “not a new technology but a fact of life” (p. 66). Therefore, this interest might be used by educators for educational purposes as this study and many others investigated.

For sure, children play computer games for several different reasons. Those reasons make them play the same computer game for a long period of time and prefer re-playing it after some time passes (Kirriemuir, 2002). It would not be wrong to say that, simply, playing computer games are fun, so children like and play them so. Research on this issue name and group the reasons of game play. Malone (1980) and Malone and Lepper (1987) group these as four characteristics of the games: fantasy, challenge, curiosity, and control (Cited in Kaplan-Akilli, 2007). On the other hand, Rouse (2001) offers more motivators for game play including challenge, socialization, be willing to action, affective satisfaction, and fantasy (pp. 2-8). In a similar vein, Sherry et al. (2006) report six types of motivators for game play: arousal, challenge, competition, diversion, fantasy, and finally social interaction (pp.

217-218). Tüzün (2004) investigates the motivating elements of educational computer games and comes up with thirteen categories. The categories include "1) Identity presentation, 2) social relations, 3) playing, 4) learning, 5) achievement, 6) rewards, 7) immersive context, 8) fantasy, 9) uniqueness, 10) creativity, 11) curiosity, 12) control and ownership, and 13) context of support" (p. 174).

There have been scholars supporting the importance of play in students' developmental stages (such as Piaget, 1951); nevertheless, the video games and related play experiences had been taken into consideration in a different way. Video games have been criticized by some groups of people so far as making students/children isolated from the social world outside, including only fun elements, and including themes that are violent and harmful for their development and breaking students' concentration that they would give to study their classes (Shaffer et al., 2005; Kirriemuir and McFarlane, 2004). On the other hand, computer games and their potential influences on the students took interests of some of the educators and scholars (Squire, 2003), especially in the last decade. The research studies investigating the educational power of video games and their potential use in educational settings started to be executed in the field. Researchers have investigated the potential effects of games on society (Newman, 2004). Contrary to the negative opinions about games, these research studies, however, showed that "games promise to stimulate the imagination, spark curiosity, encourage discussion and debate, and enable experimentation and investigation" (Squire & Jenkins, 2003, p. 10), which are all expected and valuable issues in education. In other words, what games provide, actually, is nothing different from the purposes of educators. Therefore, it would be good, as many existing research studies show, giving a chance to games to be used in formal and informal learning settings and for educational purposes. Even more, computer games give a valuable way of learning opportunity for children as much as other media (such as books, videos, and movies) do. However, what makes computer games different from other media (such as television, movies, videos etc.) is the type of interaction computer games allow to be established between the player(s) and the game itself. Thanks to this type of interactive media, students can act while learning instead of, for example, sitting back and merely watching the movie.

As mentioned before, the video games were not taken seriously by people, and still worst, were criticized by taking children away from social life and making them valuing violence (Rieber, 1996). In fact similar critics were made for television and films as well when the society met with those technologies (Squire, 2002). Turkle (1984) respond to the critics of games' being regarded as "mindless addiction" (p. 67); it is quite the opposite, in fact, gaming activity is full of actions that require multifaceted skills. First of all, there are studies that indicate that video games are regarded by many people as technological tools improving learning (Dempsey et al., 1996). Moreover, computer games have great potential of making children social and communicate with other people, even worldwide (e.g. massively multiplayer online games) thanks to technological ways of communication that they allow (such as chat, e-mail, forum pages etc.). For example, in the example of World of Warcraft, when there is a quest to be conducted in a raid or when attacking a city of enemies, a group of players, either scheduled or just formed at that time, come together since it is almost not possible to survive if you try to play by yourself. Those type of quests require extensive social interaction among the team players in fact, because each player takes a role (tank, priest, hunter etc. – preferably at least one player from each class since each class takes a different responsibility regarding their skills) and in order to take out the boss, the strongest enemy in the instance, the team needs to plan their play, move step by step and they should be very coordinated during the play. Therefore, as much as collaborative problem solving and critical thinking, social interaction gets a very important role in the game, although the game has violent items like killing.

There may be computer games including violent games; however, there are many others that do not. So, why not do people benefit from others if they just do not like violent ones? In fact, there are no research available showing the long-term effects of computer games on violent and aggressive behavior (Bensley & VanEenwyk, 2000). Due to the reasons that the game opponents have about the use of games in education, maybe all for nothing, as Kaplan-Akilli (2007) pointed out, the potential of games to be used in education have not been taken into consideration and their utilization in formal educational settings has been kind of delayed. Nevertheless, some survey research studies conducted did not result in that way: those studies could not find any relationship among game-play and being anti-social or showing aggressive behaviors (Squire, 2003). In fact, instead of making students asocial individuals, Massively Multiplayer Online Games (MMOGs) (a popular game genre explained more below) support the interaction among players because "playing games means developing a set of effective social practices" (Shaffer et al., 2005, p. 106). However, the research studies and investigations by field specialists showed the potential of video games in terms of supporting learning. According to the authors, although the things that the game players learn from the games might not always be advantageous, the people who criticize the video games as being violent or antisocial also accept that game players "learn something from playing video games" (Shaffer et al., 2005, p. 105). For example, Shaffer et al. (2005) claim that the players of the game have to learn many issues in the game in order to achieve the game goals, as they investigated the video game Full Spectrum Warrior and it is not violent at all, which is a "video game based on a U.S. Army training simulation" (p. 107). They also added that the game players have to plan everything to win the game which requires the player critical thinking and a good strategy and planning. As another example, Turkle (1984) gives the example of Pac-Man, a much more simple game when compared to Full Spectrum Warrior and it does not have violent themes at all. However, Pac-Man, like many other games, requires decision making, critical thinking, developing strategies, and motor coordination (Turkle, 1984).

There are many computer and video games available. The question is that would students be able to learn from any type of games. Although the answer may be *yes*, learning from good games may provide more unique learning occurrences for the students, for no doubt. Squire and Jenkins (2003) mention about this issue and comment on good games: "Good games are about choices and consequences, and good educational games force players to form theories and test their thinking against simulated outcomes" (p. 28). They seem to be more promising to be used in educational settings.

Educators' critics regarding video games might be because of their attitudes toward learning and beliefs of how effective learning occurs. According to Shaffer et al. (2005) this may be because computer games do not consist of or are not based on transferring direct information so that the students get direct information and memorize; rather, learning through games are something more than that as games “integrate knowing and doing” (p. 107). Computer games support this not only by letting players “wandering around in a rich computer environment to learn without any guidance” (Shaffer et al., 2005, p. 108). Rather, it is of vital importance to plan the activities and give guidance to the learners within this virtual experience. Therefore, the role of the teachers is still important in the educational process when computer games are employed.

Computer games are complex systems combining many dimensions, like societal, scientific, and financial (Jenkins, 2002). Computer games give an opportunity for the students to investigate complex systems as taking active role in this process. Computer games, as providing virtual environments, make it possible for players to decide and act in a specific way and to see its results. In other words, as Squire and Jenkins (2003) claimed “games are imaginary worlds, hypothetical spaces where players can test ideas and experience their consequences” (p. 8). By providing virtual contexts, games let the students to have experiences in that setting (Gredler, 2004). Computer games can be used to let the students take active part in their learning process, and show and apply the real-life uses of the information that they learn. They also give students the opportunity to experience of living in “simulated, rule-governed worlds” (p. 79). Therefore, the use of computer games in education may provide opportunities for the students to test some ideas related to the specific subject matters that they are learning and they do not have a chance to try in real life. For example, learning about history or geography while playing Civilization III, the students might also have experience of societies’ life from past to the future, which in fact they would not have a chance to do so in real life (Squire and Jenkins, 2003). As Squire’s (2006) words, the players may have a chance to “replay history” playing Civilization III (p. 25).

According to Shaffer et al. (2005) computer games might be a new way of learning since games “create new social and cultural worlds – worlds that help us learn by integrating thinking, social interaction, and technology, all in service of doing things we care about” (p. 105). Computer games are powerful media in terms of ensuring intrinsic motivation: as the students already like games and playing games is one of the activities in their daily routines, games increase their intrinsic motivations, and then, they are willing to be active and responsible in the learning processes (Rieber, 1996; Jenkins, 2002). Prensky (2001) asserts that being in school, regardless of the grade level or institution, is just boring, and games have the potential to change this mood of the learners. To put it another way, learning is fun for the students when they have control on their learning and when they are able to relate what they learn with the real life issues (Kirriemuir & McFarlane, 2004). By increasing the motivation of the students, games can be used in learning environments so that students involve more in the learning activities and more motivated while learning. Provenzo (1992) also refers to visually rich nature of games and their potential for providing opportunity for the children to active participation. This characteristic of the computer games gives the opportunity to shift the learning style from verbal to visual by providing with visual design items (Subrahmanyam et al., 2001). Games, when used in formal educational settings, provide with the opportunity to increase student motivation and the chance to learn in a different context, within the virtual world of the games (Gredler, 2004). Computer games have the potential to ensure skill development such as “problem solving, sequencing, deductive reasoning”, and moreover, when played together with other peers, games help develop some other skills such as “peer tutoring, co-operation and collaboration, and co-learning” (McFarlane, Sparrowhawk & Heald, 2002, p. 13).

Computer games have the potential to develop students’ computer literacy and cognitive skills, including “spatial representations”, “iconic skills” and “visual attention” (Subrahmanyam et al., 2001, pp. 13-14). According to Cole (1996), games can improve students’ academic skills; which is not a short-term effect of the games, though (cited in Subrahmanyam et al., 2001).

There are different genres of video games available. The types of computer games include action, adventure, puzzle, fighting, simulation, strategy, sports, role-playing, car racing, first-person shooter, music and massively multiplayer online games (Prensky, 2001; Newman, 2004; Sellers, 2006; Smith, 2006, Steinkuehler, 2008). Moreover, games are grouped into two regarding the number of players: single-player games and multi-player games. Although any game from any type of these genres may be used for educational purposes, there are some scholars putting academic games into another category (Gredler, 2004). Academic games also are referred as serious games. Regarding the use of serious games in education, the name of the process is constructed combining the terms *education* and *entertainment*; that is edutainment (e.g. Math Blaster). These games are not only motivating and attracting materials for the students, but also have the potential of developing their skills by providing with support on the subject matter (Bayırtepe & Tüzün, 2007). In other words, through serious games, students learn as they have fun. These games can be used by the students either for learning a new subject matter or reinforcing what they learned in classroom setting.

Gredler (2004) categorizes the possible ways that academic games can be used: this includes, “(a) to practice and/or refine already-acquired knowledge and skills, (b) to identify gaps or weaknesses in knowledge or skills, (c) to serve as a summation or review, and (d) to develop new relationships among concepts and principles” (p. 572). This type of games are designed and developed based on educational purposes. However, when compared to commercial games, the visual technology used in academic games is simpler most of the time (Kirriemuir & McFarlane, 2004).

Although Gredler only refers to the academic games, the games developed for educational purposes, there are other studies showing the benefits of commercial games, designed for fun purposes in general, on the children/students. Lineage (I and II) provides a great way for students to practice reading so that rather than debarring students from literacy activities, the game itself provides such an activity type, as Steinkuehler (2007) argues. In a similar vein, World of Warcraft, supports scientific reasoning (Steinkuehler & Duncan, 2008), computational literacy (Steinkuehler & Johnson, 2009), and digital literacy (Steinkuehler & King, 2009). In addition to increasing student motivation, Civilization III let students learn about the history thanks to playing with it (Squire, 2005). The number of examples can be increased; nevertheless, the point is that commercial games, although not designed and developed for educational purposes, have valuable contributions to students’ skills and behaviors.

Depending on the ethnographic research of two and a half year as being an active participant in Lineage, Steinkuehler (2005) investigates the potential of MMOG as a way of learning and cognitive activities. According to Steinkuehler (2008), playing in MMOG requires several important cognitive skills and learning habits: socially and materially distributed cognition, collaborative problem solving practices, novel literacy practices, scientific reasoning (like hypothesis testing and model based reasoning), computational literacy, reciprocal apprenticeship, and collective intelligence; to name a few, but no all (pp. 12-13). The results of her research studies indicate that the cognitive abilities and learning skills, which might potentially develop during MMOG participation, are quite crucial for education as well, and therefore, puts forth the potential of these game environments as educational technologies to be used in educational settings.

In another study conducted, Dempsey and his colleagues (1996) investigate the potential of 40 commercial games, selected from eight different genres. Having conducted their research, the authors conclude that, computer games can be used for educational purposes regardless of the objectives (either verbal or cognitive or behavioral). They add that computer games can be integrated to education by concentrating on appropriate outcomes.

### 2.4. MUVES – Multi-User Virtual Environments

As computer technologies continue to evolve, so are the educational methods used in classrooms and the diversity of activities that the students are engaged with. With the developments in computer and Internet technologies, and with the integration of these technologies in classrooms, the teachers and the students have faced with new educational technologies. Depending on the grade levels and the opportunities provided by the schools, there is no limitation with the use of these technologies. In other words, if the requirements (technological adequacy and match with curriculum objectives) are met, then the teachers and the students can possibly use any type of computer and Internet technologies for educational purposes. Multi-User Virtual Environments (MUVEs) can be regarded as one of these technologies, although have not used widely in elementary and secondary classrooms yet, at least in Turkey.

MUVEs refer to “2-D and 3-D virtual worlds in which learners control characters that represent them in the worlds” (Nelson & Ketelhut, 2007, p.269). MUVEs are more like computer games in terms of their similarity of creating “immersive, extended experience but with problems and contexts similar to the real world” (Dede et al., 2005, p. 2). The technology of MUVEs was grounded on MUDs (Multi-User Dungeons), MOOs (Object-Oriented Multi-User Dungeons) and IRCs (Internet

Relay Chats) (Damer, 1997). The use of MUDs and MOOs depended on the use of text; meaning that users interacted with the software and each other by typing commands on their computer screen. Recently, MUVEs provide users with more visual way of this experience by ensuring rich graphical design and easy way of communicating with the environment and other users around. This visual improvement gives a chance to the users have a feeling of being in that virtual area (Warbutron, 2009). Moreover, thanks to the visual appeal of MUVEs, the motivation of students increases (Omale, 2009). The multiple-user feature of the MUVEs gives opportunity for the students to interact with other students with a variety of skills, so that MUVEs enable “legitimate peripheral participation driven by intrinsic sociocultural forces” (Dede et al., 2005, p. 2).

MUVEs are similar to games in terms of utilizing virtual worlds that are representative of real-life settings and make it possible to its users experience a virtual trip. Thanks to this graphical design, the users can now investigate virtual worlds by manipulating their avatars. Moreover, through their avatars, users can also interact with the objects embedded in virtual worlds and other users online. The same MUVE might include more than one virtual world so that the users may travel among these worlds through teleport points. The designers can design each of these worlds according to a different narrative or story or a problem situation. In each of these worlds, the users may have a variety of experiences depending on the narrative embracing the virtual world.

Through virtual worlds, the students are able to use not only other Internet resources, but they also have the opportunity to engage in the rich activities of knowledge creation. Virtual worlds allow users “gather data, comment on and annotate it, synthesize and analyze, and distribute content essentially in real time” (Steinkuehler & Squire, 2009, p. 10). Thanks to virtual worlds they offer, the MUVE technologies give opportunity for students internalize a role and act in the virtual environment in order to solve problems relevant to that role (Barab, Gresalfi & Arici, 2009). While doing this, the students have the feeling of social presence, too (Omale, 2009).

Multi-user virtual learning environments are a type of computer software allowing multiple interactions among users who synchronously play the game. In these computer-based environments, the users come across a variety of resources, use virtual artifacts and have a virtual experience of the environment as rich as the designer of the environment allowed so. Thanks to the multi-user opportunity, the users have a chance of meeting other users across the world and interact with them using the communication tools of the virtual environment (such as synchronous chat, and e-mail). Considering that the users not only interact with the multiple users but also with information resources, it would not be wrong to say that virtual worlds ensure rich interaction, if well designed. The interaction among the users, most of the time, is going beyond a merely chat experience into "a collaborative, community building environment" (Damer, 1997, p. 22).

Dede et al. (2005) assert that "MUVEs can be powerful environments for engaging students in learning" (p. 7). Barab, Gredalfi and Arici (2009) explain learning occurring in MUVE settings as "transformational play". According to them, playing in or visiting virtual worlds does not always result in learning; rather, transformational play is necessary in order to ensure learning. Transformational play means "a player must become a protagonist who uses the knowledge, skills, and concepts embedded in curricular content to make sense of a fictional situation and make choices that transform that situation" (p. 77). Thanks to transformational play, the student is immersed in the learning environment and experience the subject matter.

According to Nelson and Ketelhut (2007), MUVEs that are developed on educational purposes let students involve in "highly interactive, authentic inquiry activities" (p. 277). MUVEs, as being interactive learning environments, have many advantages. First of all, using 3D virtual environments make it possible to provide with "an effective, active, and more playful learning process" (Jong et al., 2005, p. 33; cited in Omale, 2009). Ensuring learner engagement, MUVEs allow knowledge construction in which the learner actively participates and therefore empowers cognitive skills (Kalyuga, 2007). Based on the results of several studies, Jarmon et al. (2009) make a conclusion about the potential benefits of virtual worlds. Different studies indicate that learning in virtual worlds may support learners and increase the quality of educational experience.

> Virtual worlds are also often purported to have other instructional benefits, such as allowing for creativity within a rich media environment, providing opportunities for social interaction and community creation, facilitating collaboration, increasing a sense of shared presence, dissolving social boundaries, lowering social anxiety, enhancing student motivation and engagement, and accommodating millennial generation learning preferences (Jarmon et al., 2009, p. 170).

Trial and error is the most common method that children playing computer games employed (Dempsey et al., 1996). On the other hand, MUVEs offer a much more different experience than the type of games that allows players try their chance. In other words, MUVEs are usually designed around a problem or a specific narrative in which students (or players) need to act on the issue and put some effort on it regarding their roles in the play experience. Moreover, the play experiences can change depending on the roles students have selected. For example, Barab, Gredalfi and Arici (2009) mention about a virtual world they developed, where the student takes a specific role and then the flow of the game alters depending on this selection. They explain the narrative as quoted below.

> For example, in one of our scenarios, a student playing the game takes on the role of statistician, and in-game characters ask the student player to analyze data to determine whether surveillance cameras or an increased police presence will make the virtual town safer (p. 76).

In the example above, the experience the student has show changes depending on the way s/he interprets data, comes to a conclusion and suggests a solution to the virtual town citizens. When re-entering the virtual town, s/he can see the citizens of the town acted according to her/his suggestion: cameras installed on the places or police are located on the streets (Barab, Gredalfi & Arici, 2009). Therefore, the students take active role during the activity, and they can see immediate results of their decisions. They not only take control of their own learning, but also gain insight about perspectives of other people (empathy of being a statistician in this example).

MUVEs alter three things regarding learning experience: (1) students become more active during learning rather than being passive recipients, (2) content changes from being external information to be memorized by students to tool that the students employ in order to reach objectives, and (3) context changes from being a knowledge to be stored for the future use considering it would be necessary sometime later to current authenticity that the students experience (Barab, Gredalfi & Arici, 2009).

It is possible to mention about two most popular MUVE settings used by many people with educational purposes. They are Second Life (SL) and ActiveWorlds (AW). In both of these portals, the users are able to design and develop their own virtual areas which are either for public or private. There are many research studies conducted investigating the use of SL and AW in educational settings. We can also mention about the examples of projects developed with educational purposes: River City and Quest Atlantis, both using AW platform. All of these settings offer opportunities to be used a way of distance learning, as well as a way of motivating immersive learning environments to be used in class as a supportive material to face-to-face learning.

**Second Life (SL)**

SL was developed by Linden Lab in San Francisco and launched in 2003. SL is a MUVE setting to which everyone can sign up and create an avatar; it is available for the public. As in other MUVEs, the users, thanks to their avatars, walk around/fly among virtual worlds, and communicate and trade with others (sell/buy virtual items using the Linden Dollar). There are three ways of communication available for online users; local chat (to interact with everyone around), voice chat (chat through voice using microphone) and instant messaging-IM (for private communication). If the users want to have private lands, then they can purchase their own areas, design the place 3D according to their purposes and restrict it so that only specific people can go to. SL research has dealt with the practice of SL applications especially in higher education; there have been virtual campuses of universities and virtual classes of university professors where the students meet and participate in class activities. The universities having a virtual campus are Harvard, Ohio, Penn State, Texas A&M., and Middle Eat Technical University, just to count a few. It is possible to find examples from all around the world. There are also examples of research on secondary school level; e.g. Global Kids (Feldman, 2006). There are also important organizations using SL for online meetings and knowledge sharing (such as NASA

Space CoLab). Moreover, social organizations, such as music concerts and art exhibitions, take place in SL setting.

The studies indicate that SL ensures multidisciplinary collaboration among learners and cultural awareness (Mason & Moutahir, 2006; Liu, 2006). Moreover, SL is a supportive MUVE for learning and teaching (Zhu, Wang & Jia, 2007) and appropriate for project-based learning activities (Jarmon, et al. 2009). Considering the result of their study, Jarmon et al. (2009) indicate that "SL learning environment used with the project-based approach in this particular course effectively fostered experiential development of interdisciplinary communication awareness and strategies" (p. 180).

**ActiveWorlds (AW)**

AW is also another MUVE portal open to public. The users are represented with avatars and they can visit many virtual worlds allowed to everyone. Similar to SL, in AW, the users can buy their own land and design private spaces, which are either open to public or not. There is also an educational version of AW, ActiveWorlds Educational Universe - AWEDU, available only to those willing to make educational implementations.

The interface of AW includes four main parts: a 3D virtual environment, a chat window, a 2D part to integrate web-resources, and a frame including buttons for extra opportunities for interaction and navigation. Thanks to the affordances it provides, AW lets students participate in collaborative activities, and therefore, it can be used for synchronous and asynchronous practices of distance learning (Dickey, 2005).

Nowadays, there are types of educational MUVEs emerged "as a form of socio-constructivist and situated-cognition-based educational software" (Nelson & Ketelhut, 2007, p.269). Designed completely on educational purposes and including only educational content, these environments are promising to be used as technology-rich classroom activities. In order to give some examples of these MUVE settings, it is possible to talk about River City (project by Chris Dede), and Quest Atlantis (project by Sasha Barab). These two MUVEs are educational games designed and developed by using ActiveWorlds specifically for classroom practices.

**River City**

River City project was designed and developed by Chris Dede and his team at Harvard University using ActiveWorlds platform and depending on theories of motivation and situated learning. The target group of the project is $6^{th}$ to $9^{th}$ grades. River City resembles a city of $18^{th}$ century, within which a river running (Dede et al., 2005a). With this project, they mainly aim to present a fun learning environment for the disengaged students who have problems within their school lives. The project has been designed to engage these students in learning science concepts, to help them increase their academic skills and to motivate them within their learning process. This MUVE is "centered on higher order scientific inquiry skills, as well as on content related to national standards in biology and ecology" (Dede et al., 2005b, p. 1).

The interface of River city includes three main dimensions, very much similar to AW and QA interfaces. The screen has a 3D area, a 2D area and a chat space. Walking around the 3D spaces, the students come across with digital agents (NPCs), featured objects and videos (related with science). The students are also provided with scientific tools such as digital microscope within the environment. Through these objects, the students are tried to be engaged in inquiry-based scientific activities. The students' interaction with the virtual objects is viewed in the 2D space, a web-based area; and the space is changed in accordance with students' interaction within the 3D area. There is also a chat space where the online users can interact with each other synchronously.

**Quest Atlantis**

The details of the Quest Atlantis game are explained in Chapter-3. In this part of the dissertation, the related studies were investigated regarding the use of QA for educational purposes in different parts of the world and by different people. Since QA was such an extensive educational environment that was composed of educational activities of a variety of subject areas and was used across countries all over the world, the literature mentioned here covered different research applications. On the other hand, the common point of all those studies was the use of QA for educational purposes either in school or out-of school settings. The related literature covered the use of QA in a variety of subject areas, as stated before, such as computer, math, social science, science, and English (not only as a learning activity of mother language but also as a foreign language). Since the environment used in this study is QA, more literature regarding implementations of national and international applications are mentioned below.

***Implementations worldwide:*** Quest Atlantis has been used in different countries including USA, Australia, and New Zealand. It is not only used in formal learning settings, but also in informal learning settings such as boys and girls clubs. Moreover, the implementations and activities are held for a variety of subject areas: science, writing, language learning, math etc. As opposed to the use of QA in Turkey, the implementation examples do not only include the ones conducted for research purposes, but also include the type of implementations as use decisions by the teachers.

There have been studies investigating a variety of issues regarding QA implementation. The studies include but not limited to the investigation of implementation issues in formal learning settings and teachers' opinions on QA implementation (Thomas, 2004), QA affordances in English language learning (Zheng, 2006), QA's influences on students' learning and achievement (Barab et al., 2007c; Anderson, 2008; Arici, 2008; Warren, Dondlinger & Barab, 2008) and collaboration (Ludgate, 2008), students' engagement levels in learning activities (Lim, Nonis & Hedberg, 2006; Arici, 2008), and affordances influencing student motivation (Tuzun, 2004).

Having conducted a study in Singapore in order to investigate students' engagement in QA; Lim, Nonis and Hedberg (2006) result in low student engagement due to students' low computer competency levels. Additionally, their study shows the influences of language as well. As the language used in QA is English, it negatively influences Singaporean students' engagement for the learning activities. On the other hand, they also mention about significant increase in students' science learning depending on pre- and post-test achievement scores. There are, in fact, more studies examining student learning and achievements in QA environment. For example, Warren, Dondlinger and Barab (2008) argue that there is a significant achievement gain on elementary students' writing tasks as their interest towards writing increase.

Additionally, according to them, the use of QA reduces teacher load of answering student questions through their writing processes.

As opposed to the findings of the study conducted by Lim, Norris and Hedberg (2006), Yong and Ping (2008) mention about high level of engagement of the students, who are academically at risk, as they learn with QA. As they also claim, although these students were not intrinsically motivated towards doing quest activities, their teachers took an important role in providing with student engagement to the learning activities. As this study also shows, learning through QA also contributes to students ICT skill developments Yong and Ping (2008).

When it comes to the implementation issues in formal educational settings, Thomas (2004) makes a multiple case study and expresses his findings of each case. He works with the teachers who had selected QA as classroom material and had been using it with their students as a learning activity. He asserts that teachers continue using QA as supportive to their class activities due to the fact that it suits to their curricular goals and students like studying through QA. He also mentions about the implementation challenges; that is the security issues and the need for continues support during the implementations.

***Implementations in Turkey:*** In addition to the studies conducted abroad, there are some studies using QA as the educational game environment. These implementations, however, are few in number and of short-time implementations. For example, in one of the studies, QA is used as an environment where the students discover hardware components (Bayırtepe & Tüzün, 2007). Having collected hardware items on their q-packs, the students are able to learn about the properties of each device by reading through the instructions provided. The researchers investigate the effects of this implementation on students' achievement and computer self-efficacy. The implementation lasts two weeks after orientation session. The results they find indicate that there is no statistical significance between the experimental and control group in terms of either student achievement or computer self-efficacy. On the other hand, they claim that students like QA environment, QA is beneficial in lowering student anxiety and have benefits on individual learning.

In another study, the researchers investigate whether QA influences students' learning of mathematical functions (Tüzün et al., 2008). In this qualitative study, four students use a 3D world conceptualized for teaching and learning mathematical functions. This study takes one hour of the implementation. The researchers conclude that QA is beneficial in terms of motivating students, and allowing not only self-paced learning but also collaborative learning. Moreover, they state that QA is an appropriate learning environment for mathematical functions.

One more study investigates the use of QA in geography learning and the implementation of this learning activity lasts two weeks (one class hour each week) (Tüzün et al., 2009). Given the clues and information, the students are assigned a task of sending the lost children to their countries. In this respect, the students work to solve this problem situation. The researchers claim that the intrinsic motivations of the students are high while they are compared with their motivation in traditional school. Depending on pre- and post-test results, applied just before and just after the implementation part, the researchers state that the students have statistically significant learning gains from the implementation.

## Conclusion

The result of the studies on the use of commercial- and educational-computer games, and MUVEs may shed light on how to benefit from the potential of these technologies in educational context in order to improve student learning. Moreover, the results of such studies may contribute to the development of other educational technologies as students like these environments and they are self-motivated to participate in those.

As the literature review indicates there are numerous studies showing the benefits of computer games and MUVEs with the potential use of it in educational settings. The research studies mention about the increased learning gains, increased motivation and increased interaction among the students. These environments are represented as the technological environments that the students would like using for educational purposes, as they already like using it.

Specifically looking at the implementations of QA, it is possible to say that there are several studies conducted worldwide: either abroad or in Turkey. All the studies show the potential benefits of using QA in educational settings, besides mentioning about the challenges of using it (Thomas, 2004; Tüzün, 2007). However, the studies show an important issue: that is there are teachers in the world who demand using QA in their classrooms as supportive material for their students' learning. Nevertheless, the implementations in Turkey include merely the research interventions trying to figure out the implementation issues in the county.

The existing literature also shows the need for conducting more studies worldwide, and determining classroom implementation issues, students' and teachers' perceptions of it, and the potential challenges and barriers of putting these highly motivating environments to classroom settings.

# CHAPTER 3

# METHODOLOGY

## 3.1. Introduction

The research methodology that was utilized in order to answer the research questions of this study is explained in this chapter. In addition to the research methodology, information about the cases, methods of data collection and data analysis are all presented in detail.

## 3.2. Research Questions

The main purpose of this study is to examine the perceptions of students and teachers about learning environments that uses Quest Atlantis Multi-User Virtual Environment (QA-MUVE). Moreover, the purpose of this study is to investigate potential challenges and barriers that can be faced with during the implementation of MUVEs in these learning settings. This research investigates the use of MUVEs in both formal and informal educational settings. Accordingly, the **main research question** of the study is:

What are the perceptions and experiences of students and teachers in formal and informal learning environments that use MUVEs?

### 3.2.1. Sub Research Questions

1. What are the perceptions of students using MUVE?
    a. How do they perceive their experiences that they have while using MUVE?

b. How do they compare learning experiences in MUVE with learning in traditional classrooms?

c. What are the characteristics of MUVE that need to be changed/improved?

2. What are the perceptions of teachers/facilitators about using MUVE as a supportive educational material?

   d. How do they perceive the use of MUVE as a technology based educational material?

   e. How do they evaluate students' learning in MUVE?

   f. How do they perceive their role during the implementation of MUVE?

   g. What are their' suggestions about using MUVE in classrooms?

3. What are the challenges and barriers of using MUVE as a supportive educational material in formal and informal educational settings?

### 3.3. Research Methodology

People may have some questions in their minds about the world they experience; they may face with problematic situations in their daily lives; and/or they may want to obtain some detailed information related to their jobs. In any of these cases, they may try to find answers to their questions/problems in a variety of ways. They can "consult experts, review books and articles, question or observe colleagues with relevant experience, examine one's own experience in the past, or even rely on intuition" to answer their questions and/or to find out information that they need (Fraenkel & Wallen, 2003, p. 4). However, it is sometimes not that easy to find answers to questions or to solve the problems in case of complex situations. Moreover, the answers that are found in any way mentioned above may not be trustworthy in some cases. This brings out the importance of scientific research. Scientific research can be defined as "the systematic and objective analysis and recording of controlled observations that may lead to the development of generalizations, principles, or theories, resulting in prediction and possibly ultimate control of events" (Best & Kahn, 1993, p. 20).

There are two main types of scientific research methodology known: quantitative and qualitative. Additionally, some researchers use a mixture of these two methods, known as mixed methods research, in their studies.

It wouldn't be wrong to say that quantitative research was the dominant method in social sciences until the late of 20$^{th}$ century. Especially in natural sciences (like physics and chemistry) this type of methodology has been used predominantly. Having affected by the positivist paradigm, quantitative methodology has emphasized generalizability, objectivism and a mechanic world view (Yıldırım & Şimşek, 2005). Almost all the research studies have been conducted in laboratory settings and the idea of variables and cause-effect relationships have been focused on. Since there was no other scientific methodology available at that time, researchers in social sciences had to employ quantitative methodology in their studies. They had to employ the principles and methods of natural sciences to study human relationships, societies and cultures (Yıldırım & Şimşek, 2005).

At the late of 20$^{th}$ century a new research methodology, namely qualitative research, emerged. Qualitative research attracted the attention of the social-science researchers and it has gained much more importance in the last decades. Yıldırım and Şimşek (2005) explain the reason of this transformation - from quantitative research to qualitative research - as the paradigm shift from positivism to post-positivism in social science research. At the most simple base, paradigm can be considered as researchers' way of doing research. Johnson and Christensen (2004) define research paradigm as "a perspective based on a set of assumptions, concepts, values, and practices that are held by a community of researchers" (p. 29).

This transformation does not mean that quantitative research would not be used anymore in social science research. Patton (2002) claims that "because qualitative and quantitative methods involve differing strengths and weaknesses, they constitute alternative, but not mutually exclusive, strategies for research" (p. 14). Saveyne and Robinson (2004) define qualitative research as "research devoted to developing an understanding of human systems" (p. 1046). Qualitative research is now a complement to quantitative research and is valuable in studies that try to make sense of human-related cases by examining them in detail and in their real settings.

Although both quantitative and qualitative research methodologies are employed for scientific research purposes, the former requires the use of standardized tests and is useful when the research includes great number of participants, while the latter is used when the purpose is to make a detailed and in-depth analysis of a small case. To put it another way, quantitative research deals with the numbers and counting while qualitative research uses words and narratives.

### 3.3.1. Rationale for Selecting Qualitative Research Methodology

Although criticized by some people as not-being a true scientific method and considered as "soft" when compared to quantitative research, qualitative research is valuable in social sciences, specifically in educational research, since it enables researchers to describe the educational settings even when they know little about it (Gillham, 2000). Creswell (1998) defines qualitative research as:

> "an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyzes words, reports detailed views of informants, and conducts the study in a natural setting" (p. 15).

According to Johnson and Christensen (2004), qualitative research is the way of investigating "a phenomenon in an open-ended way, without prior expectations" (p. 360). This type of research method is a way to understand what is happening in a real-life-setting, how and why people behave in a particular way and what are their perceptions about the setting in which they live/work/study.

Savayne and Robinson (2004) state that the selection of the research methodology is determined according to the research questions that a researcher tries to answer. Considering the research questions of this study, qualitative research was selected as the research methodology. The reason behind this selection was that the main purpose of this study was to discover patters when MUVEs were used in educational settings as supportive materials. As an innovative material, the use of MUVEs first need to be investigated to see what is happening in these settings because little is known about the issue regarding Turkish educational settings. Moreover, this study aimed to understand how students and teachers perceive the use of MUVEs and to examine what challenges or barriers emerge during this implementation. Therefore, in order to understand the process from the participants' own statements and to see it through observations it was the proper way to select qualitative research and conducting an in-depth analysis of the cases and to draw a holistic picture of them. Moreover, the study aimed to analyze human-based settings which are complex, dynamic systems with their own characteristics and nature. Therefore, qualitative research method was the most appropriate way for doing this study.

Patton (2002) offers twelve major characteristics of qualitative research combined under three main categories: design strategies, data collection and fieldwork strategies, and analysis strategies (pp. 40-41). Since this study uses qualitative research methodology, the characteristics of the study are going to be explained briefly under the categories defined by Patton in the following table (Table 3.1).

**Table 3.1** The Characteristics of this Study Explained based on the Themes by Patton

| | **Themes by Patton** | **Explanations regarding this study** |
|---|---|---|
| **Design Strategies** | Naturalistic Inquiry | Each case occurred in their natural setting and the researcher was open to whatever themes that emerge during the study. |
| | Emergent Design Flexibility | After the first case study, there became a change on the design of the virtual world. Also, some design related changes were conducted depending on the nature of each case. |
| | Purposeful Sampling | All the groups that were included in the study were selected purposefully to be able to make an information rich data gathering process. |

**Table 3.1.** Continued

| | Themes by Patton | Explanations regarding this study |
|---|---|---|
| **Data Collection and Fieldwork Strategies** | Qualitative Data | In order to collect qualitative data, interviews and observations conducted, and related documents are gathered (such as chat logs). |
| | Personal Experience and Engagement | The researcher participated in each research setting and, she was the key data collector. Moreover, she was the implementer of each study. |
| | Emphatic Neutrality and Mindfulness | In order to provide with emphatic neutrality and mindfulness during data collection process, the researcher was objective, open, free-of-bias during interviews and totally present in the situation to make the most sense from the observations. |
| | Dynamic Systems | The researcher was aware of that each case was a dynamic system with its own nature and characteristics. |
| **Analysis Strategies** | Unique Case Orientation | Each case is analyzed in detail before making a cross-case analysis considering they all have unique characteristics including different student groups, teachers with different backgrounds, and diverse opportunities both in and outside of the schools. |
| | Inductive Analysis and Creative Synthesis | The creative synthesis of the data is followed by the analysis process which is conducted in an inductive way so that patterns and themes are drawn from the data. |
| | Holistic Perspective | Rather than looking into bits and pieces as distinct parts, the cases are regarded as a whole system to better understand the dynamics of each. |
| **Analysis Strategies** | Context Sensitivity | The cases are analyzed regarding the natural settings in which they occurred and without considering the generalization issue. Rather, cross-case analysis is conducted to investigate the similar and/or different patterns emerging in different settings. |
| | Voice, Perspective and Reflexivity | The researcher tries to be as much objective as possible while analyzing the data. |

### 3.4. Case Study

The types of qualitative research show differences according to the field experts. For example, according to Denzin and Lincoln (2005) the types of qualitative research include case study, ethnography, phenomenology, ethnomethodology, biography (life history), historical method, grounded theory, action and applied research, and clinical research. On the other hand, Merriam (1998) claims that there are five types available: the basic or generic qualitative study, ethnography, phenomenology, grounded theory and case study. In a slightly different way, Creswell (1998) mentions about five types as well: biography, ethnography, phenomenology, grounded theory and case study. Case study research differs from other types of qualitative research by focusing on the in-depth analysis of an individual case or several cases.

The selected type of qualitative research for this study is case study. Before defining what case study is, it will be better to make a definition of "case" as a concept. At most simplistic way, a case can be defined as "a specific, a complex, functioning thing" (Stake, 1995, p. 2). On the other hand, a case can also be defined as a "bounded system" (Smith, 1994, p. 295) meaning that case study is the investigation of a "bounded system". In educational sense a case may be a student, a group of students (a classroom), a teacher, a school and/or a program/an innovation implemented in a classroom setting. In the present study, the cases are groups of students and their teachers selected from two private schools in Ankara and two groups of students participating in a non-governmental organization in İzmir.

Case study means the investigation of a case and/or multiple cases. Yin (2003) defines case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p. 13). Case study method is preferred in education since it is effective for determining the problems faced during the implementation phase (Merriam, 1998). In case study research, the researcher makes use of a variety of data sources to understand the case and to draw a holistic picture of it.

Gall, Gall and Borg (2003) compile the characteristics of case study research as the following:

1. The study of phenomena by focusing on specific instances, that is, cases;
2. An in-depth study of each case;
3. The study of a phenomenon in its natural context;
4. The study of the emic perspective of case study participants (p. 436).

The present study is a case study and it has the characteristics of this type of inquiry as stated above. First, each case was studied in depth so that the researcher was able to understand what was happening in real-life, formal and informal educational settings where an innovative technological tool was implemented and how participants perceive it. The opinions of participants were investigated through their own words. Second, the researcher investigated each case in their natural settings. Third, the researcher benefited from a variety of data sources and collected as many data as possible regarding the purpose of the study and the research questions. Lastly, although the cases are not exactly the same; each case was selected on purpose and the researcher investigated the same specific issue in each one.

According to Stake (1995) there are three types of case study research: intrinsic, instrumental and collective. This study is an example of collective case study, also known as multiple-case study. Nevertheless, each case study is an instrumental case study as well, because they provide for the researcher an opportunity in order to better understand and investigate a particular issue; that is the implementation of an innovative educational application of a MUVE in the present research (Figure 3.1.). In other words, instrumental case studies were selected since they serve for the understanding of the phenomena.

The details of multiple case study and the reason why it was selected is going to be explained in the next section.

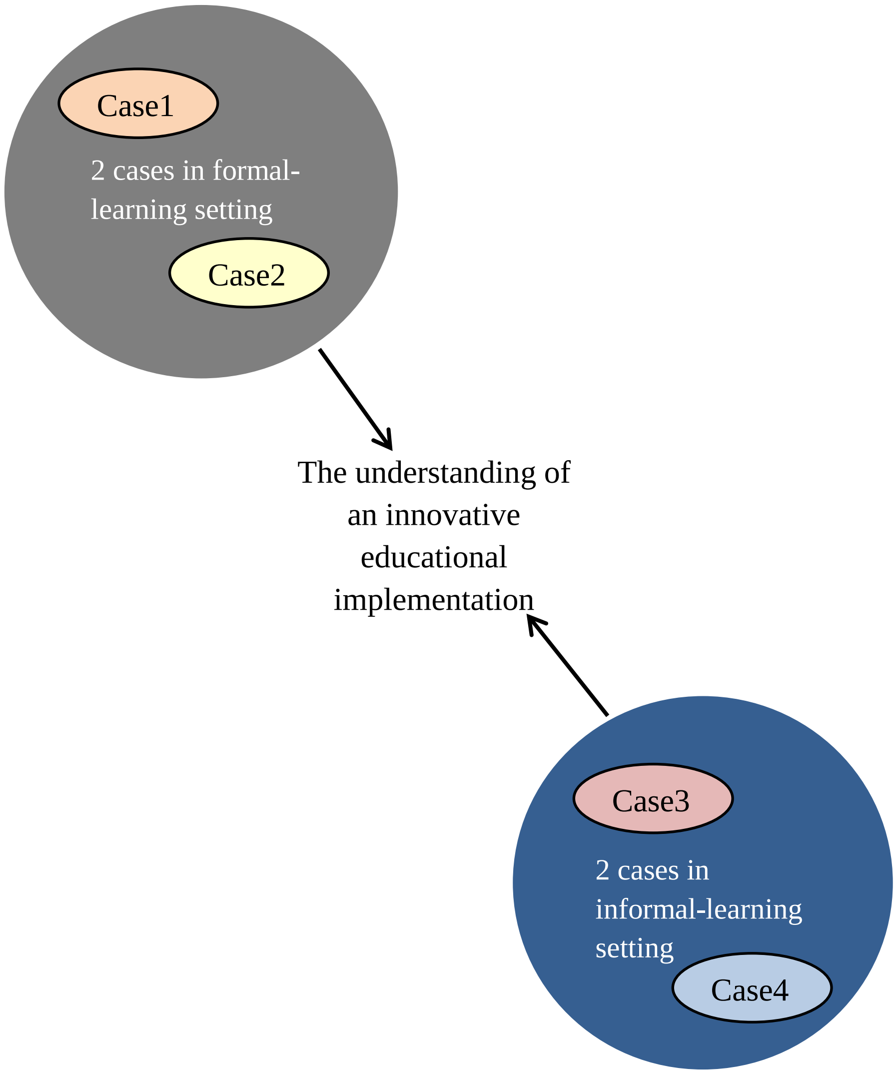



**Figure 3.1** Representation of the Study – Multiple Case Study (Adapted from Creswell, 2008)

### 3.4.1. Multiple Case Study

Multiple case study is simply the study of more than one case. Although they require much more time and resources, multiple case studies result in an extensive amount of data when compared to single case studies. Additionally, the results derived from multiple case studies are much more trustworthy than the ones from single case studies.

The selection of cases is an important process in multiple case studies. As Yin (2003) states “every case should serve a specific purpose within the overall scope of inquiry” (p. 47). Each case owns something specific to it and something common with the other cases (Stake, 2006). There may be differences or similarities among the cases where the major concern is “redundancy and variety” (Stake, 2005, p. 446). The important point is that each case contributes to researcher’s understanding of the issue s/he investigates. In the present study, each case has common characteristics with each other; they also have different aspects at the same time. First of all, the settings show differences; that is cases # 1 and 2 were conducted in private schools whereas cases # 3 and 4 were conducted in a non-governmental organization (NGO) supported by a charitable foundation. Secondly, related to the first aspect, in the first two cases teachers attended the study; however in the other two cases, the researcher was the only person responsible from managing the student group since the foundation depends on the volunteerism regarding being the facilitator for a student group. Lastly, in the school cases the selection of classrooms and of the topic depended on the opinions of teachers and the structure of the curriculum. In the NGO cases, it was a little bit more flexible although the instructional approach that the foundation followed was a critical factor in the implementation. To put it another way, the school cases were much more structured than the NGO cases. The characteristics of each case and case selection process are explained in the following section. The design of this multiple case study is schematized in Figure 3.2 below.

As Figure 3.2 shows, the researcher started the study by selecting a research topic which was investigating the implementation of a technology-based educational tool – a Multi-User Virtual Environment – and finding out the implementation issues of learning environments using these technologies. The researcher employed the results of the previous research by examining the literature and regarding the current situation of educational practices in Turkey. Considering the need to use technology-based educational materials to support students for educational activities in and out of classroom settings, the researcher decided on a specific MUVE named Quest Atlantis to see the potential use of it in educational settings in Turkey. After that, research questions were formed to limit the focus of the study. Regarding the research questions and the purpose of the study, multiple case study method using qualitative data collection and analysis techniques was selected as the research methodology. After that, a pilot study was conducted in order to test the appropriateness of research questions, pilot testing the data collection items (interview questions and questionnaires) and to decide on some design related issues. Then, the main research cases were selected (totally four) and through negotiations with teachers the materials was designed and developed in Turkish. The implementations took place in all four cases and the researcher was present in each and leaded the research process by collecting data. After the implementation of the study and data collections procedure, the data gained from each case was analyzed separately which was followed by cross-case analysis. The study, the cases, results, conclusions and implications were written in detail throughout this dissertation.

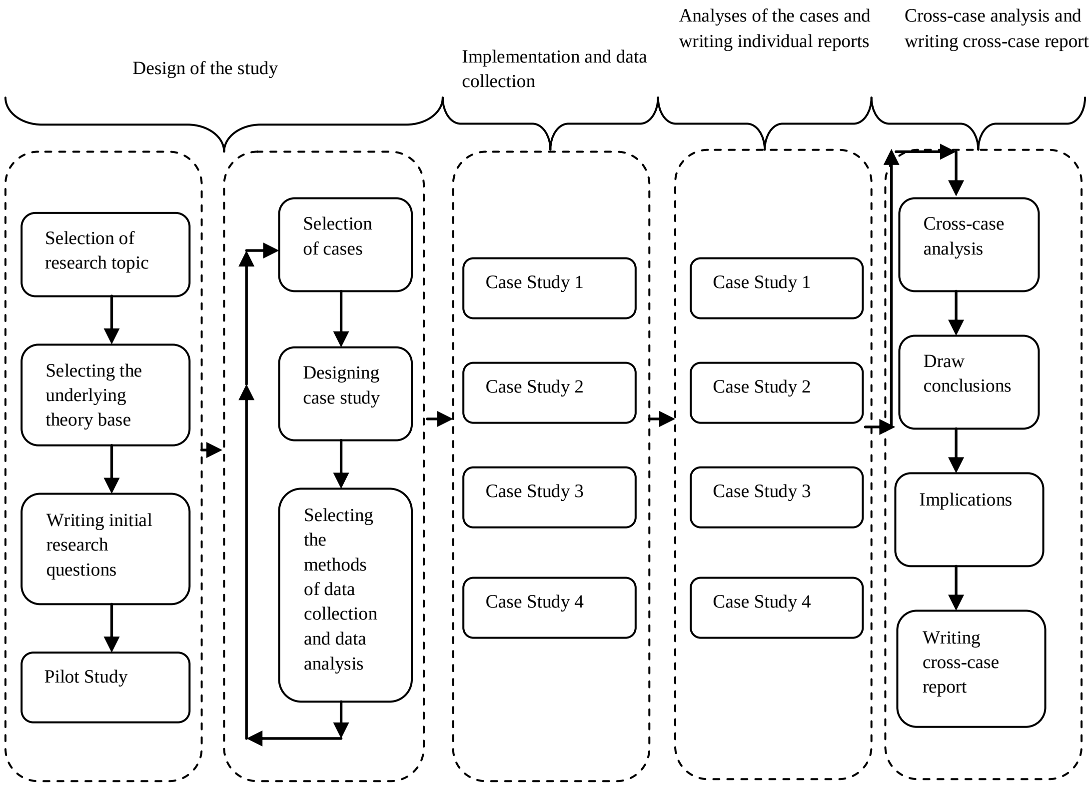



**Figure 3.2** Representation of Research Design (Adapted from Yin, 2003)

#### 3.4.1.1. The Selection of Cases

Yin (2003) mentions about the "replication logic" in multiple case studies (p. 47). In multiple case studies, the selection of cases depends on the replication logic which is quite different from the sampling logic done in quantitative studies (e.g. applying surveys to multiple respondents). After deciding on doing a multiple case study research, the researcher selected the cases purposefully either to obtain similar or contrasting results (Yin, 2003). The number of the cases depends on the purposes of the study. In these types of studies not only the multiple cases are considered as important but also each case is. Each individual case is investigated separately with its own characteristics and results. Also, each case contributes to the results of the main study. This method gives the opportunity to the researcher to compare and contrast results of each single case, which results in a more convincing and vigorous study. In this study, each of the four cases was selected purposively by the researcher. Each case was both handled separately and together as components of the multiple case study.

According to Stake (1995) the most important criterion for the selection of cases is their potential of enabling us to "maximize what we can learn" (p. 4). In this study, two different private schools rather than government schools were selected. There were two reasons of private school selection including the number of students in classrooms and the conditions of computer laboratories.

First of all, almost in all government schools the number of students in each class is higher than the one in private schools. Since this study was a qualitative study and the researcher aimed to make a sense of the phenomenon from participants' perspective, it was, therefore, important to study with classrooms including less number of students to ensure a clear understanding.

Second, when the number of students increases the chance of having each student use a computer in the computer laboratory decreases. In other words, in most of the government schools students need to share computers with their peers because of large number of students vs. less number of computers. Even in some cases the number of students that needs to use one computer together may increase depending on the conditions on which the school stands. However, in this study it was important that each student use a computer because each student had an account in the Multi-User Virtual Environment (MUVE) and each student had an online portfolio that shows the progress of them. Additionally, in case of crowded classrooms (i.e. in case of students using computers together) it is almost impossible to know which student did what. Moreover, the MUVE, Quest Atlantis (QA), did not work in a government school because of the firewall executed by the responsible department of Ministry of National Education. It is also harder to take permission to conduct studies in public schools; there are many bureaucratic requirements to be done before conducting a research and it takes a relatively longer time than getting research permission from a private school. Therefore, private schools were selected purposefully.

The reason behind selecting cases from formal and informal learning settings was to see the implementation issues in two different types of settings and to find out common and opposing patterns emerging in these different settings. Besides making the replication of the same study in another similar setting, conducting it in a diverse situation may provide researcher with rich data and may come up with quite different implementation issues. Therefore, in addition to selecting cases from formal settings, the researcher added two other cases from an informal learning setting to the research design.

Another factor about case selection, time constrains in government schools, made the researcher conducting the same implementation in a Non-Governmental Organization (NGO) setting. The two cases (# 3 and 4) took place in a NGO context. This need emerged after conducting the case studies in schools. In school settings, it was not so easy to conduct longitudinal studies. The schools, and therefore the teachers, had a loaded schedule to complete until the end of the educational year. Also, as experienced in cases 1 and 2, the field teachers had limited time to use the computer laboratory for their science classes. To conduct the study in these two cases, the researcher had only 5 and 4 classroom hours respectively for the implementation (each classroom hour equals to 40 minutes). Because of these reasons, it was necessary to replicate the study in somewhere else where longer time of implementation was possible. Therefore, a NGO setting was selected as the research context for further research and cases 3 and 4 was conducted there.

All two schools and the NGO followed the technological and educational innovations and restructured their methods respectively. Therefore, it could be a good match using this MUVE environment in these settings. After mentioning about the research, the managers of all these settings and teachers had a positive approach towards QA and accepted to study with the researcher.

Finally, all the cases were selected purposefully. There are several reasons behind this: 1) The settings were convenient to the researcher, 2) Other collaborative studies were conducted with the schools and within different locations of the NGO before this study; therefore, the school administrators knew the researcher, and vice versa; 3) As stated above schools and the NGO was open to try new technology-based educational materials for their students.

This study included four different cases and each case was covered in detail in the following parts. Before giving the details of each case, information about the pilot study is provided first. After mentioning about each case, the Quest Atlantis Multi-User Virtual Environment (QA-MUVE) is going to be explained.

### 3.5. Pilot Study

In research studies, the researcher may face with unexpected conditions in which data instruments may not be valid or research questions may not be appropriate whereas new patterns may emerge during the investigation. In other words, without conducting an initial study, the researcher may face with completely different conditions than expected, which may not be suitable to serve for the research purposes. Moreover, the data collection instruments may yield incompatible or missing findings. This is why pilot study is an important process in research studies, especially in qualitative ones in which the researcher is involved in a real-life setting most of the time and possibly face with some conditions that may influence the research process. Entering the research field without conducting a pilot study is like "entering the field 'blind' " (Sampson, 2004, p. 387). In other words, the researcher may enter a completely different field of investigation in which the research purposes to be not valid.

Conducting a pilot study, as the initial phase of a research study, make the researcher(s) be more ready and prepared to the exact research study. In this respect, a pilot study was conducted in the scope of this research study. The purpose of this pilot study was to find out the major implementation issues when a MUVE enter into the classroom setting.

The pilot study was conducted in a private school in Ankara during the spring semester of 2006-07 educational year and lasted 9 weeks (40 minutes each week). Depending on the initial interviews with school administrators and the teachers, the pilot study was conducted in a social science class of a $6^{th}$ grade classroom including 24 students (9 female and 15 male). The study was designed based on the needs of the school and social science teacher. As this needs analysis process indicated, as having implemented a constructivist curriculum, the teacher felt the need for this type of activity for his $6^{th}$ grade students, as he stated. The teacher was a young male student with self-interest towards technological developments and games.

For the pilot study, a new world in QA environment, namely Social Science Village (Sosyal Bilgiler Köyü), was designed and developed by the researcher in Turkish. For the development of quests, the researcher benefited from the students' text book and workbook, and the available quests in QA database that overlap with student activities (See Appendix A for an example quest). Moreover, the quests and the virtual area were investigated by a social science teacher and were approved as being appropriate to students' levels and their grades. All the quests were prepared in such a way that they served for the purposes of curricular objectives and were in-line with classroom activities. In addition to the quest, the students were also provided with Bulletin Board in which a variety of topics (course-related topics and daily issues) were open by the researcher. The purpose of this type of activity was to give opportunity for the students to discuss about different topics with their peers in class. The topics in the bulletin board were in Turkish and were only allocated for this group of the students.

The Social Science Village was quite like a representative miniature of a town having its hospital, houses, bank, museum etc. The quests were embedded in the virtual environment as to be related with the purpose of the quest (e.g. the quest about flags was put into the museum that included the flags of world countries). Moreover, computer stations were placed into a building in the city in order to let the students access relevant information to be used in completing the quests.

The students came to the computer lab for QA activity to which an additional class hour was allocated by the school administration. In the first two weeks, the students came to the lab in the same class hour; however, problems (such as arguments with friends about whom to use QA) started to emerge among the students. Therefore, one more hour was added and students were divided into two groups so that each student was able to use a computer. In fact, collaborative way of activity was tried in order to solve this problem before dividing the students. However, the students had problems again due to not being willing to give up using QA.

Throughout the implementation, the students completed quest activities in parallel with what they had been learning in their social science classes. After the implementations were finalized, interviews were conducted with 12 of the students and the teacher (See Appendix X for student interview questions and Appendix Y for teacher interview questions). Student interview included 16 questions; some changes were made as the design of the virtual environment and the activity changed in the following parts of the study. The teacher interview questions included 15 question and major changes were not made regarding these questions. In addition to these, student demographic questionnaire and teacher perception questionnaire were tested and revisions were made, if needed.

The interviewed students were selected purposefully; the ones who were talkative, who showed high and low participation during the implementation hours were selected at first hand so that the interviewed students were reflective of the whole classroom. Using this selection, the aim was to interview with the ones who were “informant”s since in qualitative case studies it is important to be able to get as rich data as possible (Yin, 2003, p. 90). Before the interviews, students were informed about that what they said during the interviews would be kept as secret between them and the researcher and would not affect their school grades.

Via this study, the interview questions and questionnaires were tested and necessary revisions were made. Additionally, the results of this pilot study shed light on the implementation issues by allowing the researcher investigate the way that the students behaved in QA environment, the patterns emerged from student and teacher interviews regarding their experiences and expectations, and the challenges and barriers emerged during the implementation. This study also let the researcher verify the appropriateness of research questions with data collection instruments.

Depending on the results of pilot study, some decisions were made regarding the implementation issues emerged. The issues and the related decisions were explained in detail below:

1. As stated above, topics were created in the bulletin board to give the students opportunity to discuss issues with their friends. After an orienting activity, the students were encouraged to share their opinions with each other under the available discussion topics. However, most of the students did not tend to use this opportunity. Moreover, the students writing opinions in the bulletin board were far from discussing/sharing opinions with each other. In other words, their posts on the board stayed as independent opinions, and could not turn into sharing ideas. After the activity, the students did not tend using bulletin board, too. Therefore, in other case studies, this property was not used as part of student activities.

2. The students who were interviewed stated that they liked swimming, flying and using vehicles cars found in the 3D environment. However, for some of the students, this turned into be a distracting gaming activity. They tended to finish the quest activity as soon as possible so that they could start gaming with friends and would have more time to do that. Driving cars and using vehicles and racing with each other was a fun activity they found in QA environment. This was why in the development of the virtual world used in the other cases this issue was considered by the researcher, and cars or other vehicles were not placed into the virtual area.

3. In this pilot study, the students completed weekly quests. However, due to the reason mentioned in the item above, some of the students tended to copy+paste from Internet resources without even reading it, so that they could play more. Moreover, the use of individual quests could not go beyond a classic type of Internet-based educational activity. In other words, according to the researcher's opinions, the potential advantages of using a MUVE could not be employed completely within this type of activity. In case of using individual quests in QA, the interaction and collaboration among students did

not occur effectively, too. Although provided with collaborative activities, the students could not be successful in sharing their opinions and works in QA environment as they could not be so effective in using QA interface. The interview results indicated that they expected an interface like MSN to which they were more familiar. Because of these reasons, the researcher decided to develop another virtual world using an inquiry-based learning activity. This activity, details provided later in this chapter, was prepared depending on a problem situation and all the information to be used by the students was embedded into the virtual environment as part of the problem-solving activity. Therefore, the students could be able to involve in a situative activity where they could benefit from the variety of information sources in QA environment.

## 3.6. The Cases of the Main Study

Contexts of the cases should be explained since the activities take place in those settings and it is possible that the characteristics of the context may have influences on what the researchers investigate (Stake, 2005). Therefore, detailed information about each case and their contexts in terms of general characteristics of the school, of the physical environment in which the implementation was conducted and of the participants are provided in this part. Information about students is provided in Chapter-4.

### 3.6.1. Case-1 – Formal Learning Setting-1

Detailed information about the first case study in terms of general characteristics of the school, of the physical environment in which the implementation was conducted and of the participants is provided in this part.

#### The School (School-1)

The first case took place in a private school located in Ankara, Turkey. The school was founded in 1986; and it has been teaching in its current building since 1990.

Giving education at kindergarten, primary and high school levels, the school limits its capacity with 2138 students (a maximum of 24 students in each class). Language and science laboratories are equipped with computer and video technologies. The school also has a swimming pool, one indoor facility area for sport activities, art and music classes, traffic education area, play area and a library.

The mission of the school is to raise children as individuals devoted to Atatürk's principles, able to speak at least two foreign languages, knowing how to use computer technologies, and having required academic knowledge background for entering a good university. The school also aims to make the students be sensitive to environmental problems and aware of what is going on in Turkey and in the world. In this respect, the school organizes its teaching activities as learner-centered.

This school was also known by the researcher as the one open to innovative learner-centered educational activities. The science teachers had been involved in a game-based project executed by the university. However, they did not know the QA environment.

**Science Class**

Science classes take place in the classroom environment normally. There is a computer and a projector in classes. Also, the school has two science laboratories for students to be involved in making scientific experiments.

Since science teachers did not know the QA environment, an introduction was done to introduce the characteristics of the environment. Information about the planned activity was mentioned and the details were presented to two teachers. At first, three 7$^{th}$ grade classes were included in the study; however, just before the study started, they cancelled two of the classes due to being too much loaded with curricular activities.

The science teachers had three hours during the semester to implement their class activities in computer laboratory. Therefore, they made arrangements to plan this 5-lesson-hour-time to be happening at the end of the semester while the related topic is covered. An introductory CD was prepared by the researcher introducing the virtual environment by videos recorded by Adobe Captivate. Also, flyers (Appendix R) were designed as simple handouts. The student accounts were opened at the beginning of the spring semester of 2007-2008 educational year. CDs and flyers were given to the students with user names and passwords. It was aimed that the students utilized the environment before. The students were encouraged for using the environment before the implementation started. This was why a task was constituted and a competition was organized to make students start using QA. The first two students completing the task before the others were given small gifts. This was done because the available time for the project was limited and there were not much time to spend on other types of activities. The researcher was available in QA environment in case the students needed any help. Thanks to this competitive activity, most of the students spent time in the virtual environment before the study. Also, some of them – whose English knowledge levels were high – continued completing other missions and tasks in QA environment with interacting and getting the help of the researcher.

**The Teacher**

Before the implementation, the researcher had in contact with two teachers: both female; one is young and the other is an experienced one. The experienced teacher was the science teacher of the class with which the study was conducted. She had 25 year of teaching experience and at the end of that year she got retired. She only worked at private schools.

She was graduated from Chemistry department at the Faculty of Science and Letters at Middle East Technical University. She also got a degree of Biology department at the same university. Although her department was not a teacher education program, she was enrolled in teacher training program and earned a teaching certificate. She did not continue with any masters program; rather she started her teaching career when she was graduated from the university.

She tried to give as much help as she could during the implementations. She talked to students and tried to make them complete the activity and involve in the virtual world before the study. Although she was responsible from the study and helpful to the researcher, she left the implementation part to the researcher. The reason was unsurprising: she was full with curricular activities. Additionally, she was the head of science and technology department of the school and she had many other student projects in addition to teaching activities including cross-national school projects. Since she did not have enough time, she could not spend time to learn the virtual environment. Therefore, the researcher had to implement the project and lead the classes during the study. But, the teacher did not leave the researcher alone in the class. She joined each session and helped the researcher with classroom management and organization.

**The Physical Environment**

The implementation took place both in classroom environment and in laboratory setting. There was one computer and projector in the classroom. In the laboratory (Figure 3.3), there were 28 student computers with internet access, a teacher computer, a server, a projector, a projector screen, a printer and a scanner. The number of computers was enough for the number of the students so that each student was able to use one computer and able to individually advance in the virtual environment. The QA software was installed to the computers by computer teacher before the study started.

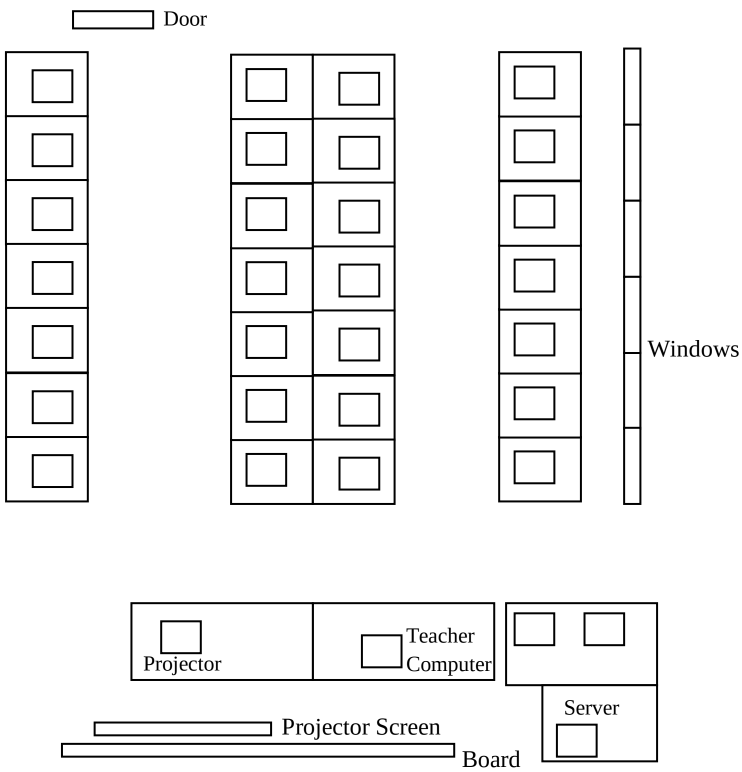



**Figure 3.3** The Physical Environment of School-1 – The Computer Laboratory

### 3.6.2. Case-2 – Formal Learning Setting-2

Detailed information about the second case study in terms of general characteristics of the school, of the physical environment in which the implementation was conducted and of the participants is provided in this part.

**The School (School-2)**

The school was established in 1989. The school gives education at kindergarten, primary, secondary and high-school levels. The school has approximately 300 teachers, 150 staff and 3000 students.

The school has a cultural and convention center, computer, science and math laboratories, libraries, and areas for sport facilities. In addition to curricular activities, the school supports its students with a variety of after-school activities (such as chess, drama, music etc.). Adopting learner-centered educational methods, the school aims to raise children as individuals who are proficient not only in Turkish but also in English and knowledgeable about using technological sources. Moreover, the school aims to make its students devoted to Atatürk's principles, have the capacity of expressing themselves, owning critical thinking skills, able to interact and work with other people, and aware of social milieu.

This school, similar to the other school, is open to educational innovations and the use of technology for educational purposes.

**The Teacher**

The meetings about the study were conducted with the head of science and technology department of the school. The teacher was an experienced female science teacher. With the approval of the school administration, she nominated a female science teacher for this study. She was a young teacher with 10 years of teaching experience. She had spent one year of her career in another private school in İstanbul. She had been teaching in the same school since then. She had two 7$^{th}$ grade science classes at the school. Therefore, both classes were included in the study.

The teacher was graduated from Biology Teaching department at Middle East Technical University. She was also enrolled in Master’s and PhD programs at Secondary Science and Math Education department.

She did not take any courses related to technology use in education during her undergraduate education. However, she was enrolled in a computer-based instruction class in her Master’s or PhD education. She informed that they talked about computer aided instruction at the class. In addition to that education, she also participated in seminars in her school regarding the technology use. As she stated, “the seminars are planned according to our requests, according to teachers’ expectations. We fill in a form. Regarding our expectations, there become seminars in February”. Moreover, she asserted that she could use the information she gained in the Master’s program and in seminars when they planned to use technology in classes.

During the implementations, she joined each session. However, she also had a full schedule and did not have enough time to learn the MUVE and facilitate the students in the virtual environment. Therefore, the researcher, again, took the role of the facilitator during the implementations.

**The Physical Environment**

The implementation of the study took place in laboratory settings (Figure 3.4). Additionally, an introductory session was held in classroom environment where there was a computer and projector available. In computer laboratory, there were 24 student computers with internet access. Moreover, there were 2 teacher computers, a projector, a projector screen, a scanner, and a board in the computer laboratory. QA software was installed to computers by researcher with the help of computer teacher.

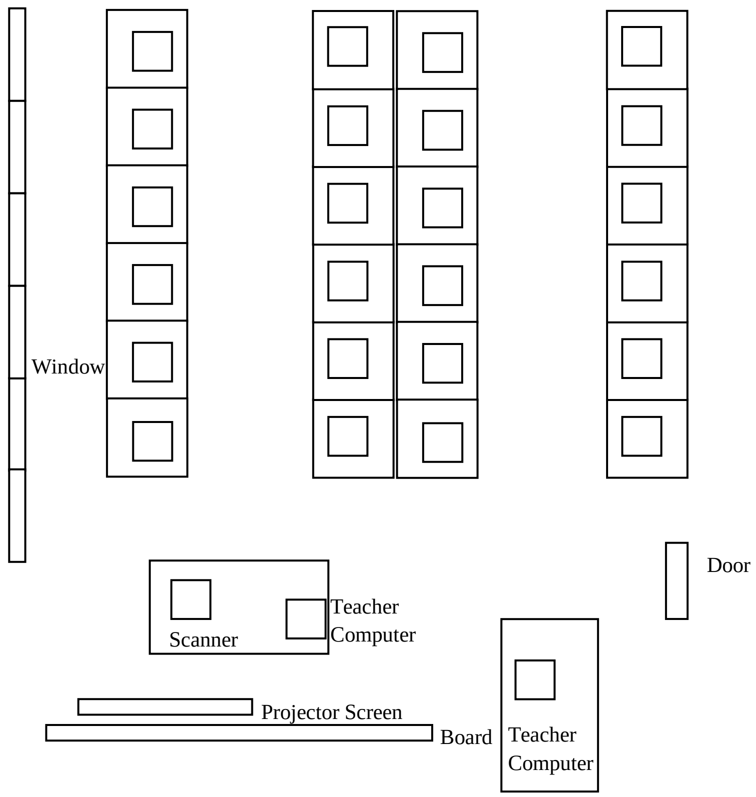



**Figure 3.4** The Physical Environment of School-2 – The Computer Laboratory

### 3.6.3. Cases 3 and 4 – Informal Learning Setting

Detailed information about the third and fourth case study in terms of general characteristics of the learning setting, of the physical environment in which the implementation was conducted and of the participants was provided in this part.

**Research Setting – A Non-Governmental Organization (NGO)**

The research was conducted at a Non-Governmental Organization (NGO). The mission of the NGO is to contribute to the education executed by government schools. The NGO has its own unique model of education that was developed in order to support the development of children and has been changed accordingly. In this respect, volunteers join the foundation and take responsibility on the education of children aged between 7 and 16. The foundation is sustained thanks to contributions of volunteers and organizations. Started to its activities in İstanbul, the foundation has now eleven Educational Parks, fifty-five Learning Centers in thirty-four cities all over Turkey. Additionally, it owns eighteen Mobile Learning Units.

1. **Educational Parks:** Educational parks are located in 10 cities: İstanbul (2 educational parks), Ankara, Antalya, Eskişehir, Van, Samsun, Diyarbakır, Afyon, İzmir, and Gaziantep. Built in wide areas, educational parks provide children with a variety of activities. These parks have in common (minimum) 10 classes for activities, 2 computer laboratories, 1 library and special areas for some activities (such as Düşler atölyesi ). In addition to these, the parks have spaces for outdoor activities as well. The facilities in the parks include theatre, music, computer and Internet, basketball, football etc. Educational Parks have a capacity of 3,500 children annually.
2. **Learning Centers:** Learning Centers are smaller in size in compared to Educational Parks. These units are mostly located in the suburban districts where children need educational support. Learning Centers have a capacity of 300-500 children annually. In addition to employing library resources for doing their homework, children have a variety of opportunities like using computers, playing chess and watching DVD films.
3. **Mobile Units:** With these mobile units, the foundation aims to reach to the children living in cities where the foundation has no organization. Equipped with computers, these units travel to schools and neighborhoods with the aim to teach introductory skills about computer technologies to children and their teachers.

### The Educational Park

The proposal of this study was offered to the Education Department of the foundation as a new project to be implemented during summer-activity period. The project was accepted and added to the program of the educational park as a voluntary activity, which means only children who wanted to participate in the activity were included in the project. At the beginning of the summer-activity period, a presentation was organized through which information about the project was given to the children.

The research was conducted in an Educational Park which was located in the suburban part of İzmir. The education and socio-economic levels of people living in this area were usually low. In other words, the students participated in this study were from low-income families when compared to the first two cases, who were from high-income families.

**Computer Laboratory**

The implementation of the case studies 3 and 4 took place in computer laboratory settings of the NGO (Figure 3.5). In the room, there were 15 student computers with Internet access and there is a black board. There was no projector or any computers left for teachers’ use in this setting because the organization depends on charitable contributions and emphasis is always on the student activities.

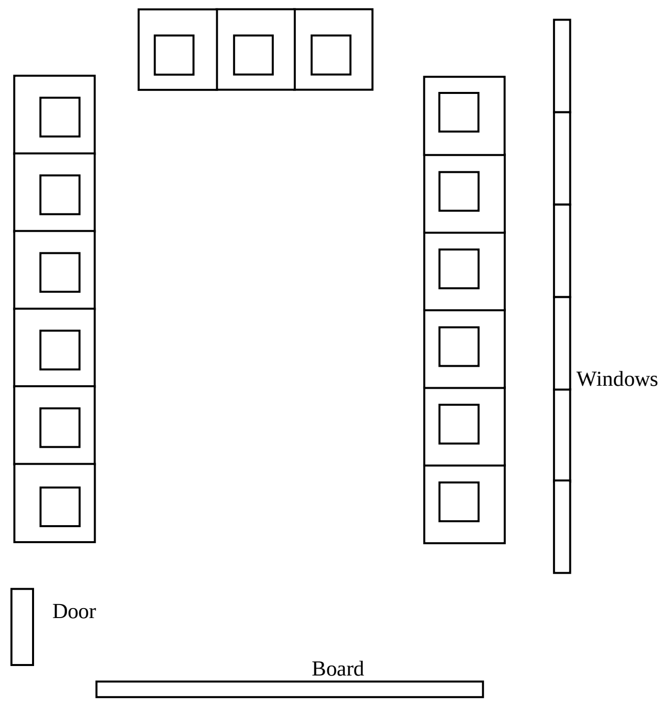



**Figure 3.5** The Physical Environment of the NGO – The Computer Laboratory

### 3.6.4. General Overview of Cases

In order to make it easier for the readers, the researcher wants to summarize the cases schematically (Figure 3.6). There are four cases included in the present study, which is a multiple case study employing qualitative research methods. Two of the cases were conducted in private elementary school settings, whereas two of them were conducted in a NGO setting. In schools, teachers were available with the researcher, but in the NGO settings the researcher was the only responsible person managing the student group and facilitating the activities. In all of the four cases the activity was related to Science.

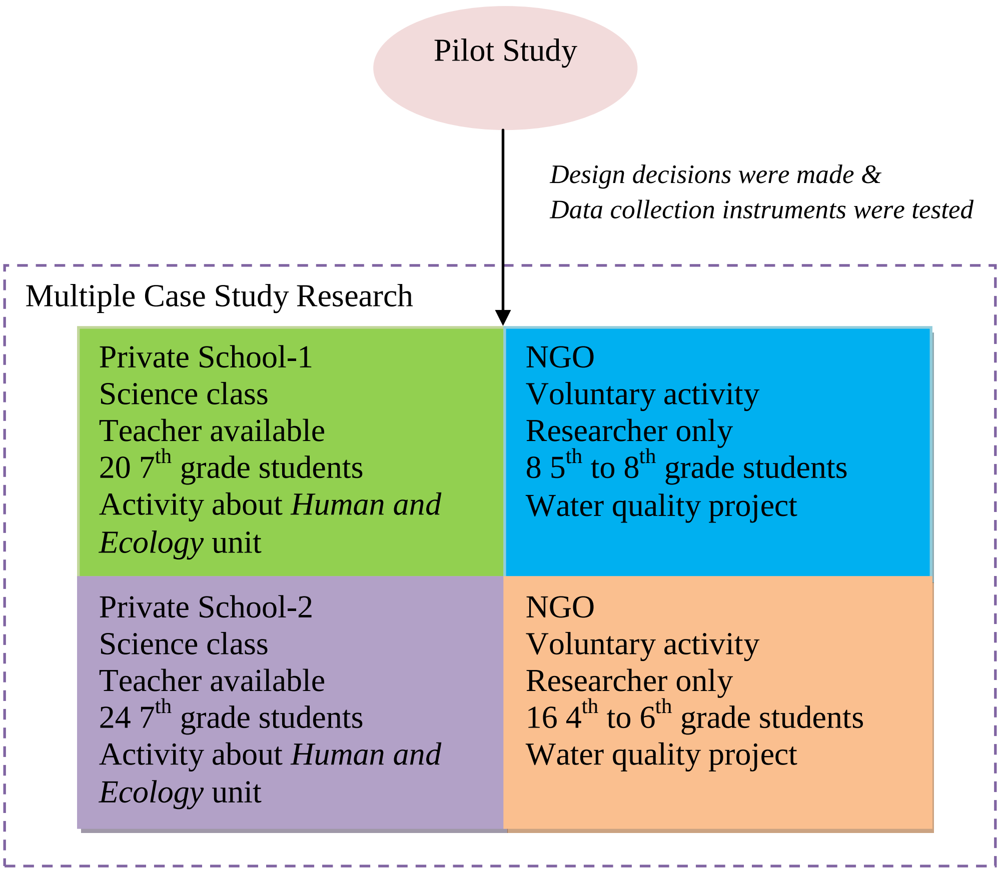



**Figure 3.6** The Schematic Representation of the Cases

### 3.7. The Multi-User Virtual Environment: Quest Atlantis

The multi-user virtual environment (MUVE) used in this study is named Quest Atlantis (QA). Sometimes called as a “meta-game,” QA is an innovative technology-rich learning environment designed around curricular tasks by Sasha Barab and his team at Indiana University-Bloomington (Barab et. al. 2005). With this MUVE, the aim is to provide a learning environment in which students not only learn but also have fun and improve their social responsibilities thanks to the QA social commitments determined by the team and embedded in most of the aspects of QA (Figure 3.7). Entertainment dimension gives an opportunity to play; makes learning process fun for the learners. On the other hand, students learn while studying on *quests* (educational activities) prepared on different subject areas. Moreover, students take a social responsibility since they become a part of a community who has common purposes.


**Figure 3.7** The Structure of Quest Atlantis

QA was established using the mythical story of Atlantis, the lost city, and it “leverages a 3D multi-user environment, educational Quests, unit plans, comic books, a novel, a board game, trading cards, a series of social commitments, various characters, ways of behaving, and other participant resources” (Barab et al., 2005, p. 2.). In addition to the use of a 3D environment, it also provides users with a 2-D web pages and a chat part within the screen as part of its interface (Figure 3.8). Users move their virtual characters, called avatars, within the virtual worlds and villages. In these virtual environments, users are able to chat with each other online while moving as avatars in the 3D space and track the educational activities they are supposed to complete. In this way, QA functions in a way similar to that of commercially available online video games such as Ultima Online or World of Warcraft. Such games, often referred to as "MMORPGs" (Massively Multiplayer Online Role-Playing Games), have become extraordinarily popular in recent years.

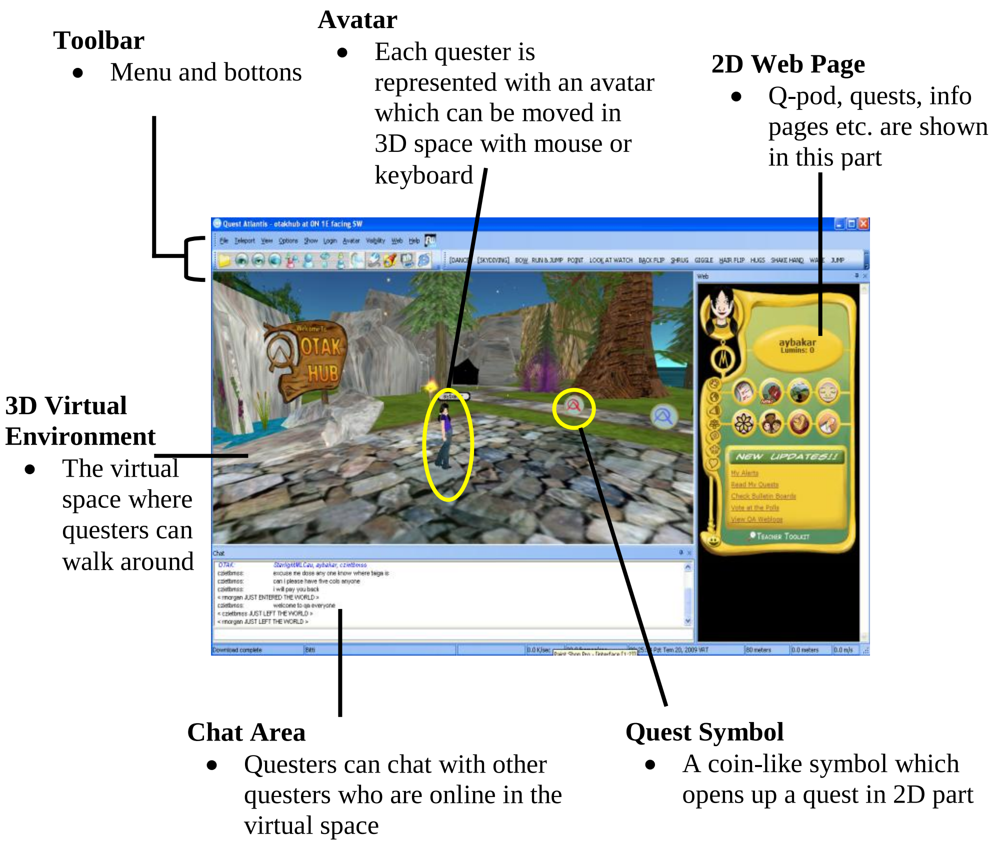



**Figure 3.8** Quest Atlantis Interface

Although it may have similarities in terms of the way it is designed (such as a 3D virtual space and chat option), QA differs from most other commercial games and MUVEs by its design aim that is "to provide a meaningful context for significant learning and pedagogy" (Barab, Arici, & Jackson, 2005, p. 15.). QA is based on the notion that students learn better when they engage in the learning activities and take active role in their learning process. In addition to game-based learning framework, inquiry learning is also grounded in QA project that strengthens learning activities by relating real-world activities with activities of QA. It is used in a variety of countries (such as USA, Australia, New Zealand, and Turkey) both in schools as a support to curriculum and in after school programs.

Users walk around the virtual worlds and complete educational activities called *quest*s which have both educational and purely entertaining components. Although the main purpose revolves around saving the world of Atlantis from an impending disaster, quests cover a variety of subject areas from science to mathematics to social sciences. The target users of QA are elementary school students aged 9-15. Quests are assigned by teachers and/or can be selected by students. Quests are symbolized with a coin-like item in the 3D space and are displayed on the 2D part of the game when clicked on. Currently, there are more than 500 quests embedded in virtual worlds and villages. Each quest includes a title, the name of the virtual world in which the quest is located, the number of lumins (points collected through completing quests) to be gained after completing it, an introduction to the problem the quest poses, the goals to be achieved in the quest and, if available, resources that could be used for the completion of the quest. After clicking on start button, the quest is attached to the online portfolio of users (*quester*s), which make it easier to access the quest later on. The users can complete the quests either individually or with other questers. Depending on the type of the quests, users are supposed to do different computer-based or paper-based tasks; either in class or in other settings. Examples include writing a report, conducting interviews, preparing a presentation, planning a community center, creating a scrapbook etc. Students can upload their computer-based works onto the system. After that, their teacher (or another nominated educator) can review students' work and evaluate it. As the teachers review students' responses to the quests, they can also give feedback to the students on their work. Once the quest is accepted, students gain lumins.

As stated before, the quests are not only associated with educational standards, but also with the social commitments. The reason behind this mission is "to support children in developing their own sense of purpose as individuals, as members of their communities and as knowledgeable citizens of the world" (Barab et. al. 2005). Through this act, the aim of QA is not only to support educational activities of students, but also to contribute to their character development by trying to make them individuals who are knowledgeable about the world around them and fulfill their responsibilities. The social commitments are:

1. Creative expression – I express myself
2. Diversity affirmation – Everyone matters
3. Personal agency – I have voice
4. Social responsibility – We can make a difference
5. Environmental awareness – Think globally, act locally
6. Healthy communities – Live, love, grow
7. Compassionate wisdom – Be kind

In addition to quests, there are also unit plans available for the use of the teachers. Unit plans include a set of related quests which are prepared on a specific content area. The teachers are provided with the guideline showing the objectives, the steps to follow, the quests and/or other activities to be completed, and, if necessary, extra information on the topic. Teachers can reach unit plans through *Teacher Toolkit.* They can also manage other classroom activities thanks to this tool such as registering their students, following up their log statistics and chat records, finding quests from different subject areas and assigning them to their class, and reviewing the work of their students.

Each user has a *q-pod*, which can be regarded as personal web-page or online portfolio. The q-pod appears in the 2D part of the QA interface to the right of the 3D window (Figure 3.9). It is designed to look like a PDA (Personal Digital Assistant). Through the q-pod, users can customize their avatar, track their progress in completing quests, follow how many lumins they have accumulated, and change their mood by selecting different emoticons or "smiley faces". Also, in a manner similar to other social networking sites such as Facebook or MySpace, they can send e-mail to other users, construct a list of friends, write some information about themselves, and check out what they have in their q-packs (a kind of bag that helps users collect virtual items like maps, stones etc. that may be used in Quests).


**Figure 3.9** The Interface of Q-POD

### 3.7.1. Design and Development Phase

There are some pre-existing activities (quests, units etc.) embedded in original QA environment that are to be used in a variety of areas including social science and science. Nevertheless, the quests and activities available in QA database are constructed in English. Although the students included in the cases of this study have taken English classes in their schools, most of them were not so proficient to be able to learn in English or to understand neither the quests nor some dimensions of the QA environment. Therefore, virtual worlds in QA environment and related student activities were designed and developed in Turkish by the researcher.

For the case studies, an original QA world (known as *Taiga*) with its core narrative was translated into Turkish and reorganized considering Turkish curriculum, the needs of the teachers/students, and the available time period. All the design period was performed by the researcher. The co-advisor of the researcher (as being a buoy) gave technical support (such as creating a new virtual world) because the researcher did not have all the authorization rights to do so.

The development phase included two different steps: 1. The design and development of the virtual area, and 2. The design and development of 2D web-space. QA uses the ActiveWorlds platform, a platform to build interactive online virtual worlds; therefore, developing a new virtual world was like “merging Lego pieces” (Tüzün, 2007, p. 470). ActiveWorlds has an extensive library of items to be embedded in the virtual worlds. Although it is object-oriented and does not require complicated coding work, it takes extensive time to build the virtual worlds: finding out the items (there is no showroom exhibiting all the items), changing their textures, and placing them in the virtual area as a relevant component require long-term work. Therefore, the design and development of the virtual world used in the pilot study took extensive time. On the other hand, the virtual world used in the four cases was copied and necessary changes were made, which was easier comparatively and took less time. Not only the structural items (such as houses, roads etc.) but also non-playable characters (NPCs) were placed in both worlds to guide the students and to provide them with helpful information. NPCs also acted as the citizens of the virtual worlds.

The second step included the development of 2D part of QA interface. As stated before, the 3D dimension of the environment is supported with a 2D part which is reserved as a space for World Wide Web (WWW). The 2D parts were developed by the researcher using MS FrontPage. Normally, the web pages are kept in the QA servers and linked to the QA database. However, due to some technical constraints, the web pages were hold in the personal web account of the researcher.

The 3D and 2D parts were connected to each other. For example, when students clicked on a NPC in the virtual world, the informative text appeared on the web-space, therefore they were able to interact with NPCs. Similarly, students were able to read their quests in the 2D part when they clicked on the quest symbol (money-like-item placed in different areas of the world). Also, students accessed their Q-pods in the 2D part.

The main characteristics and the details of the virtual world used in the four case studies are provided in the following part.

### 3.7.2. Kızılırmak Milli Parkı – Kızılırmak National Park

In addition to the virtual worlds being situated in the legend of Atlantis, there are some other worlds designed with a unique story under girding the activity in parts of the QA environment. Taiga, for example, was designed centered around the problem of water quality. In this virtual world of QA, users are challenged with a complex situation/problem that they are to help to solve. In this problem the fish population in a river located in Taiga Natural Park in the 3D space has started to decrease endangering the future of the park. Barab et al. (2007c) defines this underlying narrative of Taiga as not a simple story, but as "transactive trajectories that unfold in relation to evolving student understanding and application of disciplinary formalisms" (p. 753).

There are groups of people who live in or are present in the park, all of whom make use of the park's resources. There are park administrators who are responsible for the management of park and who try to sustain the park. In the southern part of the area, there is a fishing company called K-Fly Fishing Tour Company (Altın Olta Balık-Avı Tur Şirketi) which organizes tours and tournaments. Indigenous people called "Mulu Farmers" (Çayönü Kasabası) live on the north side of the park and have rights over the river passing through their area. The last group, the Build-Rite Lumber Company (Kereste Fabrikası), is located on the south eastern side of the park and they log the trees there and are supposed to plant new trees after logging. There are also visitors that the students come across while walking around the park and other NPCs (Non-Playing Characters) who are members of Atlantis council.

Taiga unit is so extensive and detailed that it requires weeks of implementation for students. Since it was not possible to conduct that long study and the original environment was in English, the researcher translated it to Turkish as “Kızılırmak Milli Parkı – Kızılırmak National Park” with relevant editing considering Turkish curriculum and the available implementation time. Selecting Kızılırmak instead of Taiga river was on purpose; Kızılırmak was known by students as the longest river in Turkey and the pollution problem of it had been a hot issue and had been taking place on the news frequently when the studies were conducted. The aim of selecting Kızılırmak as the core of the problem was to make it relevant for the students.

The activity in Kızılırmak National Park starts with a letter from Ahmet (Ranger Bartle), the park administrator. The aim of this activity is to make students, before entering the world, have a sense about the problem, their roles, and the mission of the activity. In his letter, Ahmet mentions about the people in the park and the current problem they have. He asks for help to save the future of the park. Students become field investigators and conduct research on behalf of Ahmet. The problem in the park is multi-dimensional. It is one in which the students need to investigate the problem not only as an environmental one but also as one that has political, economic, and social dimensions (Barab et al., 2007a).

When the students first enter the world, Defne (Salik) meets them and gives assistance on what to do first (Figure 3.10). Defne guides the students to Ahmet (Ranger Bartle) and provides them with the map of the park. As the students go through the interaction links shown in 2D part, the map is saved to students’ Q-Packs if they would like to have it.

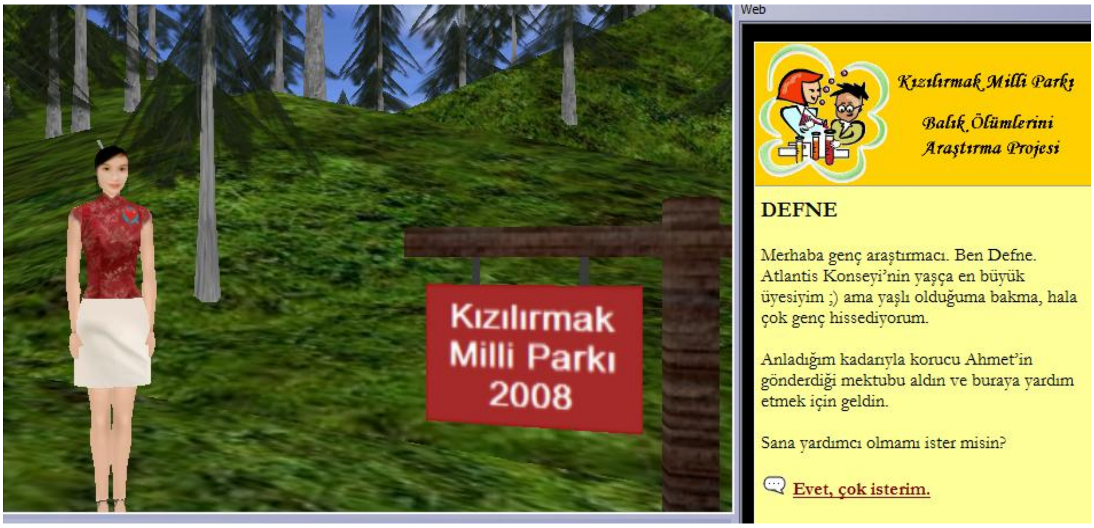



**Figure 3.10** A screenshot from Kızılırmak National Park – The welcome screen

The map (Figure 3.11) is also provided in the field notebook given to them before the implementation starts. This notebook was translated from the original Taiga field-notebook which was obtained from the QA web site. The Turkish version of the notebook was reviewed by a Turkish language specialist for grammar mistakes. The notebook was 15-page-long and it was given to each student in each case (Appendix M). The purpose of the notebook was to help students organize the data they collected from the environment. There were also some questions in the notebook related with the environment students explored, a glossary of terms that the students may be unfamiliar, and a map of the virtual environment. The map shows the places of NPCs, water monitoring stations, and all the other places located in the park.

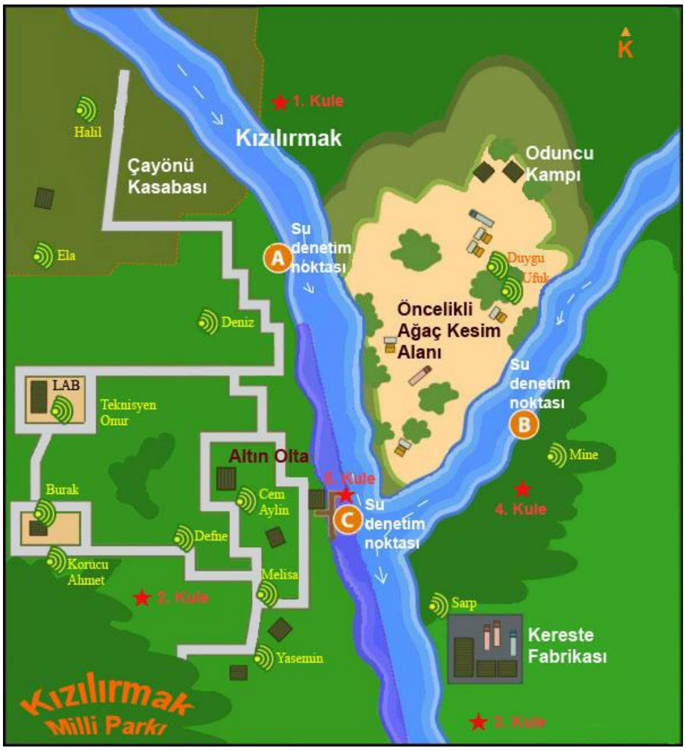



**Figure 3.11** The map of Kızılırmak Milli Park (Adapted from the original Taiga map)

Students can interact with the NPCs in different ways according to the links they clicked on. For example, while interacting with Halil - Kasaba muhtarı (Norbe – The leader of the Mulu), the students get different responses from him depending on what they want to say/ask. Nevertheless, the students are provided with similar information at the end of the interaction in either case (See Appendix S).

Each group in the park may be responsible for the decrease in fish population. Students need to learn as much as possible about what is happening because each person in the park blames somebody else as the cause of the problem and each mentions about a serious fact or opinion from his/her perspective. Even more challenging, what people say in the activity is not always true. Therefore, in addition to talking to the virtual people in the park, the students need to collect other types of data to make better and more warranted claims about the solution they propose. They, for example, may collect water samples from different points of the river and analyze them with a water analysis machine located in the laboratory (Figure 3.12).

They may also take pictures from a variety of places (shown as “kule” on the map) using cameras and find and read observation notes dropped by other investigators and make use of the graphs or tables located around the 3D space that provide some resources for players.

**Figure 3.12** A screenshot from Kızılırmak National Park – Lab technician and water analysis machine

There are several other virtual worlds within the original Taiga unit which were designed to help children to see the results of their decisions (i.e. the worlds represent the park in the future and students go to the future via a time machine and therefore are able to see what happens after implementing the solution they offered to the Ranger). After giving their decision to the Ranger through a database system, the students are directed to the relevant virtual world. Unfortunately, due to implementation time limitations and authorization restrictions (opening new worlds and relating the student interactions with NPC responses through QA database could not be done by the researcher since she did not have authorization for that).

Therefore, in order to let students see the results of the decisions that they gave about the problem, new letters are given to them as if they have been sent by Ahmet from the future. There are three versions of the letter, since there are three major groups in the park that could be reason for the problem according to the students. Related letters were distributed to the students regarding what they predicted about the reason of the problem.

Considering the school structures and classroom settings in real life, it would not be wrong to say that it is almost impossible for young students to collect and analyze data for scientific purposes. This educational opportunity lets students have an experience in which they can collect and analyze data, develop hypotheses, and test this hypothesis. The learning project “Kızılırmak Milli Parkı” was an opportunity for students and teachers to experience the inquiry learning within their schools but at the same time feeling like they were in somewhere else. The comparison of the learning objectives of this activity with curriculum acquisitions is provided in Table 3.8 below. The table indicates that the objectives overlap in the curriculum and in the activity. Both aim to increase students’ awareness and responsibility towards environmental issues. The objectives do not only include teaching the theoretical knowledge but also aim to make students act on environmental problems. The activity in QA also includes some other objectives such as effective use of computer technologies and interpreting maps etc.

**Table 3.2** Curriculum versus QA – Kızılırmak National Park

| Unit | Objectives in the curriculum | Objectives in the QA<br>*Taken from taiga teacher guide* |
|---|---|---|
| **Human and Ecology *in* 7th grade curriculum** | **Students will be able to:**<br>• explain and exemplify species, habitat, population and ecosystem<br>• explain the relationship of living organisms of an ecosystem with each other and with nonliving organisms<br>• realize the biological diversity and emphasizes its importance<br>• give suggestions about how to protect endangered fauna and flora living in our country and the world<br>• treat fauna and flora in a warmly manner<br>• collect information, presents and discusses about an environmental problem within our country or in the world<br>• offer collaborative solutions and participate in the activities devoted to the environmental problems in our country and in the world | **Students will be able to:**<br>• effectively use computer technologies to communicate with others, and to investigate scientific issues (technology fluency);<br>• understand the fragile nature of our various ecological systems and that these systems are interconnected, recognizing that one change impacts the entire system (system dynamics);<br>• appreciate that decisions about use of natural resources must balance the needs of many stakeholders, and that one solution may create problems in other areas (sociopolitical factors);<br>• recognize that inquiry involves identifying the problem, gathering data, generating hypotheses, recognizing perspectives and needs of various stakeholders, analyzing data, proposing solutions, and reflecting and revising on each of the these (science inquiry);<br>• know that various organisms and chemical factors indicate the health of an ecosystem, highlighting temperature, turbidity, pH, and macro-invertebrates (water quality concepts);<br>• recognize that what affects the balance of the food web will ultimately affect humans and their quality of life (food web);<br>• interpret maps and know that land/water are limited geographic resources (topography);<br>• demonstrate appropriate presentation of scientific data in various formats, such as scientific reports, graphs, and charts (mathematical interpretations); and • adopt a disposition |

## 3.8. Data Collection Methods

Data collection in a qualitative case study research includes a variety of data collection methods. In these kind of studies, it is important to make use of as many different data sources as possible in order to be able to understand the cases in-depth

(Creswell, 2008). In order to answer the research questions, qualitative multiple-case study was the methodology used in this study. Therefore, a variety of data were collected throughout the study to be able to conduct a detailed investigation of each case and multiple cases respectively.

The major data collection methods used in a qualitative case study researches can be grouped under three main categories: interviews, observations, and questionnaires (Merriam, 1998; Patton, 2002). The researcher used all of these methods in the present study, and data collection was done by the researcher herself in all cases. Moreover, the researcher participated in the settings in each case (Marshall & Rossman, 1999; Yin, 2003). The details of each method are going to be described in the following part.

### 3.8.1. Interviews

In order to better comprehend the perceptions and opinions of the participants, face-to-face interviews were conducted by the researcher. The type of interview method that the researcher conducted was "structured interviewing" (Fontana & Frey, 1994; Fraenkel & Wallen, 2003). Using this method, the researcher asked the same questions within the same sequence to the interviewees to learn their opinions and to understand their experiences about the implementation which were not observable. Each interview took approximately 30 minutes. All of the interviews were recorded with a tape recorder and transcribed by the researcher. In addition to the structured interviews, the researcher asked several other questions to the participants during the implementation sessions in order to better clarify their behaviors and/or opinions.

The questions in the interviews were open-ended to be able to get more information from the interviewees (Creswell, 2008). The interview questions were constructed by the researcher and to provide with the credibility, they were reviewed by five field experts. The first final version of the interview questions was constituted after getting the opinions of these experts. After that, the researcher tested the questions through think-aloud method with people who were not the participants of the study but they were in the same age group and they had similar backgrounds. Then, the questions were piloted in the pilot study. The interview questions were finalized according to the results gained through these methods.

Interviews were conducted with the students (cases 3 and 4) and the teachers (cases 1 and 2). However, in cases 1 and 2, there was no opportunity to conduct interviews with the students. In order to overcome this problem and to be able to collect data from the students, a questionnaire was prepared by the researcher. The researcher was able to gather the data from case 1 via this method. Due to authorization issues, student interviews could not be done in case 2.

**<u>Case 1</u>** In this case, there was no time to interview with the students. The students were leaving the school with school buses when the classes ended, and permission could not be granted to interview with the students during the classroom hours. Therefore, a questionnaire including 8 main questions with sub-items was prepared in order to get the opinions of students (See Appendix S). The questionnaire was both investigated by field experts and was tested with a group of students out of this study. The questions of the questionnaire were in the same scope as the interview questions. In order to collect similar data with the interviews, questionnaire questions were prepared in a way so that they collected similar data. Also, in one classroom-lesson hour, a few questions were asked to the students to learn about their general opinions about the MUVE environment. Moreover, questions related to what students were doing were asked during the implementations.

Additionally, the teacher's opinions were gathered through teacher interview (Appendix S). Teacher interview included 15 main questions. Interview questions included questions to investigate teacher's perception about MUVEs as educational materials, students' learning in these learning environments and their role.

**<u>Case 2</u>** The same time-related problem was faced within this case as well. Interview with the students was not possible due to time constrains. Similar to the situation in case 1, the researcher planned using the questionnaire to get students' opinions. However, due to authorization problems, the questionnaire could not be applied to the students. Interviews only took place during the implementation hours. The researcher asked questions about what/why students were doing. The questions were constructed on the fly. In addition to this, an interview was conducted with the classroom teacher using teacher interview questions (Appendix S).

**<u>Case 3</u>** Interviews were conducted with three students participating in the study and staying in the group until the end of the study (See Appendix B for interview questions for cases 3 and 4). In other words, some of the students gave up the project group; it was only four of the students completing the project and staying in the group until the end of the study. There was a student who did not want to be interviewed with. Therefore, a total of 3 students were interviewed in this case. Students were informed about the purposes of the study before the interview started. All of the interviews were recorded with a video recorder. Since there was no other responsible person (teacher) in these cases, only student interviews took place.

**Case 4** Interviews were conducted with the students participated in the study until the end of the implementations (See Appendix B for interview questions for cases 3 and 4). A total of 10 students were interviewed in this case. There were two students who denied doing the interview and one student gave up last week since they went to holiday. Students, who were interviewed with, were informed about the purposes of the study before the interview started. All of the interviews were recorded with a video recorder. Since there was no other responsible person (teacher) in these cases, only student interviews took place. There was one student who did not respond to the questions effectively; therefore, the researcher prepared a questionnaire only for this student including similar questions with the interview (See Appendix X).

### 3.8.2. Observations

Observation is another data collection method used in qualitative case studies. The researcher made observations in all of the cases in order to see what was happening during the implementations. Gold (1958) divides the roles of the researchers making field observation into four categories: 1. Complete observer, 2. Observer-as-participant, 3. Participant-as-observer, and 4. Complete participant (p. 217). The researcher was participant-as-observer, meaning that she participated in all of the settings she observed (Fraenkel & Wallen, 2003; Merriam, 1998). In addition to participating in the activities, she also observed the settings (Johnson & Christensen, 2004).

The aim of being a participant-as-observer was to see what was happening from the participants' perspective and to understand what they experienced as much as possible (Creswell, 2008). As the participant observer, the researcher engaged in the settings by facilitating the activities that the students implemented. The researcher observed students in order to see how they behaved in class and in the virtual setting, how they interacted with each other, and to find out if anything unusual or interesting emerged. The researcher took field notes in order to be able to remember what she observed later on (Merriam, 1998). Since she was also the facilitator of the implementations, it was not possible just to sit down and take notes. Therefore, in order to prevent missing data, each observed session was also recorded with a video recorder. Recording what has been observed with a video recorder is especially essential for interaction analysis. According to Jordan and Henderson (1995), video recorded data lets the researcher to conduct a detailed examination of interaction analysis.

### 3.8.3. Questionnaires

In order to increase the validity of the current study, the researcher collected additional data through the documents as well, that were developed to collect data within the current study. The types of documents that the researcher used were "researcher-generated documents", which are the ones "prepared by the researcher or for the researcher by participants after the study has begun" (Merriam, 1998, pp. 118-119). The documents used are described in the following section.

**Students Demographics Questionnaire** Before starting each case study, the researcher applied a questionnaire to students in order to collect data about their technology-related background (Appendix M). The questionnaire was developed by the researcher. Some of the questions were adapted from the questionnaire form developed by Tüzün (2004). The questionnaire included 17 questions which were asked to get information about students' use of computer and digital technologies. The questions were investigated by five field experts at first hand. After that, it was tested with two students who were in the same age range, but were out of the participant group. These two students were asked to read aloud the questions while answering them and think aloud in order to see if there is any misconception occurring regarding the items. After these trials, the questions were finalized and the questionnaire was used with all the participant groups in all four cases.

**Student Perception Questionnaire** As stated earlier, the researcher did not have an opportunity to interview with students in case 1. Therefore a questionnaire, including

8 main items and sub-items, was developed by the researcher to get the opinions of the students as much as possible (Appendix c). The questions were developed in a way so that similar questions were included in the questionnaire as interview questions. The questionnaire was investigated by five field experts and it was pilot tested by two students who were out of the participant group but they were in the same age range. The questionnaire was filled out by the students at the end of the implementation.

**Teacher Perception Questionnaire** A questionnaire including six open-ended questions was prepared by the researcher (Appendix N). The aim of the questionnaire was to get data from the teachers regarding their evaluations of using QA as an educational material and of the implementation specifically, about students' behaviors and their role for this and similar implementations, and their opinions regarding the improvement of the virtual environment for further uses. The questionnaire was reviewed by five field experts and it was filled out by the teachers at the end of the implementation.

### 3.8.4. Other Data Collection Methods

**Data from QA Server** Having been registered as the teacher in the QA database, the researcher had access to the list of students, student portfolios (the name of the quests they completed and their responses to those quests, total number of lumins and cols they gained, the e-mails they sent, their friends lists etc.), information about student logins (total number of their logins), chat records and bulletin board records.

**Summary of Data Collection Methods**

The data collection methods showed slight differences among the cases due to some case specific reasons. For the readers' understanding, the details of data collection methods for each case are summarized in the table below (Table 3.9). The researcher collected data through interviews, observations and questionnaires.

**Table 3.3** The Summary of Data Collection Methods

| Case | Participants | Implementation | Data Collection Methods |
|---|---|---|---|
| **Pilot Study** | 24 6th grade students<br>*9 female 15 male* | Spring semester of 2006-07 educational year<br>*9 weeks long*<br>*9 X 40 minute-long lesson hour* | • Student demographic survey<br>• Observation (video recorded)<br>• Interview (students, teacher)<br>• Student works (uploaded files to QA database)<br>• Data from QA server (info about logins, chat sessions, student portfolios, bulletin board) |
| **Case-1** | 20 7th grade students<br>*7 female 13 male* | Spring semester of 2007-08 educational year<br>*5 weeks long*<br>*5 X 40 minute-long lesson hour* | • Student demographic survey<br>• Observation (video recorded)<br>• Teacher interview<br>• Student perception questionnaire at the end of the semester<br>• Student work sheets<br>• Teacher perception questionnaire at the end of the semester<br>• Data from QA server (info about logins, chat sessions, student portfolios) |
| **Case-2** | 24 7th grade students<br>*12 female 12 male* | Spring semester of 2007-08 educational year<br>*4 weeks long*<br>*3 X 40 minute-long lesson hour* | • Student demographic survey<br>• Observation (video recorded)<br>• Teacher interview<br>• Student work sheets<br>• Teacher perception questionnaire<br>• Data from QA server (info about logins, chat sessions, student portfolios) |
| **Case-3** | 9 students (6th grade to 8th grade)<br>*3 female 6 male* | Summer 2008<br>*3 weeks*<br>*Approximately 10-15 hour with the group* | • Student demographic survey<br>• Observation (video recorded)<br>• Interviews with students (video recorded<br>• Researcher opinions<br>• Student work sheets<br>• Data from QA server (info about logins, chat sessions, student portfolios) |

**Table 3.3** Continued

| Case | Participants | Implementation | Data Collection Methods |
|---|---|---|---|
| **Case-4** | 16 students (4th grade to 6th grade) 10 female 6 male | Summer 2008 3 weeks Approximately 10-15 hour with the group | • Student demographic survey<br>• Observation (video recorded)<br>• Interviews with students (video recorded<br>• Student work sheets<br>• Data from QA server (info about logins, chat sessions, student portfolios) |

### 3.9. Data Analysis

According to Miles and Huberman (1994) "coding is analysis", as the simplest definition regarding qualitative research studies (p. 56). There stands a large amount of data coming from different data collection sources (such as interviews, field notes, observations etc.) after data collection phase of the research completed. The way to analyze this loaded data set in qualitative research starts with reading through the data in order to get a sense of it (i.e. what data tell us). What follows is called as "line-by-line analysis" (Strauss & Corbin, 1998, p. 57). Codes emerge during this analysis. Codes can be defined as "tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study" (Miles & Huberman, 1994, p. 56).

Although in the literature there are different approaches and qualitative analysis techniques suggested by different scholars, it is possible to say that they all meet in a single point. In other words, all those approaches have something in common. That is the importance of detailed description of data the researcher have and bringing main themes out in such a way that make a sense within the study and they are all related to each other (Yıldırım & Şimşek, 2005).

In a parallel sense with the main points of data analysis cited before, the qualitative data analysis procedure in this study included three main steps; including transcription of all data types, reading through each data set to obtain a general meaning from them, revealing the codes emerged from the data and explaining each by giving examples taken from any data set.

First of all, as stated before, the interviews were recorded with tape recorder and all of the observed sessions were recorded with a video camera. All these data were transcribed by the researcher before diving into the analysis part. In order to determine the themes and codes, the data were analyzed by conducting content analysis.

The transcriptions were read to see the whole picture of the data. After reading one more time, the themes and the codes falling under the themes were determined based on the research questions. The themes and the codes all came from the data. In order to support reliability of coding, the transcriptions were read for a few times. They were read once before the analysis and they were read again and again while going through the analysis section.

Moreover, as explained more in detail in peer review section below, some part of the data were also analyzed and coded by a colleague who was not only knowledgeable on games research in education, specifically Quest Atlantis, but also proficient with qualitative data analysis with which she dealt beforehand. She also coded the data and interrelated reliability values were calculated considering all the data coded by the researcher and the peer reviewer.

For the analysis of qualitative data, qualitative data analysis software, called NVivo, was used. The analyses were not conducted in an automatic way by the software itself. Rather, the software was merely used as an environment composing of all the data inputs and presenting them together. Moreover, the qualitative data analysis was done by the researcher; all the nodes were created by her. Additionally, the SPSS software was used for the statistical data analysis part. Although there was no numerical data available collected through a survey-like method, the data coming from student demographics questionnaire were analyzed using statistical techniques. In this respect, data were coded as numerical symbols and were analyzed using SPSS.

**NViVo:** It is the name of the software used for qualitative data analysis released by QSR International in 2006. The used software version was NVivo-7. All qualitative data sources were imported to NViVo as a qualitative data project. The researcher coded each data set according to main- and sub-research questions. The codes and themes were created from the data by the researcher accordingly.

**SPSS:** It is the name of the software used for the statistical analysis. Although qualitative data analysis was conducted in this study, the demographic information of the students was analyzed quantitatively through SPSS.

### 3.10. Role of the Researcher

In this section, the role of the researcher in the research settings is explained. In addition to this, the background of the researcher, her beliefs and assumptions are also clarified. The former is important to emphasize the status of the researcher in the study while the latter is important to clarify the issues of bias, a critical potential problem in qualitative research, and make the readers understand the researcher's position. Both may have effects on the study, therefore, should be explained – a concept known as reflexivity. Rossman and Fallis (1998) explain the idea of reflexivity as "…a relationship always exists between the researcher and those being researched. This relationship and the reflections on it comprise a phenomenon called *reflexivity* that is central to understanding the practice of qualitative research" (p. 38). Therefore, the role and the background of the researcher are explained in this part of the study.

**Role of the Researcher – Participant-as-Observer:** As stated before, cases 1 and 2 took place in private school settings and cases 3 and 4 took place in a non-governmental organization setting. Observing the settings and facilitating the activities, the researcher was in the position of "participant-as-observer" (Gold, 1958, p. 220). In other words, she was not only the implementer of the study (i.e. the researcher), but also was a participant as facilitating the activities in all of the four cases. Some of the students called her as "Quest Atlantis teacher".

In the cases 1 and 2, the teachers attended the classes with the researcher; however, the researcher facilitated all of the activities. As stated below, the researcher was graduated as a teacher from the university. Although she did not work in elementary schools, she was enrolled in training sessions for many semesters in her school life. She not only observed what was happening in those settings, but also had many chances to teach there. Also, she participated in many other classes in elementary schools after graduation. Therefore, facilitating the activities in the cases was not a big deal, and did not cause any problems.

In the cases 3 and 4, the researcher was one of the volunteers of the foundation. Volunteers play one of the most important roles in the foundation with supporting children's academic, social and emotional development. As written in the official web-site of the foundation "volunteers not only offer non-formal education but also help raise social awareness and promote social participation among children". In order to be a volunteer in the organization, the researcher joined three seminars which are mandatory to become a volunteer there. The first seminar was an introduction to the foundation. The history of the foundation, its mission, and the educational programs offered by it were the main topics covered in this seminar. The second seminar lasted through a day and it was about the ways of establishing communication with people, especially with children. The third seminar took two days. It was about the instruction methods to be used in activities. The topics included constructivism, cooperative learning etc. After attending the seminars, she became a volunteer of the organization. As the person knowledgeable about the research project to be implemented, she was the volunteer executer of the project in the organization. She came together with the children in computer laboratory (one hour each day) and the project hour took place between 12 p.m. and 1 p.m.

In addition to facilitating the activities, she had several other roles in this research. As the responsible person of the study, she was the designer of the virtual environments in the QA world and other documents related with the projects. She also installed the program to the computers in all settings and gave students technical support and help continually. The accounts of the students and of the teachers were created by the researcher and were controlled frequently in order to prevent abusive use (i.e. controlling chat records to see if there was any swear-wording happening).

**The Background of the Researcher:** The researcher was graduated from the Faculty of Educational Sciences of a university located in Ankara, Turkey. The department she was in enrolled was Computer Education and Instructional Technology, a department established not only to educate computer teachers but also equip them with knowledge about the use of technology in education. The graduates of the department can also take part as specialists in technology-based (especially with the use of computer and Internet technologies) educational material development. After graduating from the department, she was enrolled in the integrated Philosophy of Doctorate (PhD) program in the same department at another university in Turkey.

Since the beginning of her university life, she has come across with a variety of technology-based applications in education and took part in the development of technology-based educational materials. Therefore, she has a positive attitude, in general, to the use of technology for educational purposes.

As a person who likes playing video games and who has spent her childhood playing games on her Atari for years, “the idea of using games for educational purposes” was the inspiring idea she heard from Dr. Çağıltay and that was the day she gave her attention to this topic. She studied this topic with the research team leaded by Constance Steinkuehler at University of Wisconsin-Madison. So far, the researcher conducted several studies on the use of games in education (Bakar, İnal & Çağıltay, 2006a; Bakar, İnal & Çağıltay, 2006b; Bakar, Tüzün & Çağıltay, 2008; Steinkuehler et al., 2009). Reviewing the literature on this topic and coming across with the QA project and research projects conducted around the project, she decided to use this virtual environment and conduct a study and see what happens in the conditions of Turkey. This was the starting point of this research; it was the topic she studied with self motivation and interest.

**Assumptions on research paradigms:** The researcher took several research courses during the PhD covering both qualitative and quantitative research methods. She also read lots of articles and studies conducted using either qualitative, quantitative or mixed method. Having a background on research methods, she is knowledgeable about the potential strengths and weaknesses of each method and believes that one of them can be selected regarding the research purposes. If researchers want to investigate a large group of participants in the broad sense then they can select quantitative method; on the other hand, if they want to examine a small group of participants in depth, qualitative method would work for them; or they can combine both methods depending on what they want to study.

In the present study, she aimed to determine the patterns of using a MUVE in educational environments. Since the purpose of the study was to see the whole picture, investigating the context in detail was the best choice; therefore, she decided to conduct a qualitative case study.

**Ethical Considerations:** Before conducting the study, she submitted the research proposal to Institutional Review Board (Fen Bilimleri Enstitüsü Etik Kurulu). Since the research does not provide any division that could harm the participants of the study, the research got permission from the board. The researcher also talked to the administrators of each school and the headquarters of the organization. The details of the implementation, data collection tool, and the virtual environment QA was introduced to them as a proposal at first. After getting permissions, information about the QA was given to the head of field teachers (zümre başkanı) and meetings were conducted. The details of the project (which subject, teacher, classroom to select) were discussed with them, and they were provided with information about the phases of the study. Also, students were enlightened about the project before the study started, and voluntary participation forms were signed by the students.

The researcher had meeting with committee members throughout the study. She gave information about the process of the study (what has been conducted so far, and what is the next step to be) in these meetings. All the data collection instruments were reviewed by the committee members and changes were done according to their suggestions when needed. The advisor and co-advisor of the researcher were knowledgeable about the every step of the study; the researcher was in touch with them continually. Especially, the co-advisor of the researcher gave support on the technical issues of the QA since he had more authorization rights as being a buoy of the QA project.

While writing the results and conclusions of the study, the researcher was objective as looking through the emergent themes and results, and she always depended on the data from interviews, documents, and observations. She also compared the results of the study with others from the literature in order to compare/contrast the findings.

### 3.11. Trustworthiness

The trustworthiness of research results in education has vital importance (Merriam, 1998). Trustworthiness is the key term used for case study research regarding validity and reliability (Bassey, 1999). The researchers should consider some issues while conducting a qualitative study in order to make it a trustworthy investigation; that is to provide with valid and reliable results.

**Triangulation** Triangulation means the use of multiple data sources or multiple ways of verifying the results of the study (Merriam, 1998). It also means collecting data from different contexts (Maxwell, 1996). The study “gains credibility by thoroughly triangulating the descriptions and interpretations” (Stake, 2005, p. 443). In the present study, data triangulation was ensured by collecting the data using a variety of ways, including interviews, observations, and questionnaires, in order to make a coherent analysis of the cases. As a multiple sources of data, interviews were conducted not only with the students but also with the teachers. Also, the researcher conducted studies in four different settings, that was data from multiple cases was gathered to “cross-validate and corroborate findings” (Johnson & Christensen, 2004, p. 426).

**Clarifying researcher bias** Researcher bias is a critical treat to validity in qualitative research because the researcher is the key instrument of data collection and analysis. Also, some researchers criticize qualitative researchers as finding out “what they want” and writing what they found (Johnson & Christensen, 2004, p. 249). On the other hand, Rossman and Fallis (1998) name qualitative researchers as learners who “construct an understanding of their topics through the questions they ask, the contexts they study, and their personal biographies” (p. 26). Researcher bias occurs due to the researcher’s attitude of selecting the “relevant” data from interviews, observation or any other type of data to be recorded. In order to clarify this issue and overcome a potential threat of researcher bias, information about the researcher, including her role in the research settings, and her theoretical background and assumptions, is provided previously in this chapter. In other words, a self-reflection was done by the researcher to ensure reflexivity (Johnson & Christensen, 2004).

**Peer review** Peer review is one another method used in order to promote trustworthiness. Peer review can simply be defined as getting comments of other people about the analysis, results, and conclusions of the research.

During the analysis (i.e. the coding process), interrater reliability was calculated for all the qualitative data types. Coding was done by the researcher and a peer separately, and then the codes were compared and interrater reliability was calculated. The peer was also a PhD student in the same department with the researcher. She was experienced on qualitative data analysis. Moreover, she had experiences of research investigating the use of games and MUVEs; she also conducted studies about Quest Atlantis before. The interrater reliability was calculated using the formula (Equation 1) by Miles and Huberman (1994, p. 64).

$$\text{Reliability} = \frac{\text{Number of agreements}}{\text{Total number of agreements + disagreements}} \qquad \text{Eq. 1}$$

The name of the codes and patterns were finalized after this process. The interrater reliability values are summarized in the table below (Table 3.4).

**Table 3.4** The Value of Intercoder Reliability Addressing the Types of Qualitative Data

| | Student interviews | Student perception questionnaire | Teacher interviews | Videos |
|---|---|---|---|---|
| The value of Intercoder reliability | 80 % | 79% | 78% | 82% |

In addition to peer check for the coding process, the researcher asked her advisor, co-advisor, and a peer to comment on the results and conclusions as well. Moreover, as stated above, all the data collection instruments (interview questions, questionnaires) were also reviewed and evaluated by other researchers (the details are provided in the "data collection tools" section in this chapter).

**Rich descriptions** The way that the researcher follows to write a study may influence the readers' understandings of the results (Gall, Gall & Borg, 2003). While writing the results of this study, the researcher explained each case in detail and used exact quotations by the participants to make the readers feel what happened during the implementations of the study. The detailed and explanatory writing style of the researcher also may support other researchers to transfer the information and results gathered from the present study to other settings, and/or to conduct the same study within another context (Creswell, 1998). This is the term known as transferability in qualitative research.

**Long term interaction** In qualitative studies, the researchers should interact with the data sources (participants, documents, the observed setting etc.) as much as possible (Yıldırım & Şimşek, 2005). In the present study, the researcher spent time within the research contexts as much as possible. In order to know the participants well and to be known by them before the study started, the researcher was introduced by classroom teachers earlier and they were given information and opportunity to use the QA environment. The researcher conducted more than one observation session in each case, which reduces the influence of the presence of researcher in the settings. Also, she was online in the QA environment to help and facilitate the students who needed information about what to do.

### 3.12. Limitations and Delimitations of the Study

The limitations and delimitations of the present study include the following issues:

- The teachers who participated in the study did not take active part during the implementation and therefore the researcher took the role as the teacher as well. She collected the research data and conducted the implementation by herself.
- The participants of the study is limited to two classrooms selected from two different private schools in Ankara, and also limited to the two groups of students attending a NGO summer activities in 2008 in Izmir.
- The groups are limited with the students who were in the selected classrooms/groups when the study was conducted.

- Although there is more than one case included in the study, this study is limited in terms of generalization. The results of the study may give a general sense to the researchers and teachers interested in the topic; however, cannot be generalized beyond the study.
- The reliability of the responses gathered through the interviews and questionnaires are limited with the honesty of participants.
- The researcher did not have the chance to spend time with the students who included in this study. The school rules restricted excluding the researcher's participation to the classrooms apart from implementation hours. In the NGO cases, the students joined the groups when they wanted, therefore, the groups showed differences each time an activity period got started. Also the students came from different schools. Therefore, the researcher did not have a chance to be with the same group before the study began. In order to overcome this limitation, the researcher spent some extra time as much as possible.
- The results of this multiple case study conducted through qualitative method cannot be generalized due to small sample size; however, people can transfer the information to other similar settings.
- In cases 3 and 4, as there was no other facilitator or teacher in the research setting, the researcher was the only facilitator. Therefore, the researcher gave her opinions as explaining second sub-research question. In order to prevent researcher bias emerge, the researcher relied on data while giving results of those cases.

# CHAPTER 4

# RESULTS

## 4.1. Introduction

This study is a qualitative multiple-case study investigating the use of a Multi-User Virtual Environment, called Quest Atlantis, in educational settings in Turkey. In this respect, four case studies were conducted. The qualitative data were collected from each case through interviews, observations and documents. In this chapter of the dissertation, the results obtained from each case are presented in a detailed and extensive way to make the readers understand the cases as much as possible and to help them see the whole picture. Before making a cross-case analysis among the cases, the researcher will first explain the results gained from each case as an initial step (Patton, 2002).

In this chapter, giving the results of each case study, the demographic information of the students is going to be provided as the initial step. Using a questionnaire, the researcher obtained the demographic information of students including their opportunities for using computer and some other digital technologies, and their habits of using computer and Internet technologies (duration, frequency, and purposes of use). The questionnaire included 17 questions (see Appendix I). This information may provide with information that may explain some of the similar or different results gained from each case.

As the next phase, the qualitative results are explained in the scope of the research questions. After giving the results of research questions for each case study separately, the results are compared and contrasted to investigate if there are similarities and differences among the cases. In other words, a cross-case analysis is provided following the individual results of each case study.

### 4.2. Results of Case-1

The results of case-1 are presented under the following section. The demographics of students are explained as the first phase. After that, the results of qualitative analysis are provided regarding each research question.

#### 4.2.1. Demographics of Students

This case study was conducted with a 7$^{th}$ grade classroom of a private school located in Ankara, Turkey. The number of students in case-1 was 20; seven of which was female and thirteen was male (Figure 4.1).

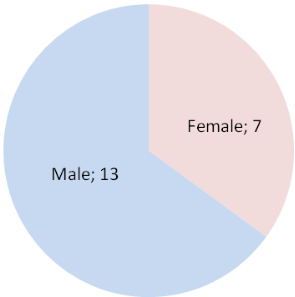



**Figure 4.1: Graph illustrating the distribution of gender**

As demonstrated in Table 4.1 below, every student who were participated in case-1 had home computer with Internet access (n=20, 100.0%). All of the students stated that they used the computer that they had at their home. Nevertheless, among these students, only 18 (90.0%) of them expressed that they connected the Internet from home computer while two (10.0%) of them did not. In addition to home computer, 14 (70.0%) of the students had at least one game console (such as Atari, PlayStation etc.) whereas six (30.0%) of them did not have any.

**Table 4.1** Students' having home computer and game console

| | Yes | | No | | Total | |
|---|---|---|---|---|---|---|
| | *f* | % | *f* | % | *f* | % |
| Home computer | 20 | 100.0 | - | - | 20 | 100.0 |
| Internet access at home | 20 | 100.0 | - | - | 20 | 100.0 |
| Game console | 14 | 70.0 | 6 | 30.0 | 20 | 100.0 |

The durations of students' computer and Internet usage were investigated and the results are presented in Table 4.2. The results indicated that most of the students asserted that they had been using computer technologies for more than five years (n=13, 65.0%) and using Internet technologies for four years and more (n=15, 75.0%). It was surprising that there was no student who had been using the computer and Internet for one year and below; in other words, all of the students had been using these technologies for at least two years and a high percentage of them had already been using for four years and more.

**Table 4.2** The length of time that the students use computer and Internet

| | Computer use duration | | Internet use duration | |
|---|---|---|---|---|
| | *f* | % | *f* | % |
| 1 year and below | - | - | - | - |
| 2-3 years | 1 | 5.0 | 5 | 25.0 |
| 4-5 years | 6 | 30.0 | 7 | 35.0 |
| More than 5 years | 13 | 65.0 | 8 | 40.0 |
| Total | 20 | 100.0 | 20 | 100.0 |

Table 4.3 given below shows the numbers of students regarding the frequency of their Internet use. As the results indicated, a high percentage of the students (n=12, 60.0%) used the Internet every day. Other six students also use this technology often as they claim they use it a few times in a week. There was only one student using the Internet rarely – a few times in a month.

**Table 4.3** Students' Internet use frequencies

| | Internet use frequency | |
|---|---|---|
| | *f* | % |
| A few times in a month | 1 | 5.0 |
| A few times in a week | 6 | 30.0 |
| Every day | 12 | 60.0 |
| Total | 19 | 95.0 |

In addition to the duration and frequency of Internet usage, students were asked to state the places where they used the Internet most often (Table 4.4). As the results indicate, home and school are the most common places where the students had access to Internet. Six (30.0%) students stated that they used this technology at home, four (20.0%) at home and school, and six (30.0%) at home, school and another place (such as a friend's computer) where they had access to a computer with Internet access. Four other students asserted that they accessed the Internet at home and some other different places such as Internet café's or the office computer of their parents.

**Table 4.4** The places where the students access the Internet

| | Places to use Internet | |
|---|---|---|
| | *f* | % |
| Home | 6 | 30.0 |
| Home & School | 4 | 20.0 |
| Home & School & Somewhere else | 6 | 30.0 |
| Home & Somewhere else | 4 | 20.0 |
| Total | 20 | 100.0 |

The results about the students' use of computer software are summarized in Table 4.5. Presentation software was the only one among others that all of the students (n=20, 100.0%) had utilized. Other types of software that most of the students used are categorized respectively as games (n=19, 95.0%) and word processors (n=18, 90.0%). Drawing software (n=7, 35.0%) and spreadsheets (n=9, 45.0%) were the software types that was used by the less than half of the students.

**Table 4.5** Number of students using computer software applications

| | Use of computer software use | |
|---|---|---|
| | *f* | % |
| Presentation | 20 | 100.0 |
| Games | 19 | 95.0 |
| Word processor | 18 | 90.0 |
| Drawing | 7 | 35.0 |
| Spreadsheet application | 9 | 45.0 |

Another item was about the Internet applications that the students employed (Table 4.6). According to the results, e-mail (n=18, 90.0%) and watching videos (n=18, 90.0%) were the most favorite Internet applications that the students engaged in. Playing single-player games, doing chat, listening mp3 files, downloading files and searching for information through search engines were all done by 17 (85.0%) students. Flowing around web sites (n=16, 80.0%), social networking (n=14, 70.0%), uploading files (n=12, 60.0%) and multi-player gaming (n=12, 60.0%) were the other most popular Internet applications among the students. On the other hand, watching films (n=7, 35.0%) and posting opinions on forum pages (n=5, 25.0%) were the least popular ones. One student did not respond to this item.

**Table 4.6** Number of students using Internet applications

| | Internet applications | |
|---|---|---|
| | *f* | % |
| E-mail | 18 | 90.0 |
| Watching videos | 18 | 90.0 |
| Single-player gaming | 17 | 85.0 |
| Chat | 17 | 85.0 |
| Listening MP3 | 17 | 85.0 |
| Download files | 17 | 85.0 |
| Searching information | 17 | 85.0 |
| Web (WWW) | 16 | 80.0 |
| Social networking | 14 | 70.0 |
| Upload files | 12 | 60.0 |
| Multi-player gaming | 12 | 60.0 |
| Watching films | 7 | 35.0 |
| Forum postings | 5 | 25.0 |

All of the students (excluding the missing data) (n=19, 95.0%) stated that they benefited from the Internet technologies while doing their homework. Only one student (5.3%) claimed that s/he got in touch with teachers using the Internet (Table 4.7).

**Table 4.7** Students' purposes of using the Internet

| | Purposes of using the Internet | |
|---|---|---|
| | *f* | % |
| Homework | 19 | 95.0 |
| Contact with teacher | 1 | 5.3 |

### 4.2.2. Research Question – 1 – Student Perceptions

In this study, the opinions of students could not be gathered through interviews since there was no time available during school hours. The students went their home with school services when the classes ended. Moreover, the students did not have extra time during school hours to do the interviews. Therefore, the student perception questionnaire was prepared and applied to this group of students. The questionnaire included eight main questions with sub questions (see Appendix G). The students gave short answers to the questions. Among the twenty students, fifteen of them filled the questionnaire.

In addition to the questionnaire, spontaneous questions were asked to the students so that their opinions were gathered as much as possible about the implementation process. In this part of the dissertation the codes emerged from this data was explained in detail regarding the research questions.

#### 4.2.2.1. The Way the Students Used QA

The table given below (Table 4.8) shows the number of times that students logged in, the number of chat massages and e-mail that they sent.

As the table below indicated, the number of logins showed differences among the students. This difference of the numbers may be an indicator of student interest towards the project and QA environment in general. Some of the students logged in more than others; in other words, they also logged in more than the project required. The opposing situation can also been from the table: some of the students logged in less than the number of implementations. This may be due to students' attendance during the implementations. As the implementation was conducted at the end of the semester, some of the students did not continue the classes regularly. Moreover, a few of the students sent chat messages and e-mails to others, as the table showed.

**Table 4.8** Students' QA use statistics

| Students | Gender | # of logins | # of chat massages | # of e-mails sent |
|---|---|---|---|---|
| S1 | Female | 23 | 51 | 8 |
| S2 | Male | 15 | 5 | 0 |
| S3 | Male | 3 | 0 | 0 |
| S4 | Male | 4 | 2 | 0 |
| S5 | Female | 19 | 16 | 0 |
| S6 | Male | 7 | 0 | 0 |
| S7 | Female | 6 | 0 | 0 |
| S8 | Female | 6 | 4 | 0 |
| S9 | Male | 1 | 2 | 0 |
| S10 | Male | 2 | 12 | 0 |
| S11 | Male | 2 | 6 | 0 |
| S12 | Male | 12 | 57 | 0 |
| S13 | Male | 1 | 0 | 0 |
| S14 | Female | 4 | 7 | 0 |
| S15 | Female | 3 | 2 | 0 |
| S16 | Male | 19 | 123 | 1 |
| S17 | Male | 10 | 11 | 0 |
| S18 | Male | 10 | 31 | 0 |
| S19 | Female | 66 | 25 | 5 |
| S20 | Male | 19 | 10 | 0 |

#### 4.2.2.2. Student Experiences

**Easy project:** Twelve of the students claimed that it was an easy project to complete. For example a student stated that "it was so easy to find out the data that I easily completed the game" (C1/S19) and another student added that collecting the data helped them accomplish the task "*[it was easy]* because when you evaluate the whole data sources together, the results come up" (C1/S7) *[Italics in brackets were added by the researcher]*.

One of the students claimed that "it was easy because it was Turkish" (C1/S16).

**Difficult:** Although most of the students stated that the project was easy and they did not have difficulties completing the activities, there were three students complaining about the projects' being difficult. These students did not mention about easy part of the project. For example one student stated that it was difficult for him since "I had to investigate whole Kızılırmak park" (C1/S11).

On the other hand, there were four other students who gave their opinions about both the easy and difficult parts of the project. One student said "it was hard to take notes" (C1/S12), and one other student said "the game was working too slowly" (C1/S13). Other two students mentioned about the load of data sources: One of them said that "I became undecided and it took too long to collect the data" (C1/S1) and the other said "it was hard and the reasons of this was that there was too much data and it was needed to benefit from too many resources" (C1/S18).

**QA Characteristics that Students Like/Dislike**

The responses that the students gave about their likes and dislikes of QA characteristics were categorized and the codes were grouped under the related themes, as shown in the table below (Table 4.9). Student likes included the themes fun, easy, scientific, learning and being online. On the other hand, student dislikes included having connection problems, time, bad game elements, taking place in computer environment. Some of the items below were only cited by one student; while some others were mentioned by few students.

**Table 4.9** Students' likes vs. students' dislikes

| Student likes | Student dislikes |
|---|---|
| 1. Fun<br>• Learning through gaming<br>• Gaming<br>• Subject matter<br>• Completing tasks<br>• Interaction with friends | 1. Having connection problems |
| 2. Easy<br>• To learn<br>• To finish the task | 2. Time<br>• Time is limited<br>• Too long<br>o Reading and writing the thoughts of each person (NPCs) in the game<br>o Takes too much time<br>o Caused losing time/ Wasted my time<br>o Could not spend time for tests |

**Table 4.9** Continued

| | |
|---|---|
| 3. Scientific<br>• Collecting data<br>• Inquiry skills<br>• Increased interest for research<br>• Developed scientific thinking skills<br>• Increased research skills | 3. Bad game elements<br>• Boring<br>• Bad graphics<br>• Not being able to collect some items (stones)<br>• Not being able to customize avatar (deficient number of clothing and face options) |
| 4. Learning<br>• Informative<br>• Environmental conscious<br>• Environmental pollution<br>• A variety of subject matters<br>• Computer literacy<br>• Good way of learning class related subjects<br>• Real life issues<br>• Ecosystem<br>• Good way of reinforcing class subjects<br>• How to make research<br>• Self consciousness | 4. Taking place in computer environment<br>• You have to spend some hours in front of computer in order to finish |
| 5. Being online<br>• Being able to be online by convincing parents of studying school subject | |

**Student likes:** As seen from the table, students' likes of QA implementation were slightly more than their dislikes of it. Students stated that they had fun while playing computer game in class environment. Other things that they enjoyed included learning in a game environment, the problem case of the activity and the way it was used as part of a class work (i.e. the subject matter), completing the tasks around the problem case and interacting with their friends in the virtual environment while doing all the other course related things. For some of the students learning through QA was easy. Additionally, finishing the task was easy for some other students, too.

In terms of learning through a problem case in an inquiry learning environment, the responses of the students showed that learning in QA contributed their scientific skill development, and they liked this opportunity. As being a scientist investigating a fish-decrease problem in a national park, students liked collecting data as part of their work. They also thought that learning in QA increased their inquiry skills, their interest for conducting research, the ability of scientific thinking and their skills for conducting research.

Students mentioned about some other issues related with their learning as their likes of QA and its implementation. The answers of students indicated that the implementation learning through QA was a good way of learning the class subjects and it was also a good way of reinforcement for those subject issues. QA was so much informative that it made them knowledgeable about ecosystem, environmental pollution and it increased their environmental consciousness; and therefore their awareness toward environmental issues had been increased. Investigated this environmental problem, students thought that, QA helped them to decide on what to do if they face with a similar situation in real life in the future. Students also claimed that they learned how to make research. Interestingly, students thought that they not only learned about environmental issues but also about a variety of other subject matters. Additionally, QA ensured the development of students' computer literacy skills, and also their self consciousness, as the student answers to the questionnaire showed so.

Another issue a male-student (C1/S11) put it under "likes" category was that QA's being a course-related issue and it's being played on the Internet gave a chance to him for being online at home (most probably during the hours when his parents did not let him to do so). The surprising point is that he was not interested in the QA activity at all during the implementations. On the other hand, he "used" QA to convince his parents to be online on the Internet. Most probably, he opened QA window and in another window he did whatever he actually wanted for passing time on; and the kept QA page open whenever his parents were around him. This was something he liked about QA; was it a contribution to him or a real like of him? – it was discussible though.

**Student dislikes:** One of the dislikes that the students mentioned was connection-related-problems that they had faced while using QA. Students complained about communication problems several times as a factor preventing their QA use, both at home and at school lab. There were some students stating that they were not able to run QA in their home computer where the operating system was Windows Vista. Additionally, during the implementation sessions, due to low-Internet-speed and the deficient capacity of computers, some of the students' game screen stopped running and they had to either wait for some time to QA for running again or start using another computer or restart their own computers. This problem caused students losing interest. Additionally, the time was so limited from which these problems stole some time, too.

Another dislike was related with time issue. Although there were students stating that the activity was easy and it did not take much time to complete, there were some other students thinking just the opposite. They stated that the time available was so limited that they had difficulty finishing the activity. Additionally, the students mentioned about the load of the information (data) which took too much time from them. According to them, reading and writing the thoughts of each NPC in the game were too much and took from their time. Interestingly, there were students complaining about this issue as a problem for preventing them doing other activities either of their social life or of the time they supposed to spend answering SBS tests.

Some of the students also mentioned about some of the game elements as their dislikes. Considering that they were children of high-income-families and they all had computers and Internet access at home, some of them, inevitably, had been playing computer games with a more attractive graphical interface. This could be the reason why the game elements of QA did not satisfy their expectations of a computer game. Some of the students, unfortunately, found QA as boring and including bad-design elements. On the other hand, there were other students who disliked not being able to collect some items (such as stones) embedded in 3D worlds. Two of the students stated that they were not satisfied with avatar customization alternatives. According to the, they were not able to customize their avatars as they wanted because the number of clothing and face options were limited.

One more dislike that the students mentioned was QA's being in a computer environment. There might be several reasons behind this; first of all the student may dislike being in front of computer screen for doing homework even if it was a game-like environment. Second, spending long time with computer may bore them. For example, one of the students said that as dislike "you have to spend some hours in front of computer in order to finish". Another reason may be QA's being an innovative learning environment and as something entering their classroom by an outsider. Learning through a computer-based immersive learning environment was not a type of learning for them; they might have difficulty because of that.

#### 4.2.2.3. Comparison of QA with traditional classes

Students' responses indicated that they did not like QA setting at first, but as they use it their interests toward it increased. They also added that they found the activity fun and useful as they continue doing the project. There were also students asserting that this activity made them canalizing to science and being scientist.

It was interesting that some of the students indicated that their interest towards science increased with the implementation they participated in QA setting. According to some of the students, QA made it possible learning and having fun together. On the other hand, there were students indicating that they did not find it as a type of activity related with their science classes. This may be due to the fact that they were not get used to learn through a MUVE setting, and this activity was a very different than the other traditional methods such as lecturing, the use of books etc. Moreover, although the activity was a science activity and it was about environmental issues, and the implementation was conducted as parallel with the same subject matter in 7$^{th}$ grade curriculum; the virtual environment did not include exactly the same content existing in text book. This may be another reason why students felt that the activity was not related with science. As depending on a different learning experience and as being very different from the text-book-type of learning, the students may not be able to relate this type of activity with their class activities, even though their teachers claim so. Therefore, teacher facilitator gains much importance at this point.

Some of the students claimed that the Kızılırmak National Park activity did not arouse their interest towards science; rather, it increased their interests toward environmental issues. They agreed on the fact that they learned concepts about environmental issues, such as pollution, the importance of protecting the environment, the importance of making research, and the complexity of ecology.

Some of the students confessed that they completed the activity because it was compulsory and because their teacher wanted them to do so. Unfortunately, some of the students did not like the activity at all and, as stated before, could not relate it with their science classes.

According to most of the students, the field notebook was so thick and including too many pages. The idea of doing too much work, however, decreased their motivation at first. On the other hand, as they go through the steps of the project and work over the problem, they acknowledged that it was a useful source, and it helped them organize data. According to these students, taking notes made it easier to see what was happening in the park, and what caused the problem emerging.

As a classroom activity, it was kind of complicated for the students. Although details of the project explained by either the researcher or the science teacher many times, they could not get into it, as it was an innovative activity, they had limited time of implementation, and it was a complex learning environment including a variety of dimensions.

Considering with the type of homework, some of the students found QA as a fun way of doing homework. As these students were interested in the project, and as they were very much into the project and they were trying to solve it, they liked being a part of it. One of them claimed that she thought that doing homework might be difficult within a game-like environment; however, she found out that it was just the opposite. It was not difficult for her; and moreover, it was fun.

#### 4.2.2.4. Student expectations about the improvements in QA

As mentioned before, these students were very much familiar with computers and computer games in general, and some of them did not like the graphics of QA-MUVE. Comparing with other types of games they usually play, they found QA simple and not attractive enough. According to these students, the graphics of the environment should be improved, and it should be made more exciting and appealing. The game should also be made fascinating, as the students claimed. The students also suggested that it should include other activities; should not be limited with this science activity only.

Some students state that it is a good way of learning and practicing so that it can be used in other subject areas as well besides science; such as social sciences. According to these students, the use of QA would make classes more fun. One of the students, for example, suggested that the environment can be used to animating the wars done during the Ottoman Empire period.

The students also claimed that a research activity like this should include less writing and less reading activity. The students needed to continue some part of the projects at their home, as they could not finish the necessary parts in computer lab. This made them felt like the activity was overloading for them.

### 4.2.3. Research Question – 2 – Teacher Perception

The results of teacher interview are provided under the headings below regarding the sub-research questions. The way the teacher perceived the use of MUVEs as educational materials, her opinions about her students' learning in a learning context where a MUVE tool were used and her role in this learning environment, and finally her suggestions regarding the further use of MUVEs in learning environments are explained in detail by supporting the codes with her speeches.

#### 4.2.3.1. The way the teacher used technology

Regarding the technology use in education, she did not enroll any classes during her undergrad education; rather she participated in several seminars and in-service training programs that aimed to make teachers use technology in their classes in order to increase the effectiveness of their teaching. These seminars and training programs included technological applications, computer games, the use of computers and web-sites, design and development of web-sites, as she stated.

In this case, the classrooms were equipped with technological devices. There were computer, projector and smart board in each class; meaning that the teacher had already been using technology in her classes, as she also claimed. She expressed that they, as the whole school, supported the idea of using technology in education.

> C2/T1: This is the mission we have, as the whole school. It is technology prioritization, the existence of smart boards in classes, students' being the as followers of technology and Internet applications and their use of it, and thanks to in-service training programs, our technological developments, being well-informed about technological applications happening in our country and in the world, and finally the use of technology depending on our school's opportunities and in collaboration with computer teachers.

As the teacher expressed on more time, they were pretty much depended on other conditions when it came to technology use. They planned their techno logy use at the beginning of each semester; nevertheless, the situation showed changes during the practice. She asserted that they, at least, tried to guide students in technology use out of school.

> C1/T1: We need to use technology in practice; therefore we integrate it when we are preparing our yearly educational plans. However, the use of computer lab or the use of games or other applications to support the curriculum subjects depend on the flow of course; we sometimes use technology each week, but we sometimes cannot use it for a month. This is completely depended on subjects and the availability of computer lab. We mostly use lecturing method and give theoretical information in class in order to complete the requirements of curriculum. Even though we do not use it, we try to direct students to technology use.

She also asserted that they integrated technology while they were writing yearly educational plans; however, when it came to implementation of the curriculum, they mostly depended on the schedule of computer labs and the load of curriculum work. When they had opportunity, they took the students to computer labs to do experiments in computer environments.

> Researcher: Can you give an example of technological applications that your students do in computer lab environment?

> C1/T1: In computer labs environment… For example, there are experiment software and web sites that we use. Also, one of our science teachers translated one of these web sites. Let’s say, after explaining a chemistry subject, we do the related experiment in computer lab rather than doing it in science lab. Each student can individually complete an experiment, such as an experiment of acid-base and salt, by working on it step-by-step; and it is also a visual way of experimenting. Moreover, the level of danger is less. Therefore, we use computer lab for chemistry subjects most of the time.

The teacher pointed out that it is mostly four or five times in a single semester that they could use computer labs. For this case study, they made an arrangement with computer teachers and we could use the lab for three weeks. But, as said before, they had opportunity to use technology in class, as well.

> C1/T1: We have smart boards and installed software programs in our classes. We use Vitamin *[the name of the software company producing educational programs]* CDs; they have experiment parts and games to practice learning. We use these materials as much as possible depending on the sequence. *[Italics in brackets were added by the researcher]*

The teacher also stated that they did not prepare any type of technology-based materials. Rather, they used the ones prepared by others such as software companies or the ones prepared by educational researchers, such as this one.

#### 4.2.3.2. MUVEs as technology-based educational materials

Although not mentioned about the details, the teacher said that she used games in class to practice the subjects she taught to students. According to her, QA was a successful learning environment and it was useful for the students because it allowed students learn by doing. She explained her opinions about QA as a MUVE to be used in classrooms. Considering this implementation as an integration of technology into science classes, she stated that she found it beneficial. Pointing out how it contributed, she emphasized about the time problem at the same time.

> Researcher: How do you evaluate this implementation as the integration of technology to science classes?

> C1/T1: Very beneficial, because I believe that games allow students learn better thanks to supporting learning by doing. However, we had time problem and we were not very successful in motivating our students; this was our fault and it was due to time problem. We believe that it was very beneficial, but it need longer time of implementation.

According to the teacher, QA contributed not only to her class activities but also to their school mission. Stating that they were an ecologist school, an eco-school, she added that this implementation contributed them in making their students responsible of their environment. She expressed that QA was not only useful in a constructivist learning environment but also was crucial as being a material supporting computer-based instruction.

> C1/T1: I think, it was such an important visual material supporting environment subject and students' practice their knowledge. I believe it will contribute a lot to computer-based instruction.

In addition to supporting learning by doing and visual way of learning, QA allowed students to practice school subjects at home, as the teacher claimed. It had a variety of advantages that was the reason why she considered the game as a supportive tool for permanent learning.

> C1/T1: The advantage of it is permanent learning. It is very beneficial for students to use it at home. I believe it supports permanent learning a lot, because when the students go home they practice what they have learned in class, they use their imagination, they employ their knowledge, and they use all their senses. It is very beneficial when it is used properly.

She also stated that she would like to use QA in her future career. The reason was that QA was a visual way of learning about environmental issues and it was supporting knowledge construction.

> C1/T1: I would like further use of QA because I believe that it helps students' creative thinking, it supports the subject of environment in a

> visual way, it supports scientific thinking and it is useful to educate scientists.

Although the teacher mentioned about many advantages of using QA in her class, she also pointed out that the implementation could not be very successful due to some problems related with students; such as not paying attention to the study or getting prepared for SBS exam.

> C1/T1: It could not be very successful due to some reasons aroused from our side. We could not follow students one-to-one. Students did not play it a lot since they could not use their home computer, it overlapped with exam period, and the curriculum was very much loaded, and also not being able to understand QA language, not consulting you a lot, and goofing off. However, it is a very nice game in terms of its working logic. Also, the students had opportunity to see this type of implementation existed and could be done in school setting.

She also mentioned about some teacher-related problems as the reason of study's not being successful. On the other hand, she claimed at even a single student's positive gain from QA was a success from her perspective.

> C1/T1: We did not prepare students sufficiently. Also, I was not master of the subject, and I confess, I did not do lots of the things and did not play the whole game. I will not say I did not take it seriously, but we were unsuccessful since we were too loaded and I could not leave time for it. In fact, I do not accept that it was wholly unsuccessful. It could be successful enough as we desired. But, I believe it was nice to have at least few students benefited a lot from it in our student group.

#### 4.2.3.3. Opinions on students' learning

Teacher's opinions about students' learning through technology were positive in general. In her point of view, the students were open to learn through technology in general and the school supported them in this respect, as she said "we created awareness among our students". In addition to this, according to the teacher, the principle behind QA was very good and this study was beneficial for students in showing that they could learn thanks to games in this way. On the other hand, she also mentioned that making students accustomed to learn through games was something requiring time. Since the students got used to learn from books and mostly theoretical knowledge was taught to them in class, learning through games was a handicap for them. In other words, as the teacher stated games were a free-time activity for them, not a learning tool; nevertheless this study introduced students this innovative learning method.

According to the teacher, some of the students did not want to complete the activities since they were not motivated to do so. She mentioned about time problem and teachers' ineffectiveness in motivating students in this activity. She said that "the reason may be irresponsibility of students, the game's being long, and available time's being small". She also pointed out some other problems. According to her, the grading system in Turkish education was another factor affecting student motivation towards learning. Another factor that had negative effect on student motivation was that the game was too complicated for the students, as the teacher claimed.

She also mentioned about another reason for the loose of student motivation. That was the language of QA's being in English. Although all of the content was translated into Turkish, it was like an obstacle influencing teachers' and students' first impression towards the game. She claimed that students had problem in understanding game due to its language. After reminding that the content of the learning material that the students were supposed to engage in was all in Turkish, she expressed that they could not be very successful in motivating their students so that they were not very much willing to learn through QA. Moreover, learning through a game was something that they were not accustomed to. As the teacher said, this required extra time to teach them learning through a game-like learning environment.

> Researcher: Although the menus were in English, the content we developed was pure Turkish.
>
> C1/T1: Yes. It was because of students' irresponsibility. We need to try so hard in order to explain this to our students in a country where this type of grading system exists. We could not achieve this since we had short time and a loaded schedule. We could not motivate students well, we could not do that. It was because of us. But there were some students who were interested in it. The system was designed in an

> effective way and it had a Turkish version you helped us a lot. But, we could not motivate our students.

As there were students not interested in learning with QA, there were some others who liked learning in that way so. In other words, some of the students benefited from QA more than some others, as the teacher asserted. She said that it was like fifty-fifty, which means half of the students engaged in learning through QA and they liked doing so whereas the other half did not participated in the activities much. She also stated that even if it was few students benefited from QA, it was a successful application for education.

> Researcher: Did your students share their opinions with you about this learning experience they engaged in?
>
> C1/T1: Yes, they did. They mostly talked about its being in English. These may not be their real opinions. They might be pretending this as an excuse. But, there were some students who liked it a lot. They said that the implementation was so good. But, I do not think that all of them were interested in this activity due to considering they could do something else rather than dealing with the computer. I also could not allocate enough time for this. There were some students who liked it and some others who did not. We can say that it was like half-to-half.

According to her, QA was beneficial for students because it supported inquiry-based learning and students were able to learn by doing. She said that "I think that QA increased students' problem solving, analysis and synthesis skills". Moreover, QA provided students with a visual way of learning. In other words, it was an opportunity for students learn visually. Additionally, as the teacher claimed, engaging in inquiry learning in QA environment, students needed to spend more effort on their learning process because it was a type of learning that they needed to actively participate and solve a multi-dimensional environmental problem.

> C1/T1: QA has also some advantages, students spend effort on their learning…, which is so beneficial for them. They learn visually, and they also learn by doing.

#### 4.2.3.4. Opinions on teacher role

Although the teacher participated in this case was an experienced and senior one, she was open to technological innovations. As she also stated during the interviews, she liked being a teacher in a technology-rich learning environment. Moreover, she added that she believed in the effectiveness of technology-related implementations and would give support to these types of studies to be conducted in her class, such as this one. She asserted that the new curriculum was open to technology-based implementations, but it is at the same time turned into a struggle due to including many activities supposed to be conducted in a limited time.

> Researcher: How much does the new curriculum suitable for technology-based applications?
>
> C1/T1: Yes, the new curriculum is appropriate because there are activities in that. Activities require time. We have a time problem therefore the extra activities should be shorter and should be applied when the related subject is on and the class conditions are appropriate. This is again related with professionalism of the teacher.

Considering the current study of using MUVE in her class, she claimed that it contributed to her although she could not contribute to the study as much as she wanted due to being too much loaded. According to her, successful technology-based implementations were very much depended on the teacher. She commented on the easiness/hardness of teacher role in a technology-based learning environment by saying as below.

> C1/T1: It is depended on teacher's skills. If you know your students well, and you are the master of your subject area; then I do not think that it would be hard. If you start in a systematic manner and determine the assessment criteria, it would not be hard I think.

As she thought that the teacher was responsible on the success or fail of this type of technology-based educational implementations, she blamed herself on the un-successful part of the implementation. In addition to teacher load, the need to educate students before the study influenced the study's success according to the teacher.

> Researcher: What does being a teacher mean to you in this type of learning setting?
>
> C1/T1: Being a teacher is nice. I am kind of teacher who is open to innovations. I am proponent of these applications, and I am ready to help all the time.
>
> Researcher: Yes, I know.
>
> C1/T1: But, of course, preparing our students to this took time; it required preparatory work. I do not think that I achieved this in my loaded schedule. I mean, I do not think that I achieved my objectives as the teacher; but I think that it contributed a lot at the same time. To introduce it and even make them aware of this type of studies was very nice, I think. It was a nice study and I thank for that. I am always open to this type of studies.

Comparing this implementation with face-to-face classes, the teacher asserted that it included both easy and hard ways of teaching. On the other hand, she mentioned mostly about the hard ways of teaching in a technology-based learning environment, including a MUVE in this case. According to her, teaching in MUVE-based learning environment was hard because it was hard to attract student attention and to follow student progress. She also mentioned about the difficulty of teaching in this learning setting when there was only on teacher responsible of the teaching process.

> C1/T1: It has, for sure, both easy and difficult parts. The difficult part is to ensure students' concentration and to help each student, in front of the computer, in every phase of their progress on my own hook. It is hard when you are the only teacher; there are 25-27 students in classes, and therefore you cannot suffice each student's needs. They are not able to progress *[the project]* perfectly. It is hard to come up with by myself when the students constantly ask questions. But it has good sides, too…It benefits them a lot; they learn visually and learn by doing.

In addition to allowing students learn visually and by doing, the technological materials, specifically QA, were beneficial according to the teacher as an alternative way of active student learning. She mentioned about the disadvantage of lecturing on student learning and stated that this type of learning environments was a good alternative when used in a suitable way.

> C1/T1: I believe it was beneficial for the students. They were able to apply what they had learned verbally. I am proponent of using materials; I mean performing lessons with only lecturing method would do nothing more than making students sleep. I think it is very much beneficial to do this type of applications by subject. Instead of using lecturing, the use of technological-materials, the use of games in the right time and place is very much useful.

She stated that she would like to use it in her future career. She expressed the potential advantages of game like environments utilizing technology.

> C1/T1: Yes, I would like to use it because this is such a study cultivating students' creative thinking, giving visual support about environmental issues, enhancing scientific thinking and supporting scientist development program.

In addition to using QA in her future career, she also stated that she would like to take a role in the development process as well. She said that "In the development phase, working as subject matter expert and working in collaboration during the implementations" (C1/T1).

#### 4.2.3.5. Suggestions

**Additional time for the implementations:** Since the implementation was very much affected by time limitations, additional time for implementation was one of the suggestions the teacher in this case offered. She also mentioned about the flexibility that the teachers could be able to have while implementing their schedule.

> C1/T1: Yes, we conducted this activity; but due to curriculum load and inadequate class hours we raced against time. Inevitably, this caused constraints; I could have been able to allocate four-class-time for this activity. But we have to cover the curriculum.

Related with the time-limitation problem, if the school administration was not able to change schedule, as she suggested, MoNE should plan this type of implementations and they should be able to give additional class hour to do apply.

> C1/T1: You conduct this studies and I think you should share this studies with MoNE. Why do they only allow the applications of activities they prepared? This binds us, limits us. They talk about creative thinking, but we are not able to support creative thinking with the activities they submitted to us. We are open to technology and this is an extra activity for us that we want to apply; but the curriculum does not allow us to do so. At least, like a pilot-school-application, MoNE should provide these schools with additional class hour.

In the first case study, the school administration had added additional class hour for the implementations. As in that case, based on the experiences she had through this study, the teacher claimed that it would be better if the school administration added additional class time for this implementation. At this point, she also underlined the importance of school administration to conduct a similar study. According to her, school administrators should accept the implementation thereby the teachers can involve in so.

> Researcher: What should be done maintain the continuity of these implementations?
>
> C1/T1: First of all, you need to have well-established communication with school administration; the administrators and the teacher group will be in touch with you all the time, and they will all agree doing the study. In other words, teachers' acceptance of the applications depends on the approval of school administration. After explaining the importance of your implementation to them, and if they can arrange one more additional class hour because the class time in the curriculum is not enough for us considering the subjects; then this implementation can be applied much better.

**Shorter game and leveling system:** Another issue that she suggested was about the nature of implementation. According to her the length of implementation was long and, as she always complained during the implementations, the activity was complicated for the students. She suggested that the activity should be re-designed so that a shorter and the game include a leveling system.

> C1/T1: The game should better be a shorter one. The ratio of students who get bored increase when the game gets longer. It should be up to

> the point. I understand your rationale. You want students learn more, use more knowledge, and focus more. But, I think it would be much more successful if the game progressed step-by-step, starting with small scale games and getting longer in time.

**One-to-one integration to the curriculum:** As could be seen from the teacher quotation above, the teacher regarded the nature of this activity as something more than they covered in the curriculum. What she wanted was a one-to-one adaptation of activity with the curriculum. As she stated that "I believe that it will be much more successful when it is adapted to curriculum one-to-one". The activity was something extra for her and she did not want to dive into anything else than curriculum subjects. The reason might be the curriculum load, SBS exam, inflexible curriculum, and time limitations.

**Informing parents:** As some of the students stated that their parents did not allow them conduct activities in QA since they thought it was just a game-play. This issue was another teacher suggestion; she claimed that parents should be informed about the study and its value.

> C1/T1: We can get help of parents at this point. We tried to inform parents about the study but as I said before our implementation period was short, so we could not be very successful at that point. It would be better if we were able to make parents conscious and say them that the students should play the game at home.

**The integration to curriculum and the use of computer labs:** As a technology based activity, QA implementations were to be conducted in computer labs. Except for some private schools, the use of computer labs for science classes is not common in Turkey. The teacher suggested that these implementations should be integrated to their curriculum and they should use computer labs to conduct activities.

> C1/T1: There is even no computer in most of the schools; we have them because we are in a private school…We should integrate this to curriculum at the beginning, we need to allocate time for it. As we spare one class hour for each week for science lab, the use of computer should be the same.

**Student education:** The teacher's opinions were positive toward QA, but there were some requirements that need to be met before doing that type of implementations. Several times during the interview, she emphasized the need to educate students and make them conscious about the activity before the implementations. She also underlined the importance of the need to facilitate students well as she claimed "when the students educated, when they are guided well, when it is done well and when it is adapted to curriculum, I believe it will be beneficial". She stated that preliminary process was needed in order to make students get used to the learning environment.

> C1/T1: The students have a rationale. There is an adaptation period needed, and then you can move into the implementation. We passed that period fast and we intervened in the middle. I think the adaptation process should have been longer.

Although QA was introduced students one semester before the implementation, this might not be effective since they did not use it actively in any of their classes before the study began. On the other hand, there was no opportunity to do so due to curricular load and unavailable lab schedule.

**Teacher education:** Like student education, teacher education was another issue that she suggested. Although the researcher met with the teacher several times to introduce the game and to make her knowledgeable about QA, she did not have time to either play the game or discover the dimensions of problem situation in the learning material. She suggested that it would be better if they had a chance to take training during their seminar term, which took place before each educational year.

> Researcher: I opened an account in the game for you to play. Did you have a chance to login and explore the game?
>
> C1/T1: Too few! We were too loaded and we could not use it a lot. We are guilty at that point, we know. You also did a lot and guided us all the time. You also help students. They had difficulty since they were not accustomed to this type of study. Frankly, if we could do a preparatory work during our seminars for a longer time, we would not compel you and we would make it more successful.

According to the teacher, teacher education should be an essential process and it should be conducted even before student education. As she also added that the teachers should enroll in a long training period: “I believe that teachers would be more successful in implementation after involving in a long-term training”. Additionally, she again emphasized the importance of preparation which should have been taken place before the educational year started.

> Researcher: As you said before, the implementation took place at the middle of the semester and therefore the adaptation of students was difficult, so does the teacher. What should be done in order to take this implementation as a part of your class?
>
> C1/T1: As I said before, at the beginning of educational year when we are preparing our yearly plans, raising awareness of school, administration and everyone else, the group of field teachers; our training with your preparatory studies; our game-playing individually. When all these happen then it would be more successful. It becomes a very useful material for us, too.

As in the first case, this teacher also pointed out the current status of teachers in terms of technology use. She stated that there were still teachers who had difficulty in using technology in their classes. While mentioning about this problem, she also pointed out another important issue: that was the use of technology in education was not common in Turkey. Considering what the teacher declared, the importance of teacher education on technology use can be seen obviously.

> C1/T1: The teachers can be trained well with educations or seminars. I put myself among these teachers. There are teachers who have difficulty in using technology, let it be admitted that. The teachers have difficulty on the use of computers and any other technological device in classrooms. These are still new for Turkey. Computer-based education is not as common as the one in abroad. Therefore, we have difficulty.

**Not a part of class work:** Another teacher suggestion was about introducing the game as a game not a class work. As she stated, introducing the game as an obligatory class work, then the reverse happen. They may not like it as a game.

> C1/T1: I wish it was not a part of class work; but rather the students should have played it as a computer game when they went their home. It is because it stresses students more when it is named as class work.

**Implementation in all classes:** In order to do this case study, at the beginning, the plan was to use it with all of the 7th grade classrooms. However, due to teacher load and the scheduling problems of computer lab, the implementation was conducted with only one of those classes. The teacher stated that this affected the motivation of the students who participated in this case study, because they thought that this was an extra work and only they had to do it.

> C1/T1: The selection of one class for the implementation caused some disadvantages for us.
>
> Researcher: Like what?
>
> C1/T1: They see their friends and they make comparison like "just we apply it, why do not they do as well?" This was disadvantage for them, of course.

Therefore she suggested that it would be better if they had a chance to apply QA in all of their classes. This also would create a collaborative learning environment, as she claimed "if we could apply it in all of the classes, they would help each other and try to solve it, I think".

### 4.2.4. Research Question – 3 – Challenges and Barriers

**An innovative way of learning:** The teacher stated that "the students had much difficulty since they are not familiar with this type of project" (C1/T1). Some of the students also claimed that they had difficulty in solving the problem as it was a complicated one. Kızılırmak-Park project was new for the students and this might be one of the reasons why they had difficulty. The teacher also mentioned about another computer game project they used in science classes; but according to her QA project was difficult than the other project for her students.

**Classroom management:** The teacher mentioned about classroom management issues regarding challenges of QA-like projects in school settings. Since the implementations took place in computer environments, it was a challenge that "if you do not control them, the students can either open other web-sites or can play other games online” (C1/T1).

**Curriculum load:** Curriculum’s being too loaded was a critical issue, as the teacher stated. Although she worked in a school that followed technological innovations, when it came to implementation they very much bounded up to science curriculum. She said that “My school is such as school trying to implement every new opportunity in a way the curriculum allows” (C1/T1). She also pointed out that the available curriculum was very much theory-based.

> C1/T1: While we registering the students we, as a school, assert that “we are a technologic school, we have technologic classrooms, and smart classes”. Students’ attitudes are also good. However, since we have a theoretical curriculum that we have to apply, we have difficulties from time to time regarding class hours.

She also continued talking about how curriculum limited the technology-based implementation in their school.

> C1/T1: Yes we do activities, but the redundancy of subject matters in the curriculum and the available class hours make us race against time. Necessarily, this imposes restrictions. I should be able to spend four class hours for this implementation. But we have to cover the subject matters

The other important issue about curriculum load and how the curriculum imposing on the teachers influenced technology use in schools. Although the curriculum was a constructivist one, it is quite strict that regardless of school, teacher or students, the same curriculum has to be applied in every school. Inevitably, when it is about the implementation of such a loaded curriculum, there remains no time for other extracurricular implementations.

> C1/T1: They talk about creative thinking. We can never ensure creative thinking through the things they apply and presented to us. We are open to technology, but this is an extra work for us. We want it to be applied but the curriculum does not let this happen.

When it came to her opinions about the implementation of QA, she again talked about curriculum load as one of the reasons for students' demotivation. She said that "when the students go to home, they did not play due to several excuses, such as not being able to turn the computer in, its' being within the same period with SBS exam, and the loaded curriculum" (C1/T1).

**Demotivated students:** As stated before, in order for orientation, the students were introduced with QA in the previous semester. The purpose was to help students interact with the QA environment so that they could be more competent throughout the project. However, regardless of orientation process and the teacher's continues recall and motivation efforts, there were several students who had never get online and played QA environment before the project started. Therefore, the students' non-use of QA was not a big challenge at this point.

Regarding the same issue, in this case study, almost half of the students were not very much interested in the project.

**Implementation time:** Since the project was about environmental issues and water quality, and it was the final subject matter in the curriculum, the implementation of the project had been set to the parallel time (i.e. last month of the educational year). This was a challenge according to the teacher since we intervened in a new project at the middle of the semester. The reason of unsuccessful results of this project was due to this problem: "As I said, intervening at the middle *[of the semester]*, timing was the biggest problem of us. It was all because of that" (C1/T1) *[Italics in brackets were added by the researcher]*. On the other hand, it was not possible for science teacher to use QA environment throughout the semester. Neither curriculum load nor teacher load let this happen. She once again talked about the same issue "Our only complaint is about the difficulty of the implementation when intervention takes place in the middle" (C1/T1).

**Inexperienced teachers on technology use:** Although it was a private school following up technological innovations and integrating those technologies to classrooms, the teachers were not technology competent, as the teacher claimed. In fact, she was also very much interested in the project and tried to help as much as she could. However, she even could not find time to log in and to investigate the QA environment in detail. Moreover, she could not take active role during the implementations since she was not very much competent on technology-based implementations like QA project. She also stated that "not really, we are not really competent, although we believe that we improved ourselves much and we are explorers. But the teachers are not enough" (C1/T1) when answering a question "what would you say when you think about how much the teachers are competent on technology use?" (asked by the researcher). She also emphasized these technologies' being innovative for the teachers: "These issues are so new for Turkey. Computer-based education is not common, as it is in the schools abroad. Therefore, we have difficulty" (C1/T1). As can be seen in the quotation, she pointed out that computer-based applications do not really take place in Turkish educational context. Considering that they are not very competent on computer use and not very much familiar with this type of implementation, it would not be wrong to say that this was a critical challenge.

**Not being able to use labs all the time:** The researcher communicated with the teacher many times and tried to make her investigate QA environment in detail and be competent with it. However, the teacher could not schedule time for this. She explained the reasons by stating "our time's being limited, not being able to use computer lab all the time, and time available in order to reach a big curriculum; the reasons caused by us" (C1/T1).

**Load of teacher:** Related with the issue above, the teacher mentioned about her loaded schedule as a reason of not being able to investigate the game environment in detail. She did not enough time "to spend on the project" (C1/T1).

> Researcher: I created an account for you. Did you find any chance to get online and investigate the game without my presence?
>
> C1/T1: Very little, we could not use it within this loaded schedule. We are guilty at that point, we know. You did all you could and you guided us. You also helped children a lot.

**Parents:** There was a student who claimed that his parents did not want him to play QA since he was supposed to do school homework instead. The teacher also mentioned about this issue and the disadvantage parents caused.

> C1/T1: Since they were not able to comprehend the incident, they thought that it was a game. They did not allow game play at home. They tended to be more like “sit down and do your homework”. Even if we explained, it was needed to raise the parents’ awareness more.

**English interface:** Although this case took place in a private school and the students’ English competencies were high, the teacher found this as a barrier for her students. It caused students “not being able to understand its language” (C1/T1). The teacher also said that “that [game’s English interface] was what they were always saying. Maybe, those were not the real opinions of them, they were alleging as an excuse” (C1/T1).

**SBS exam:** The students were getting prepared to the SBS exam while the study was conducted. Moreover, some of the students did not participate in some of the days of implementation. Although some of the students continued doing the project at home, it was not the case for all the students. Some of the students did not even submit their works, or they did not do anything at all.

According to these students, SBS exam was really an important exam. Besides its stress, the majority of the students wanted to get ready for the exam, especially when the exam time was approaching. These students were mainly into the exam and solving SBS like tests was the only activity they wanted to enroll in. Therefore, setting up the implementation time of the project in a close time to the SBS exam was a challenging issue for the current study.

**Gaming not learning:** For some of the students, the gaming aspects of the environment were more appealing than the project. Therefore, they were not into the problem case, but into the fun and gaming activities of the environment. They were running around the virtual worlds with their peers and trying to find out game-like activities. For these students, classroom management by the teachers gains much importance.

**Technical problems:** As stated before, some of the students were not able to continue the project at home as their home computer could not operate QA-MUVE. They also claimed that their computer stopped running as they wanted to use QA. It was also the case for lab implementations, too. During the implementations, some of the student’ computers did not work or stopped working as they working through the project. After waiting for the computer to run again for some time, and getting no response from the computer; those students needed to find another computer (working), go to there and running QA there in order to continue working on the project. These technical problems, however, caused students lose their interest and feel disappointed in the middle of the implementation. Moreover, it caused them lose time, which was already limited.

**The importance of grading:** Grading is important for some of the students more than learning acquisitions, unfortunately. It was one of the challenges of this study, too. All the students' grades had already been submitted before the implementations of this research. The students knew the fact that they would not be graded from the project. Therefore, this caused some of the students staying disinterested towards the project.

**Duration:** The implementation hours were very much depended on schedules of the school: the school had already a schedule for curricular activities, and specifically, the computer lab had its own schedule determined before the semester began. Therefore, when it is planned to implement an additional activity rather that the ones planned and scheduled, it causes timing problems. As stated before, the curriculum is very much loaded and very much strict. Therefore, it is hard to apply a different learning activity rather than the ones existing in the class book. This also affects the duration to be settled up for the implementation. There are many constructs of the existing educational system effecting the duration. In the current study, the study was limited with the 5 class hours; that would be better to spend more time with the students. Nevertheless, in the current conditions it is really a big challenge.

### 4.3. Results of Case-2

The results of case-2 are presented under the following part. The demographics of students are explained as the first phase. After that, the results of qualitative analysis are provided regarding each research question.

### 4.3.1. Demographics of Students

This case study was conducted with a 7th grade classroom of a private school located in Ankara, Turkey. The number of the students was 24 and the ratio of female and male students were equal (Figure 4.2).

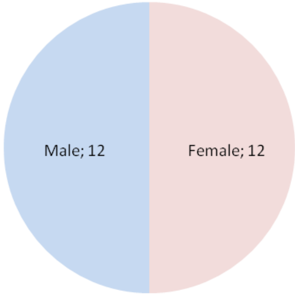



**Figure 4.2** Graph illustrating the distribution of gender

Information about students' access to computers and game technologies was the first dimension of student demographics (Table 4.10). In this case, all of the students (n=24, 100.0%) had home computer with Internet access and they stated that they used this computer. Among these, 16 (66.7%) of them had also at least one game console (such as Nintendo, Atari, Play Station) where as eight (33.3%) of them did not have any of them.

**Table 4.8** Students' having home computer and game console

| | Yes | | No | | Total | |
|---|---|---|---|---|---|---|
| | *f* | % | *f* | % | *f* | % |
| Home computer | 24 | 100.0 | - | - | 24 | 100.0 |
| Internet access at home | 24 | 100.0 | - | - | 24 | 100.0 |
| Game console | 16 | 66.7 | 8 | 33.3 | 24 | 100.0 |

One another item was to measure the length of time that the students had been using computer and Internet technologies (Table 4.11). The majority of the students (n=20, 83.3%) had been using computer technologies for more than five years. The remaining four (16.7%) students had been using this technology for four to five years. There was no student who had been using computers for less than four years; in other words, all of the students were familiar with computers for at least four years. Considering the Internet use durations, most of the students had been using Internet for more than five years. Eight other students stated that they had been using the Internet for four to five years. The Internet usage durations showed similar results with computer usage; there was only one student asserting his/her Internet use duration as two and three years.

**Table 4.9** The length of time that the students use computer and Internet

| | Computer use duration | | Internet use duration | |
|---|---|---|---|---|
| | *f* | % | *f* | % |
| 1 year and below | - | - | - | - |
| 2-3 years | - | - | 1 | 4.2 |
| 4-5 years | 4 | 16.7 | 8 | 33.3 |
| More than 5 years | 20 | 83.3 | 15 | 62.5 |
| Total | 24 | 100.0 | 24 | 100.0 |

Students' Internet use frequencies are summarized in Table 4.12 below. Most of the students stated that they used the Internet a few times in a week (n=15, 62.5%). There is no student claiming that they used the Internet rarely (a few times in a month). Only eight (33.3%) students stated that they used the Internet every day. One student did not respond to this item.

**Table 4.10** Students' Internet use frequencies

| | Internet use frequency | |
|---|---|---|
| | *f* | % |
| A few times in a month | - | - |
| A few times in a week | 15 | 62.5 |
| Every day | 8 | 33.3 |
| Total | 23 | 95.8 |

Information was gathered on the places that the students use the Internet technology most frequently (Table 4.13). The results indicated that most of the students (n=16, 66.7%) access the Internet at home. Six (25.0%) students stated that they use the Internet both at home and school. There are only two students using this technology not only at home but in some other places including a friend's computer and Internet café.

**Table 4. 11** The places where the students access the Internet

| | Places to use Internet | |
|---|---|---|
| | *f* | % |
| Home | 16 | 66.7 |
| Home & School | 6 | 25.0 |
| Home & School & Somewhere else | 1 | 4.2 |
| Home & Somewhere else | 1 | 4.2 |
| Total | 24 | 100 |

The types of software that the students used are summarized in the table below (Table 4.14). All of the students (n=24, 100.0%) used word processor. Also, 23 (95.8%) students stated that they used games and presentation software. Additionally, more than half of the students used drawing (n=18, 75.0%) and spreadsheet applications (n=13, 54.2%).

**Table 4.12** Number of students using computer software applications

| | Use of computer software use | |
|---|---|---|
| | *f* | % |
| Word processor | 24 | 100.0 |
| Games | 23 | 95.8 |
| Presentation | 23 | 95.8 |
| Drawing | 18 | 75.0 |
| Spreadsheet application | 13 | 54.2 |

In another item, information about the Internet applications that the students employed was gathered (Table 4.15). According to the results, e-mail, listening mp3 files and watching videos were the most favorite Internet applications that the students engaged in (n=23, 95.8%). Playing single-player games, doing chat and downloading files were the types of applications done by 22 (91.7%) students. Flowing around web sites (n=21, 87.5%), searching for Information (n=20, 83.3%), multiplayer gaming (n=15, 62.5%) and uploading files (n=14, 58.3%) were the other popular Internet applications. Social networking (n=11, 45.8%), watching films (n=11, 45.8%) and forum posts (n=6, 25.0%) were the applications done by less than half of the students.

**Table 4.13** Number of students using Internet applications

| | Internet applications | |
|---|---|---|
| | *f* | % |
| E-mail | 23 | 95.8 |
| Watching videos | 23 | 95.8 |
| Listening MP3 | 23 | 95.8 |
| Single-player gaming | 22 | 91.7 |
| Chat | 22 | 91.7 |
| Download files | 22 | 91.7 |
| Web (WWW) | 21 | 87.5 |

**Table 4.15** Continued

| | | |
|---|---|---|
| Searching information | 20 | 83.3 |
| Multi-player gaming | 15 | 62.5 |
| Upload files | 14 | 58.3 |
| Social networking | 11 | 45.8 |
| Watching films | 11 | 45.8 |
| Forum postings | 6 | 25.0 |

Among the participants of this case, 23 (95.8%) students stated that they benefited from the Internet technologies while doing their homework. Only two (8.3%) students claimed that they got in touch with teachers using the Internet (Table 4.16).

**Table 4.14** Students' purposes of using the Internet

| | Purposes of using the Internet | |
|---|---|---|
| | *f* | % |
| Homework | 23 | 95.8 |
| Contact with teacher | 2 | 8.3 |

### 4.3.2. Research Question – 1 – Student Perceptions

In this case study, the opinions of the students could not be gathered through student interviews. The reason of this problem was the limited time the school administration allowed for the implementation of the study. Since the students did not have extra time in the school setting for interviews, the student perception questionnaire was given for the science teacher. However, as the teacher stated the school administration did not allow the questionnaire to be applied to the students. Although the permissions were gathered beforehand, this problem occurred during the study. Therefore, the students' perceptions could only be gathered through spontaneous questions asked during the implementations.

### 4.3.2.1. The way the students used QA

The table given below (Table 4.16) shows the number of times that students logged in, the number of chat massages and e-mail that they sent.

**Table 4.15** Students' QA use statistics

| Students | Gender | # of logins | # of chat massages | # of e-mails sent |
|---|---|---|---|---|
| S1 | Male | 13 | 18 | 0 |
| S2 | Female | 0 | 0 | 0 |
| S3 | Female | 8 | 0 | 0 |
| S4 | Female | 16 | 228 | 0 |
| S5 | Male | 9 | 30 | 0 |
| S6 | Female | 3 | 11 | 0 |
| S7 | Male | 15 | 32 | 0 |
| S8 | Male | 3 | 4 | 0 |
| S9 | Female | 3 | 0 | 0 |
| S10 | Male | 27 | 161 | 2 |
| S11 | Female | 1 | 8 | 0 |
| S12 | Male | 17 | 64 | 1 |
| S13 | Male | 13 | 102 | 0 |
| S14 | Male | 4 | 5 | 0 |
| S15 | Male | 11 | 33 | 1 |
| S16 | Female | 1 | 0 | 0 |
| S17 | Female | 3 | 2 | 0 |
| S18 | Female | 4 | 31 | 0 |
| S19 | Female | 1 | 0 | 0 |
| S20 | Female | 9 | 10 | 0 |
| S21 | Male | 22 | 352 | 4 |
| S22 | Male | 12 | 15 | 0 |
| S23 | Male | 32 | 96 | 0 |
| S24 | Female | 6 | 1 | 0 |

#### 4.3.2.2. Student experiences

In this case study, the opinions of the students could not be gathered through interviews. The reason was similar to the one in case-2. The students went their home when the classes ended. There was no time for interviews during the class hours, too. Therefore, as in the previous case study, the student perception questionnaire was planned to apply this student group. The questionnaire copies were given to science teacher as she said she was going to apply it. Nevertheless, when the semester ended, the teacher said that she did not apply the questionnaires because the school administration requested another permission application. Although the researcher and the teacher were in communication with each other via e-mail and phone, the teacher did not inform the researcher about this requirement and concurrent problem in time. Therefore, the researcher could not gather data from the students in this case study.

### 4.3.3. Research Question – 2 – Teacher Perception

The results of teacher interview are provided under the headings below regarding the sub-research questions. The way the teacher perceived the use of MUVEs as educational materials, her opinions about her students' learning in a learning context where a MUVE tool were used and her role in this learning environment, and finally her suggestions regarding the further use of MUVEs in learning environments are explained in detail by supporting the codes with her speeches.

#### 4.3.3.1. The way the teacher used technology

**Communication through e-mail:** As the teacher stated that teachers' use of technology was encouraged in the school she worked in. The school administration demanded teachers to be technology literate so that technology is required to be used not only in classes for educational purposes but also as a way of communication among school staff. She explained this by saying as below.

> C2/T1: We are all expected to be technology literate, and in an advance stage and constant use. For example, the correspondence inside the school is sent us over the Internet. Therefore, we always

> need to check our e-mails when we get home. I mean, nothing come us as print-outs.

**Teachers are monitored:** In addition to communicating with teachers through online ways, the school administration expected teachers using technology in their classes as well. Moreover, they monitored the teachers in this process, as the teacher claimed.

> C2/T1: There is performance evaluation criteria list utilized in our school. It includes to what degree the teacher employed technology, to what degree s/he follow up technological improvements, bring them to the school and apply it, to what degree s/he is aware of technological developments, to what degree s/he communicate with other teacher online etc. we get degrees from all these criteria and we are evaluated about use of technology.

**Technologies used – PowerPoint, online experiments and Moodle:** As the teacher explained the school had tried use of different technological materials, such as an online portal developed by an academician at Middle East Technical University, Vitamin, and they had been working on integrating Moodle to their teaching practices when we conducted the interview. About the previous attempts, as she stated that, were cancelled either due to the deficient technological infrastructure of the school or material's failing in satisfying the needs of the school (the teachers and the students). What the school wanted to do with Moodle was the integration of worksheets and activity handouts to Moodle so that the students would be able to access the sources from their home, too.

The teacher stated that there could be problems emerge in online learning and she also said that complete online learning where no teacher was available would not be suitable for the students. On the other hand, there was computer and projector in each classroom in this school. The teacher stated that they prepared PowerPoint presentations so that the classes were much more visual for the students and they would get more from the class.

She mentioned more about their PowerPoint usage. According to her, PowerPoint presentations were very much helpful for the students in their learning process because students were more active thanks to PowerPoint presentations. What they did within these presentations were transfer of book pages into the computer environment.

> Researcher: What do you do on technology integration as science teacher group?
>
> C2/T1: We are such a group supporting this very much. Also, I think that we are one of the teacher groups in the school working much on this issue. Thanks to scanner, we integrate every single page to our presentations so that the students can see the activity, which is present in the book, in the presentation. It is much better in this way. Following up their books, the students, for example, can involve in the active participation more when they see the same things in front of them *[in the presentation thanks to projector]*. And now in terms of Moodle work, we are such a teacher group that has already done many things *[Words in italics were added by the researcher]*.

**The use of computer lab:** In this school, the field teachers had opportunity to take the children to computer labs in order to conduct science activities in computer and Internet environment. There were computer teachers standing in the computer lab in those sessions to help field teachers. Additionally, they were included in the process of preparing activities. As in the case-2, the teachers had limited opportunity to use computer lab; it was approximately one or two times in a single semester. It was not only limited due to loaded lab schedule but also due to curriculum load of the teachers. What they did in the computer lab was to have students prepare PowerPoint presentations most of the time. The teacher stated that they also took care on the activities so that the children were not able to copy & paste from the Internet; rather the students were supposed to prepare the projects by themselves.

> Researcher: As far as I know, you conduct activities in the computer lab.
>
> C2/T1: Yes, we do.
>
> Researcher: Can you mention about those activities?
>
> C2/T1: We prepare those activities with computer teachers. For example, within the first semester, depending on how we are doing with the course schedule of the class, we get an appointment for two-class-hour. The activities are shaped based on the suggestions of computer teachers and our recommendations. There is also packaged software on the Internet; for example there used to be one about

> systems. We sometimes use those. We sometimes have students prepare PowerPoint presentations or prepare calendars about organic compounds. I mean, we decide together.
>
> Researcher: Are there any criteria you consider while selecting the topics?
>
> C2/T1: It should be in a way that helps students understand the subject better and the students would be able to find more visual material over the Internet. What we do not want is that students would not be able to copy & paste from the Internet. We are so attentive on the activities that the students who understand the subject can complete.
>
> Researcher: What I meant was actually that: For example, let's say you are going do an activity about organic compounds in computer lab. Why do you choose organic compounds particularly?
>
> C2/T1: Let's say, for example force and motion is a physics subject and the students need to make drawing. It takes too much time. They answer at most one question at two hours. But, regarding organic compounds, the students find more pictures and it is more verbal. We decide in this way. For example, if it is something about physics, we do experiments that we find on the Internet.

Since they had limited time in the computer lab, the teacher said that they distributed the handouts to the students before the activity so that they would be able to study on the activity before the class.

> C2/T1: We give handouts to the students before we go to the computer lab and say "we are going to do this and that, get prepared accordingly. And, we go to the computer lab, they have limited time. They have the evaluation criteria and the questions they are supposed to answer. Accordingly, they do it by themselves within the given time.

#### 4.3.3.2. MUVEs as technology based materials

**An enriching and beneficial learning addressing multiple intelligences:** In terms of the use of QA in her classes, the teacher claimed that it was an enriching and beneficial learning opportunity for her students. She stated that she liked the environments as the learning activity and added that it supported many aspects of learning process, as quoted below.

> Researcher: what do you think about the advantages of this type of learning environments?
>
> C2/T1: It is beneficial in terms of increasing students' interests; teachers' teaching method, how can I say, supporting them with a variety of opportunities regarding teaching methods; enabling students comprehending the subject matter in a better way; enabling them keep the subject visually in their mind; and also addressing multiple intelligences.

**Visual learning:** The teacher asserted that she considered QA as a visual material: "I remember it was very nice as visually". As in the previous quotation, she also stated that visual way of this material helped students remember what they had learned, too.

**Effective activity about ecology:** The teacher stated that the activity was a nice one about ecology subject. She said that "It was nice as being an activity about ecology. It would be nice if any other projects like this are conducted for other subject areas as well".

**Hard at first and require time to understand:** The teacher mentioned about the complexity of QA as a learning activity that the students had just met. As an innovative learning material, it was difficult for the students, as she claimed. She said that "It drew student attention. At first, they felt like it was hard but then when they dived into it, they all comprehended, as I remember".

**Much to read:** The teacher commented about the parts that the students needed to read. Mentioning about the students' dislikes on reading, the teacher said it could be a factor preventing students from completing the activity. In addition to criticizing the need to read many things, she appreciated the factor of reading as an encouraging activity to make students like reading.

> C2/T1: There was a bit more parts that the students required to read. If there are students who did not do the reading parts, it is because our students do not like reading books and, most probably, they skipped those parts because of that reason. Nevertheless, it was a nice activity and it was beneficial, too.

**Motivating:** As seen in the above quotations, the teacher said that QA drew student attention. She pointed out that QA could be used to motivate students to science classes. She expressed that she would like to use it in the future since it might help her motivating her students. She claimed that “I want *to use* it. I want it since it attracts student attention more. They actually like science classes in the elementary school; but we may ensure that they would love it more”.

**It should overlap with the curriculum:** The activity was about ecology and it was conducted in parallel with the science class as they were covering the same subject in classroom. However, what the teacher claimed about the activity showed that she expected to see the same content in the game as in the science book. Her opinions indicated that the activity should only include the book parts, but nothing more.

#### 4.3.3.3. Opinions on students’ learning

**Students already interested in computers and ready for computer-based learning:** The teacher firstly mentioned about the students’ attitudes toward computers. As she stated that the school (the administration and the teachers) supported technology use in classes, so do the students. Additionally, the questionnaire results indicated that all of the students had home computer and Internet access; which meant that they were all accustomed to use computer and Internet technologies. The teacher also claimed that the students liked science classes taken place in computer labs.

> C2/T1: Most of the students are very interested in computers. Some of them are more knowledgeable than us. The computer classes and some of the performance-homework-studies are done in computer labs. They also like it. They are also disposed to it. I guess they will also like online education if we start it so.

**Learning about real life issues:** In addition to being a science activity on ecology subject, the activity was also an opportunity for students to learn about real life issues, the teacher pointed so. The teacher expressed that the students were able to see the many dimensions of an environmental problem thanks to this activity. She also added that she found the activity very useful for the students learning about environmental issues.

> Researcher: What do you think about the activity?
>
> C2/T1: I think they observed that how could the things they have learned be important in real life. They saw that how could a minor change, a change made by human beings, affect the environment, the nature negatively. *[Inaudible words]*, then they saw that how could a harmful substance damage the lives of many living things. I think it was very useful in that respect. They experienced that how the things occurred in reality beyond theory. *[Words in italics were added by the researcher]*.

**Increasing analytical thinking and reading skills:** More than being a science activity, it increased students' analytical thinking skills and supported their reading abilities, as the teacher stated. Additionally, according to her, thanks to this activity, the students learned analysis, synthesis and resulting on a problem case.

> C2/T1: The activity is not just depended on knowledge. They will comment on it, and they will look at the results; it enables their reading. We have many students who do not know or like reading. It prompts students to read; the students think in an analytic way, they make interpretations, make synthesis. It is useful in these respects.

**Some students were interested; some not:** As in the previous case, some of the students participated in the activities, but some did not. The teacher stated that there were several motivating factors for student participation; however, some of them did not involve in the activity as much as others. On the other hand, she also stated that regardless of the student number, it was an acquisition in the learning process.

> C2/T1: The material itself also increased their interest. Preliminary preparation, being first past the post *[she is mentioning about the competition conducted at the beginning of the semester as part of the student orientation, the winner is rewarded]*, and preparation were influential for some students but not for the others. All in all, they are different; each of them is different than others. Ultimately, it is an acquisition for us to have some students affected in a positive way. *[Words in italics were added by the researcher]*.

**Following their progress:** Thanks to Q-Pad application, the students were able to follow their progress (such as the quests they had completed and they were supposed complete, the lumins and cols they gained etc.). The teacher also mention about this benefit of the environment. She said that “They can see their progress better in there”.

**Technology use:** The teacher mentioned about another contribution of the environment on students. She stated that students benefit from the technology in their learning process. The students were not only able to learn about science but also about technology.

> C2/T1: If we can link up the activities with daily life issues, the students can better understand the subject matter, they can use it in daily lives more, and they can benefit from the technology more in this way.

#### 4.3.3.4. Opinions on teacher role

**Self-confident on technology use in class:** As she stated during the interviews, she had enrolled in a computer-based instruction class during her graduate education program. Underlining the proficiency of teachers working in their school regarding their computer literacy status, the teacher claimed that they had taken seminars on computer usage. Nevertheless, she segregated the primary school, social science and Turkish language teachers and asserted that they might have difficulty in using the environment since it set on an English interface. On the other hand, she seemed that she was self confident as being a teacher knowledgeable about computer-based Instruction, having a command of English and being computer-literate, as she claimed so.

> C2/T1: Our science teachers are proficient on this *[referring to the technology-supported activity conducted in this case]*. If they are teacher in our school, the one who were not proficient on computer usage had already been given computer seminars by computer teachers. Science teachers can do it very easily; however, a primary school teacher cannot to this activity, they would have so much difficulty. Since the program is in English, they cannot arrange it at the beginning, they cannot do it. Social science teachers, Turkish language teachers cannot do that due to inadequate English knowledge. *[Words in italics were added by the researcher*

**Likes teaching in a technology-supported environment:** She said that she liked teaching in a learning environment where a MUVE was used. In addition to pointing out the time problem, she mentioned about the advantages of teaching in a technology-supported learning environment.

> Researcher: What is the meaning of teaching in this type of activity for you?
>
> C2/T1: First of all, I like it. We have just talked about it, it should not be all about lecturing in class; technology should be there as well. It should not be only depended on technology, we should teach the curriculum subjects matters in class, too. Yet, students' interests to the subjects may increase thanks to different activities, they may be more conscious. All is a whole. Regarding the knowledge acquisition, different types of the activities are valuable. I wish we did not have time limitations so that we could do similar things for each subject matter.

**Teacher role is easier:** Comparing teaching in class with teaching in a computer lab where a technology-based activity was conducted, the teacher expressed that the latter was easier. Her reason was about the center of the learning process: while in the first one teacher take the active role; but in the second one the students are centered on the learning process. In fact, the role of the teacher does not diminish in a constructivist way of learning; nevertheless, the teacher interpreted the case differently. Moreover, as it will be explained below under the next code, the teacher did not take active role in the implementation sessions. This might be another reason why she felt teaching was easier in a constructivist learning environment where a MUVE was used.

> Researcher: If you compare teaching in class with teaching as part of this activity, what would you say about easiness or difficulty of teaching?
>
> C2/T1: It is easy since students are in front of computers. It is easier. Ultimately, the assessment is also easier since it depends on prepared criteria. Regarding teaching in class, they tend to participate all together. Assessment of some subjects is also more difficult. This one is more comfortable, easier.

**Teacher should involve in material development:** As in the two cases explained before in this chapter, the teacher did not take active role during the implementations; meaning that the researcher performed the facilitator role and the teacher only helped with the classroom management. When this was asked to the teacher, she asserted that in order to implement any activity in her class, she needed to prepare it herself. On the other hand, before the implementation started, the researcher had met with the teacher many times and tried to make her play game; however, she did not do it so.

> Researcher: As you remember, I run the implementations in this study as the researcher. You were also in the lab as a participator, but what would you suggest in order to make the teacher facilitate the whole process? What do we need to do?
>
> C2/T1: The teacher should prepare the material, at least most of it. I am not able to be very effective on a material that I did not prepare. If I knew how to prepare it, at least if we worked on it together, that we did not have a chance, then I would facilitate easily it since I would know it more. With this much knowledge, it is not possible to guide students when we are in the school or when they are at home.

Although she claimed that she found herself successful in technology use in class, here she admitted that her knowledge was not enough to guide the process.

**The importance of teacher in technology-supported learning environment:** According to the teacher, the role of the teacher in the learning process was so much important that she did not want education to be processed only through online means. Moreover, she stated that the students also need to meet with the teacher face-to-face in the learning process to ask questions or to get help in the learning process.

> Researcher: What are your general thoughts about technology use in education?
>
> C2/T1: We discussed it many times in the past. The type of education in which the technology is put into practice and the teacher is taken out cannot be thought of. It is because students want to learn in an interactive way: in an interactive class, there should be the teacher to whom they could ask questions and get answers, and they could discuss. When we think about online educational system, there is no teacher in the learning process. Even though they could access the teacher online, it is not a classroom environment anymore. There is no

> any other student; the students is alone – just the student and the teacher. On the other hand, technology should be in use, for sure the students understand the things better when they see a picture of it or apply it.  We sometimes show them the experiments online which cannot be made in classroom environment. It is very beneficial in that respect, but teaching in class is something different. I think both of them *[technology and the teacher]* should be in the process. *[Words in italics were added by the researcher]*

**Want further use:** After completing the study, she expressed that she would like to use this MUVE environment in her future career as well. On the other hand, she did not attempt on using it for the next year though.

#### 4.3.3.5. Suggestions

Depending on the experiences she had throughout the implementations and her perceptions and opinions about the process, and the status of the students' and herself, she made some suggestions about the use of MUVE in classroom settings. The codes emerged included better technical conditions, less number of students, less reading load, more time for the implementation, one-to-one curriculum integration, students having home computer, teacher education and teacher involvement. The details of each code are explained below.

**Better technical conditions:** She claimed that in order to increase student and teacher participation in this type of applications, technical conditions were important. She stated that "the computers that are used are also important. All the computers required to be functioning well. One is off, one's mouse does not work…These are all lose of time. The students lose their attention".

**Students having home computer:** She additionally mentioned about another technical requirement, which was students needed to have their home computer. The reason was the time available during school time was so limited that students could not handle all the staff at school. She said that "how will the students complete their homework; at first they need to have computer at home".

**Less number of students:** As another requirement for MUVE-based activities in school environment, she mentioned about the number of the students in each class.

Although in order to control this problem, student groups were selected from private schools for the study, this problem emerged yet already.

> C2/T1: The size of the class should not be much because you do not have a chance to deal with each student when you do the activity with 25 students. Maybe it would be different if we did it with 10 students. They also see each other in there, right?
>
> Researcher: Yes, they do!
>
> C2/T1: Students lose their attention when the class is too crowded. They make fun of it. However, if it was conducted with less number of students, maybe, it would attract students' attention more.

**Less reading:** As the teacher previously commented on the problem of students' reading behaviors, she made a suggestion on this issue. She suggested that the reading part might be less so that the students enrolled in the activity more: "the text parts could be diminished".

**More time for the implementation:** The implementation was limited with three class hours due to curriculum- and school-related issues. Although additional orientation sessions were conducted and students were encouraged to continue at their home computers, it would be better to have enough class hours. The teacher also mentioned about the time limitation problem and stated that "we need to have extensive time".

**One-to-one curriculum integration:** The activity was related with ecology unit although the book content was not transferred into the MUVE environments as they appeared in the book. Nevertheless, the interview showed that the teacher expected one-to-one curriculum integration to the book content into the MUVE environment so that students could find the same text found in the book in their screens as well. After commenting on its usefulness as a technology-based learning material, she made suggestions as below.

> C2/T1:…Maybe, if there were activities assessing students' knowledge related with course related subjects, the subjects that were exactly from the lesson, it would be extended over a longer period of time. The information given there is so nice; it brings students in environmental consciousness and environmental protection

> awareness; and they *[the students]* bring forward their ideas. But if there are different activities through which the students could use the exact information they learn in class, then we would have a chance to extend the duration. When it is the other case *[as in this study]* we think like we should not lose much time. If the students do an activity on computer with which they will be able to learn the lesson content, then maybe we would not be have to teach the same subject in class.
>
> Researcher: In fact, they had been learning the unit ecology subject in class just as we conducted the study. This was why we conducted the study at that time. Don't you think that our study was related with the class subject?
>
> C2/T1: It was, but some of the concepts, how can I can explain, but for example ecosystem, population, energy pyramid; if there were questions directed on these concept, definitions of terms, or as if you asked whether it could be prepared for other subject areas as well; if there were related activities explaining each subject matter, then we would have a chance to allocate more time for it. Maybe not in subjects of physics, but a biology-topic would be more suitable. *[Words in italics were added by the researcher]*

**Teacher education:** Another issue the teacher commented on as a requirement of this type of activities was teacher education process. Additionally, she mentioned about the MoNE as they should have been responsible in the preparation of these materials and in the process of teacher education.

> C2/T1: There might be some production units or departments or reflective units working on behalf of MoNE. They can prepare this type of activities. Training should be provided for the teachers about each activity. But these activities cannot be applied to each subject area; it should not in every topic. These activities can be applied. But, as I said, I do not know how it happens with a physics or chemical subject. Each biology subject may not be appropriate, either. Designing and preparing this type of things is not easy. Too much effort is spent on it. The teachers also want to include in the preparation process; nevertheless, they need to be proficient to design these things and need to spend months.

**Showing working examples:** She continued with her speech and added that in addition to training teachers, showing them good examples and explaining them how to apply the same activities in their classes would be a good way to encourage teachers.

> Researcher: What should be done in order to encourage teachers at this point?
>
> C2/T1: It is needed to inform them on technical issues and to inform them about studies so that they could understand better. Additionally, they *[the teachers]* need to see it rather than saying "oh very nice activity" when heard without seeing it. And they want to use in the future if they believe in that the activity is useful, efficient and supportive. *[Words in italics were added by the researcher]*

**Teacher involvement:** As she mentioned as in above quotations, she claimed that she could not participate actively during the implementation sessions since she did not design and develop the activity. Respectively, she suggested that "in order to ensure its continuity the teacher should be in the design and development process".

#### 4.3.4. Research Questions – 3 – Challenges and Barriers

**Deficient technical infrastructure:** Although the study was conducted in a private school setting in which each student had a chance to use a computer, the teacher complained about the deficiency of school in terms of technical infrastructure. The teacher, in fact, mentioned about this problem not because her experiences in the current study; rather she pointed out this problem depending on her previous experiences on previous attempts on technology integration. She, at the same time, expressed that it was a problem of most of the schools, in general, where computers were not in enough capacity for this type of activities. She said "There are no computers or computer labs in schools enough for this *[mentioning about QA implementation]*." *[Words in italics were added by the researcher]*.

> C2/T1: We had a problem on our project we did with Mr. Ozden *[the person with whom they were doing a technology-based educational project]*; our school network was not enough. We were losing too much time while we were uploading our worksheets. We thought that we would not be able to do this with Internet speed at home…It took time to add, remove, or prepare some of the programs. Therefore, we decided not to do it. *[Words in italics were added by the researcher]*.

**Distracting game elements:** QA was a game for the students and the charm of play could possibly take the attention of the students from the learning part. The teacher also mentioned about this problem. She said that the students were able to see each other in the virtual environment so that their interest to the learning part decreased. She also mentioned about student worksheets as a distracting element for the students. During the implementations, some of the students complained when they first saw it since the worksheets included many pages and there seemed too much to do, as the students declared.

> C2/T1: When they saw the booklet *[student worksheets]*, it ends at that point. They complain saying "how am I gonna read this?" and then they make it up. They start playing, and they have fun with friends when they see each other there. They just spend time then. *[Words in italics were added by the researcher]*.

The crowded population of classes was another influencing factor at that point, according to her: "when it is too crowded in class, they lose their interests. They make fun of it".

**Loaded curriculum:** The teacher expressed her feelings about the curriculum load as another challenge of these applications. She pointed out that the new curriculum supported constructivist learning activities: "It *[QA-like implementations]* is appropriate to MoNE system, in fact. The curriculum supports this type of activities; however, we have curriculum related constraints" *[Words in italics were added by the researcher]*. According to her, the new curriculum was better than the previous one in terms of allowing the use of constructivist activities and being a less-loaded one. On the other, she also stated that it was still such a loaded one that the applications of extra activities were almost not possible due to time limitations.

> Researcher: To what extent is the new curriculum suitable for this type of implementations, you think?
>
> C2/T1: In fact the curriculum is suitable. The new system is also a constructivist one. It aims to direct students in a constructivist way of thinking. The curriculum is suitable compared to previous one; it was much loaded in the past, it is a little bit more convenient now but not at each grade level. Since we are not comfortable there is no way for extra activities; I even cannot find time for experiments some of the time. We do worksheets, use the book, conduct the activities, do the experiments and make presentations. To allocate two class hours in every one week for extra activities and to take students to computer

> lab for doing activities each week for each subject matter is not possible. In fact it is impossible. Maybe, if there were fewer subjects, then it would be possible to do similar activities for every subject.

**One-to-one curriculum integration:** Although she liked the QA implementation, what she really expected as a computer-based learning activity was different somehow. She expected to have students see the exactly the same content from the book in their computer screens. Her suggestion on this issue was explained above in the suggestions section. This was a challenge for her because it was a confusing issue to present students with extra information out of book. This problem was a reason why they cancelled a previous project, too.

**QA with English interface:** Although the activities were all in Turkish, the interface of the environment was in English. The teacher asserted that this could be a challenge not for the students but also for some teachers. She also claimed that although they, as science teachers, would not have any problems due to their proficiency of English, other teachers (such as social science or Turkish language teachers) could have problems since they were not sufficient in English language when compared to them.

**SBS:** As in the previous two case studies, SBS exam emerged as a barrier of this study, too. During the orientation sessions while the researcher was introducing QA to the students, one of the students said that "Teacher! What if I do not participate in this activity? I have to get prepared to SBS" (field-notes, orientation session, case-3). There were several other students complaining on the same issue. Nevertheless, the teacher talked to the students about the activity as being a required part of their curriculum and tried to convince them on the usefulness of the project.

**Student disinterest:** There were several students in the classroom who were mostly interested in the fun part of the game environment. This could have several reasons, as the observations indicated. It was the end of the semester when all the student projects had already been completed and all the exams had already been executed; therefore all the grades had already been given to the students. In other words, the students knew that they would not get any grades from this activity. Moreover, the teacher explained the potential reasons of student disinterest in another way. According to the teacher, there were several reasons behind this.

> Researcher: There were students who either did not want to participate in the activity or were interested in the fun part of the game, such as wandering around the 3D environments. What were the reasons of this, you think?
>
> C2/T1: The reasons were students' being unwilling to spend time, being reluctant to read or having difficulty in reading long passages.
>
> Researcher: Why did not they want to spend time on it, you think?
>
> C2/T1: I mean, they see a long reading passage there that they supposed to read and comment on it. It was not just a game. There was a mission they were supposed to complete and it was not practical to them doing that so. It was not similar to the games they played at home, they were not fighting. Therefore, it did not draw attention of some of the students.

**Students do not like reading:** Just as it was mentioned in the teacher quotation above, some of the students did not like reading much, as the teacher asserted so. She said that students thought they would have many things to do when they first saw the student worksheets. As a result, the teacher added, they tended to skip reading; rather filling the spaces through making up. Since some part of the data collection of students depended on reading speeches of NPC characters and some other extra information given to them, this problem could be a serious challenge decreasing student motivation.

**Inexperienced students on technology-based learning:** Although the students who participated in this case study were experienced on technology use, the teacher pointed out a critical barrier of this type of implementations, which was students' being inexperienced on technology use. The teacher declared that the students in other school might not be computer literate at all. Moreover, as a game-based-learning activity, it was innovative learning methodology for the students. All the students, expect for one, stated they played computer games. However, most probably, games took part on their life as a free time activity so far. In this case, students might need to have additional time to get used to learning through a game environment.

**Inexperienced teachers on technology-based learning:** Similar to students' case, teachers' being inexperienced on technology use and on the technology integration to their classes were another barrier that the teacher mentioned about. Although the teacher had been using technology in teaching process, the use of QA as an educational material was innovative for her. Moreover, she claimed that she could not be so active in class during the implementations due to not being involved in the preparation of the material. Therefore, preparing teachers for learning settings where QA like environments used was a challenge and could be a potential barrier.

**Students required studying at home:** Although the activity was very beneficial to enhance students' knowledge about ecology unit, the limitations of school hours for the implementations required students study the project at home as well. Unfortunately, the school hours were not enough to have students complete the project at school. Nevertheless, the researcher stayed online in case of students needed help. Additionally, the researcher gave e-mail address and MSN username to the students.

**The importance of grading:** As mentioned above, the implementation of this case study was conducted at the end of the educational year when all the grades had already been submitted and all the student projects had already been completed. Moreover, the students knew that they would not get any grade after completing this project. This caused a critical problem in the study since some of the students did not pay much attention on the project. During the interview with the science teacher, this issue was asked to her. She also pointed out the importance of grading in having some of the students spend effort on a project.

> Researcher: What should have been done to have students regard this type of activities as part of the class work not as something as an activity from outside?
>
> C2/T1: First of all, our students care about activities that are graded. They have a task that they need to complete. It is difficult for some of the students. If we say that "this is your homework and you will be graded on this", then the students do it either they want or not. They start doing in any case. If they have fun of it, then they continue doing it by themselves. However, forcing them is needed at that point.

**Time:** Especially this case was the one among five that was affected by time limitations most. In other words, time problem was a critical limitation of this case study. The researcher had three weeks in computer lab assigned for the implementation of the study. Additionally, in order to ensure student orientation, some of the science classes had been utilized.

The teacher also mentioned about time limitations as a barrier to utilize QA like environments in learning settings. She said that “It was a good activity on ecology unit. I think it would be nice to use similar activities in other subject areas as well. We just had a problem. The available time was limited for the activity”.

### 4.4. Results of Case-3

The results of case-3 are presented under the following part. The demographics of students are explained as the first phase. After that, the results of qualitative analysis are provided regarding each research question.

#### 4.4.1. Demographics of Students

This case study was conducted with a group of students in a NGO located in İzmir, Turkey. There were nine students in this group of which three were female and six were male (Figure 4.3).

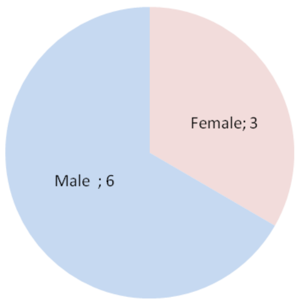



**Figure 4.3:** Graph illustrating the distribution of gender

Since the ages of the students showed differences in this organization participated in the activity groups of the organization, the grades of the students in this case showed slight differences. Four of the students were from $7^{th}$ grade, two from $6^{th}$ grade, one from $5^{th}$ grade and the last one was from $8^{th}$ grade.

The results of students' status of having a home computer and game console are presented in the table below (Table 4.18) Less than half of the students had home computer (n=4, 44.4%) and Internet access (n=3, 33.3%). All these four students claimed that they were able to use their home computer. Only one (11.1%) student stated that s/he had a game console at home. Most of the students did not have access to computers, Internet or game console at their home.

**Table 4.16** Students' having home computer and game console

| | Yes | | No | | Total | |
|---|---|---|---|---|---|---|
| | *f* | % | *f* | % | *f* | % |
| Home computer | 4 | 44.4 | 5 | 55.6 | 9 | 100.0 |
| Internet access at home | 3 | 33.3 | 6 | 66.7 | 9 | 100.0 |
| Game console | 1 | 11.1 | 8 | 88.9 | 9 | 100.0 |

The length of time for students' computer and Internet usage were investigated (Table 4.19). A high percentage of the students (n=6, 66.7%) stated that they had been using computer for three years or less. Similarly most of the students (n=6, 66.6%) had been using the Internet for three years or less. There was only one (11.1%) student using these technologies for more than five years. Remaining two students had been using computers and the Internet for four to five years.

**Table 4.17** The length of time that the students use computer and Internet

| | Computer use duration | | Internet use duration | |
|---|---|---|---|---|
| | *f* | % | *f* | % |
| 1 year and below | 1 | 11.1 | 4 | 44.4 |
| 2-3 years | 5 | 55.6 | 2 | 22.2 |
| 4-5 years | 2 | 22.2 | 2 | 22.2 |
| More than 5 years | 1 | 11.1 | 1 | 11.1 |
| Total | 9 | 100.0 | 9 | 100.0 |

In another item of the questionnaire, the frequencies of students' Internet use were investigated (Table 4.20). The results showed that slightly more than half of the students had been using the Internet for a few times in a week. Two (22.2%) of the students had been accessing the Internet for a few times in a month whereas two (22.2%) others had a chance to use it every day.

**Table 4.18** Students' Internet use frequencies

| | Internet use frequency | |
|---|---|---|
| | *f* | % |
| A few times in a month | 2 | 22.2 |
| A few times in a week | 5 | 55.6 |
| Every day | 2 | 22.2 |
| Total | 9 | 100.0 |

The places where the students had access to the Internet showed differences (Table 4.21). Two (22.2%) of them had been using the Internet at home, two (22.2%) at home or school and somewhere else, and two others either at school or home and school. Remaining three students stated that they had access to this technology in other places such as Internet cafés or a friend's computer.

**Table 4.19** The places where the students access the Internet

| | Places to use Internet | |
|---|---|---|
| | *f* | % |
| Home | 2 | 22.2 |
| Home/School & Somewhere else | 2 | 22.2 |
| School | 1 | 11.1 |
| Home & School | 1 | 11.1 |
| Other | 3 | 33.3 |
| Total | 9 | 100.0 |

In another item the types of the software that the students had been using were investigated (Table 4.22). All of the students (n=9, 100.0%) had been playing games. On the other hand six (66.7%) of the students stated that they had been using presentation software and five (55.6%) others using word processor. Only two (22.2%) of the students had been using spreadsheet and one (11.1%) using drawing software.

**Table 4.20** Number of students using computer software applications

| | Use of computer software use | |
|---|---|---|
| | *f* | % |
| Games | 9 | 100.0 |
| Presentation | 6 | 66.7 |
| Word processor | 5 | 55.6 |
| Spreadsheet application | 2 | 22.2 |
| Drawing | 1 | 11.1 |

The number of students and the types of the Internet applications they employed are summarized in the table below (Table 4.23). The results show that all of the students (n=9, 100.0%) had been playing single player games on the Internet. The other most frequently used Internet applications were e-mail (n=6, 66.7%), flowing around web pages (n=6, 66.7%), chat (n=5, 55.6%) and listening mp3 files (n=5, 55.6%). Watching videos (n=4, 44.4%), watching films (n=3, 33.3%), downloading files (n=2, 22.2%), social networking (n=1, 11.1%) and playing multi-player games (n=1, 11.1%) were other Internet applications done less than half of the students. It was surprising that there were no student searching for information, uploading files and posting on forum pages.

**Table 4.21** Number of students using Internet applications

| | Internet applications | |
|---|---|---|
| | *f* | % |
| Single-player gaming | 9 | 100.0 |
| E-mail | 6 | 66.7 |
| Web (WWW) | 6 | 66.7 |
| Chat | 5 | 55.6 |
| Listening MP3 | 5 | 55.6 |
| Watching videos | 4 | 44.4 |
| Watching films | 3 | 33.3 |
| Download files | 2 | 22.2 |
| Social networking | 1 | 11.1 |
| Multi-player gaming | 1 | 11.1 |
| Searching information | 0 | 0.0 |
| Upload files | 0 | 0.0 |
| Forum postings | 0 | 0.0 |

Among the participants of this case, seven (77.8%) students stated that they benefited from the Internet technologies while doing their homework. There were three (33.3%) students claiming that they got in touch with teachers using the Internet (Table 4.24).

**Table 4.22** Students' purposes of using the Internet

| | Purposes of using the Internet | |
|---|---|---|
| | *f* | % |
| Homework | 7 | 77.8 |
| Contact with teacher | 3 | 33.3 |

### 4.4.2. Research Question – 1 – Student Perceptions

#### 4.4.2.1. The way the students used QA

The table given below (Table 4.25) shows the number of times that students logged in, the number of chat massages and e-mail that they sent.

**Table 4.23** Students' QA use statistics

| Students | Gender | # of logins | # of chat massages | # of e-mails sent |
|---|---|---|---|---|
| S1 | Male | 10 | 30 | 0 |
| S2 | Male | 27 | 3 | 0 |
| S3 | Male | 13 | 19 | 0 |
| S4 | Male | 3 | 12 | 0 |
| S5 | Male | 3 | 30 | 0 |
| S6 | Female | 2 | 3 | 0 |
| S7 | Female | 2 | 0 | 0 |
| S8 | Female | 2 | 6 | 0 |
| S9 | Male | 10 | 7 | 0 |

#### 4.4.2.2. Student experiences

As the student had experiences not only of the implementation but also of the organization, both types of student experiences were explained below under the related titles.

##### 4.4.2.2.1. Students' experiences of the organization

**Duration:** The students were asked to state how long they had been attending the activities in the organization. Two of them said that they joined the organization two years ago and they had been coming and attending the activities since then. The other student stated that he had been participating in the organizations for two and a half year.

**Purpose:** In this case, there were several reasons or purposes for students' coming to the organization. This included having fun, to improve their school success, and to learn more. Students also stated that they joined the organization due to the suggestion of their parents and/or their teacher. Additionally, according to the students being in the organization was a better choice for them than being outside and spending hours there.

According to one of the students, being in the organization during the free times (times out of school hours) was a better choice to spend time outside for no-purpose (i.e. just to be outside) and being in the organization was also a way of having fun (C3/S3).

> Researcher: What were your purposes for coming here?
>
> C3/S3: There are many friends in our neighborhood. They go out during noontime when it is so hot outside, or they go out at evenings or early mornings. I also get bored. I sometimes want to go out but sometimes not. This is why I came here; not to waste time in vain, but to learn. I came here for this reason.

Another student also mentioned about his reason for coming the organization depending on his mom's suggestions. He said that "*[I came here]* to learn new things during the summers" (C3/S2). He added that "my mom said that it would be beneficial for my school success. And, I said ok!" (C3/S2) *[Italics in brackets were added by the researcher]*.

The other student, on the other hand, stated that he started the organization due to his teachers' suggestions that she made for his parents. He thought that his teacher did not like him. He also added that he started coming in the organization in order to improve his school success since, as he told during the interview, he was not successful.

> Researcher: What were your reasons for coming here?
>
> C3/S1: My reasons for coming here were course related. Since my school success was not so good *[I came here]* to improve it. In fact, I planned to come here one year before. My mom and dad had been suggested by my teacher for making me work in somewhere. I worked due to that reason. *[Italics in brackets were added by the researcher]*.
>
> Researcher: Really? Did you give up your school?
>
> C3/S1: No, I worked during summer.

> Researcher: Why do you think your teacher suggested something like that?
>
> C3/S1: I think she was irritated by me.

**Opinions:** According to one of the students, coming to the organization was beneficial for him. Moreover, he thought that learning in the organization was more fun than learning in school. He also underlined that organization's not having a strictly structured curriculum, *or* program, was so effective that he was able to join in the activities that he wanted to do so.

> Researcher: Which type of activities you like most. You said you had been coming here in order to improve your school success. Which one do you like more: doing that kind of things *[involving in lessons]* or involving in other types of activities? *[Italics in brackets were added by the researcher]*.
>
> C3/S1: Lessons are fun here, more fun. I mean, we do not get bored. Having lessons is more fun. It is sometimes the case, but sometimes I do not like it that much. In that case, for example, we want to play games in the computer room and we play.

All the three students expressed that they liked participating in the organization's activities. One of them said "Here, I like almost everything" (C3/S1) and another said "playing basketball, playing computer games, using computers, joining in Dreams Workshop (Düşler atölyesi) (C3/S2). The last students said "*[I like]* doing activities with my friends" (C3/S1) *[Italics in brackets were added by the researcher]*.

#### 4.4.2.2.2. Students' experiences of the implementation

**Voluntary participation:** As stated before, students had been introduced QA and they had been informed about "Kızılırmak National Park Project". Students joined voluntarily and they had different reasons for participating in QA implementation. The reasons students mentioned included QA's being a game and the project's being a computer activity, having fun, and their wonder about the project. Additionally, one of the students said that he thought the project was real and therefore he wanted to contribute on an environmental problem.

One of the students claimed that he liked computers and computer games; therefore, QA project drew his interest as being a game like activity using computer and Internet technologies. He answered the question of his reason for voluntarily participating in QA project by saying “Well, it is because I like computers a lot. The computer game took my interest. Also, its’ being 3-Dimensional; I mean its’ being like real attracted me more. This is why I joined” (C3/S3). He also mentioned about another reason; that was QA’s being a new game for him and its’ being unique. He claimed that “You can watch a movie in a cinema or in television. But, QA is not something I could see either in TV or in a cinema. I joined since it was prepared as one-off *[i.e. it was specially designed and was unique]”* (C3/S3) *[Italics in brackets were added by the researcher]*.

Two of the students claimed that QA presentation took their interest and aroused their wonder. One of them said “I wondered what this place was like, therefore I joined here” (C3/S2).

One student explained during the interview that he thought that the project was something real. This was why he wanted to join the project in order to contribute on an environmental problem of Kızılırmak River. Moreover, he said that he wanted to have fun with the project.

> Researcher: You know QA participations were voluntary. I made a presentation and you wanted to join. What were your reasons for participating in the project?
>
> C3/S1: I supposed that the game was real. Therefore, I wanted to be involved in an adventure and to have fun.
>
> Researcher: What do you mean by saying “real”?
>
> C3/S1: I thought that Kızılırmak Park really existed.
>
> Researcher: Did you want to contribute on it?
>
> C3/S1: Yes! And also I wanted to have some fun.

**Contributing to learning:** All of the students in this case stated that they found QA as an environment that could contribute to students’ learning. For example, one of them said that “Learning within Kızılırmak National Park has contributed to us a lot. We learned about the park, we discovered those places. I mean it made many contributions to us" (C3/S1). Another student also mentioned about this positive potential of QA while answering the question of stating if there was QA's negative characteristics. He said "I think, there is not *[any negative properties]*. It fills children's minds with better and nice things" (C3/S3) *[Italics in brackets were added by the researcher]*.

**Fun game:** In addition to being a useful learning environment by making contributions to the students, as they said, it was also a fun game through which they had fun. For example one of the students interviewed explained that he found QA as a fun game even when he first saw it. He they continued to explain his feelings about the environment in a similar way. He mentioned about almost all the steps followed while expressing his feelings on his experiences. He was aware about the problem and the expectations from them. On the other hand, he used the words "entertaining" "game" that they "played" rather than, for example, "a serious project" even if he had thought that the project was a serious one being experienced as a real-life problem.

> Researcher: As you know, during the summer activities, we completed a project all together. Can you explain the experience you had here?
>
> C3/S1: How?
>
> Researcher: For example, suppose that I am a friend of you and I know nothing about this project. What would you tell me?
>
> C3/S1: It is a game! There is a book and it is all written in it to show us what to do next. We can not only benefit from the book but also can ask your help, so that we know it better. We played the game, Quest Atlantis, to save Kızılırmak National Park. We initially wandered around an area and we tried to find some places. Then, we went to Kızılırmak Park and we went though some parts, did water analysis, walked around, and took pictures. Then we completed the game. We found why it *[fish decline]* was happening, why it was the case. We found the problem source. *[Italics in brackets were added by the researcher]*.

The same student also said that he said some of his friends that "I wish you participated, it was full of fun" (C3/S1). Another student interviewed also mentioned about the "entertaining" way of QA when the same question was asked.

> Researcher: As you know we executed a project here in the scope of summer activities. How would you describe your experiences to me?
>
> C3/S3: How am I going to do it?
>
> Researcher: Let's say I am a friend of you and I do not know anything about the project. What would you explain to me?
>
> C3/S3: The fun side, I would talk more about the fun parts of it because it did not have boring parts that much. I mean, it did not have *[boring parts]* at all. I explained in this way and they thought it was entertaining. For example, I told to a friend who is in your new group now *[mentioning about a student in case-5]*. He wondered when I said, for example, there are places full of fun. *[Italics in brackets were added by the researcher]*.

**3D places to walk in:** As in the other cases, students mentioned about 3D places while talking about QA where they have experienced this project. One of them said that "We initially wandered around an area and we tried to find some places" (C3/S1) and another mentioned about their car-driving experience while they wandering around 3D places by saying "we got into the cars and we drove around" (C3/S1).

**Interacting with NPCs in 3D environment:** Another student interviewed mentioned about the interaction with NPCs they encountered while wandering in 3D environments. He gave specific examples while pointing out his experience. He said that "I talked to, for example, Ali. *[Another NPC]* explained that they had been going there for two years. Then *[I remember]* what Korucu Ahmet said. You asked us to fill the notebook and we read through it found *[NPCs]*" (C3/S2). *[Italics in brackets were added by the researcher]*.

**Easy to finish:** One of the students interviewed indicated that the game was easy and he did not have difficulty while finishing the project. He stated that "the game really easy for me. Each part of it was so easy. The game was an easy one" (C3/S1).

**Being researcher:** There was one student saying that he felt like a real researcher while completing the project. Before beginning of the project, the activity started with a letter coming from park ranger. They were assigned the role of a researcher to be trying to find the reason of fish decline. This student mentioned about this issue and expressed about his feelings he had experienced in the project. He stated that "*[This project]* taught me being a researcher, learning while discovering 3D places, and learning through collecting data" (C3/S3) *[Italics in brackets were added by the researcher]*.

**Learning through simulation:** Another student mentioned about the similarity of QA as a real life learning environment. What he said indicated that he found QA as an environment similar to a simulation because it was designed in such a similar way to real life. He said that he introduced QA to a friend and while doing this he said that "I explained him how the environment was. I asked him if he knew Kızılırmak River. Then, I said, having been inspired by Kızılırmak, they made an area where there are very nice houses, lands, and factories" (C3/S3). The same student also pointed out another characteristic of QA that was it enabled a learning environment very similar to real world cases. According to him, QA "made several types of activities available to them without going anywhere" (C3/S3).

In a similar way, another student (C3/S1) expressed that he believed that the project was a real one when he saw QA introduction, which included several screen shots of the park and brief information about the project. As explained in detail and quoted above, the student thought that the problem was the real problem of Kızılırmak and he wanted to be in the group that was supposed to solve this problem and save the park. Most probably he was influenced the 3D design of the environment and he thought that it was real.

**Research activity of solving the problem of Kızılırmak Park:** One of the students interviewed mentioned about the purpose of activity as his experience he had. He said that this implementation was a problem solving activity in which they tried to solve the reason why there was a decline in the fish population.

> C3/S1: We went to Kızılırmak Park. We did several things there. We passed through stages, we made water analysis, we walked around and tool pictures. Then, we completed the game. We found out the reason why this problem has happened. We found out the reason of the problem.

In a very similar way, another student claimed that the experience he had was a research activity in which he worked with friends having either similar or opposing ideas. He said that "I like making research *[in the organization]* just as I like doing it in Quest Atlantis. We make research with friends. There are several others having same opinions, but there are also other thinking in different ways" (C3/S2) *[Italics in brackets were added by the researcher]*.

**Planned activity guided by the facilitator:** One of the students emphasized one of the characteristics of the activity conducted. According to him, it was a previously planned activity. Additionally, thanks to guidance of the facilitator they did not have much difficulty throughout the project. He stated that "What to do next is already written in the booklet. We read through them. We get what we needed from there. We also ask you to get help. Then, we know it better" (C3/S1).

**Taking notes helped solve the problem:** As mentioned before, students used field-notebooks in order to take some notes about their findings related with the park. The purpose of the notebook was to make students organize their data and somehow guide them what to do next. The students, at first, found the notebook so thick that they would not be able to finish completing. At the end of the study, the students were asked to state what they thought about the notebooks. One of the students explained the reason why they found the notebooks boring when they first saw it.

> Researcher: You know, I distributed the notebooks at the beginning of the study in order to let you take some notes. You complained about the many pages the notebook had.
>
> C3/S3: Yes, but while worked throughout the project, it finished very quickly.
>
> Researcher: What was the reason of this complain?
>
> C3/S3: We had just started the project and we thought that the project would be boring all the time. It was because we thought that we would only write but not play.

Another student also mentioned about a similar reason for their reaction to student field-notebooks. He said that the notebooks daunted them just at the beginning of the project. He stated that "I thought that we won't be able to complete all of it because we would not have enough time. But, it was not the case, it was not that much; it was less than we thought" (C3/S2). Moreover, another student talked about the same issue. He asserted that "Thanks to taking notes of what I had found, we made it in a faster way and it was not hard for me" (C3/S1). The other student also commented about the same issue. According to him, the notebooks were so useful that they helped the students in reaching at the final point. He said that “Yes, *[they worked well]*. If we did not take those notes, we would not be able to reach the conclusion. We would not be able to find out anything only depending on water analysis and notes *[to be found over the walkway]* (C3/S3) *[Italics in brackets were added by the researcher]*. He added that “Notebooks helped us. They helped us finding out the real reason” (C3/S3).

One other student mentioned about the benefits of using those notebooks during the project. He mentioned about the advantage of notebook in terms of providing them with data organization. He claimed that “We collected lots of data. Even if we forget there: who is guilty, who is not” (C3/S1). He also added some other opinions of him about notebooks: “The notebooks served their purpose, they worked out well. They allowed us to take notes, we found out how to make water analysis. We collected all the information in the notebook” (C3/S1).

**Think they had learned:** The students stated that they had learned something from the QA project conducted. They learned “while walking around” and not only with the help of “friends” but also of “the facilitator” (C3/S1). What they had learned included making research, the importance of data collection, many ways of collecting data and environmental awareness. They also learned multiple perceptions people had, as one of them stated so.

In terms of environmental awareness, one of the students said that he learned “for example, fish deaths; how fish die” (C3/S2) and as another student said “how dangerous it would be to pollute the environment, at the end of the project” (C3/S3).

Another issue that the students learned about was making research and what was needed in this process. One of the statements by the students was the importance of data collection. In addition to indicating that there were multiple ways of data collection, such as “taking pictures, diving into the sea, looking at closer, doing water analysis” the student “reached the result” (C3/S3). This was better way of making research for him when he compared with making science research in school. It was because the opportunities were limited in school case; for example, there were no microscopes in their science lab so that he was not able “to investigate animalcules” (C3/S3). He also commented on the importance of data collection. Thanks to, for example, collecting data on water analysis, investigating field notes etc, he learned "it was not possible to reach the conclusion" (C3/S3), as he claimed so.

In addition to learning about making research and the importance of protecting the environment, the students learned about different perceptions the people might have, as they claimed so.

> C3/S3: I learned it was not possible to know what others would do. For example, there was someone blaming lumber company; she was saying that they were suspicious about the company. There was another person saying that it was because the indigenous people living there.

**<u>QA characteristics that students like/dislike</u>**

In this case, students' likes regarding QA were more than their dislikes of it. Their likes included driving cars, walking around 3D places, interacting with their friends and NPCs, and making research etc. On the other hands, they did not mention that much about their dislikes. Their dislikes included getting lost, English interface of the environment and water analysis section. The details of each were described below under regarding sections.

**Student Likes**

**Driving cars:** All the three students (C3/S1, 2 & 3) stated that they liked driving cars in the 3D environment. After the project had finished, the students were informed about the car-driving part in the game, which can be thought as a reward-like activity or as a post-project activity to let students have fun. They liked driving cars, they raced each other, and they drove round the 3D environment by car, as the field notes stated.

**Walking/running around and discovering new places:** Another like of the students were walking or running around 3D environment and discovering new places. For example, one of the students said that he liked "chatting while walking" (C3/S3) and in a similar way the other said that he liked the times "when we run" (C3/S1).

Each time one of them discovered a new place that they liked or that they needed to find out as part of the project, they shared it with other students in class and helped them find out that place. In that respect, they described which way they had followed. For example, one of the students explained the time when he got excited and liked by saying that "What I liked most was finding out new places, such as the theatre, as we were wandering around. We discovered new places, when I got excited most" (C3/S1).

**Interacting with friends:** Two of the students stated that they liked interacting with their friends (C3/S1 & 3). One of them, for example, said that "*[one of the advantages of QA]* was to be able to talk with friends there" (C3/S1) *[Italics in brackets were added by the researcher]*.

**Interacting with NPCs:** In a similar way with the code explained above, students also liked interacting with NPCs. Moreover, they liked the opportunity to talk in Turkish. One of the students claimed that he liked "for example, you are looking for some people and talk to them. They ask me if I wanted to talk to them, and I say "yes". I like doing this and writing what they say" (C3/S2). In a similar manner, the other student asserted that he liked "talking to those other people. We supposed that we would talk them in a standard manner, but thanks to clicking on them we got information" (C3/S3). Finally, the other student mentioned about the language equality differently than the menus of QA. He indicated that he liked NPCs' talking in Turkish. According to him, it was the advantage of QA that "The people in Kızılırmak Park talking in Turkish" (C3/S1).

**The project itself:** Two of the students (C3/S1 & 3) explained that they liked the project itself. For instance, one of them declared that he liked "all the parts of the game" and one of those times was when "we went to Kızılırmak Park and talk to the people there" (C3/S1).

**Chatting in English:** Although no student were compatible with English as much as their peers in private schools and no student chatted in English as QA database-analysis results indicated, one of the students who was interviewed mentioned about the opportunity to chat in English with other students connecting from abroad. He stated that "There I some English words that I know, and using that information, I sometimes can talk to other people from other countries. In fact, I do not know English that much" (C3/S1).

**Making research:** Two of the students interviewed expressed that they liked making research regarding this project of which they were a part. As one of them stated that making research "was a positive side of the game" (C3/S2).

**Discussions:** C3/S3 expressed that he liked discussions that was held by the guidance of the facilitator in order to make students share what they had found and what they had been thinking about fish decline problem. He also explained his reason: "Everybody had different opinions. Some was true, and some was false. In order to make the final decision, since I would not be able to make a decision on my own, we decided together. We found out the truest one" (C3/S3).

**The game itself:** One of the students said that he liked QA because "it was a game that I have not met before, I have not played before" and, because "it was entertaining. It was fun to get know the environment". Moreover, he was interested in computers and computer games, and as being an example of this, QA took his interest: "Since I like computers, I had fun time. Being in a computer environment made me happy" (C3/S3).

**Unrealistic situations:** Although there was a student in the first case that disliked unrealistic situations taking place in the 3D environments, another student in this case claimed that he liked those situations. He, for example, said that "When we get into the water *[the river]*, we did not sink, we did not die. This impressed me more" (C3/S3) *[Italics in brackets were added by the researcher]*. As being more different that real life and some other games, that gives some number of lives to the user and each time the players do something wrong or missing, then they lose one of those lives. In this case, the student liked surviving in the river, or not losing one of his lives because of getting into the water and dying. The game, in fact, does not include this type of game structure at all.

**Reading:** During the interviews, the students were asked if they got bored while reading the passages, which were presented to them as NPC speech. One of the students said that he found somehow boring at the beginning, but when the project went one he liked reading so.

> Researcher: There were some parts needed to be read. You said that you got bored at first. Was it really boring for you? What did you feel while reading?
>
> C3/S3: Not that much. It was fun though. Without them *[reading passages]*, the quests won't have meaning at all.
>
> Researcher: So, you mean while going through the project…
>
> C3/S3: They actually helped us. *[Italics in brackets were added by the researcher]*.

### Student Dislikes

**English interface:** QA's interface and all the other content of it, except for the world designed for this study, was a problem for the students in this case. It was because they did not know much English. They all were students at government schools and they did not have chance to practice it, if they learned it in school proficiently though. This was reason that one of the students claimed that the interface of QA was in English and he did not like it so. He stated that "Some of the parts were in English. It would be better for us, if they were in Turkish" (C3/S1). He also kindly suggested that not only the virtual world, Kızılırmak Park, but all the game would better be in Turkish.

**Getting lost:** Another student complained about getting lost and not being able to find out what he searched for. He said that "What I disliked was, for example, you go and go but you found out nothing. It really irritated me" (C3/S2). This situation was also the one he lost his excitement within the game. This student, in fact, was not very much interested in the research part at the beginning. Rather what he wanted to do was just play and discovering new places. However, he somehow included in the project after a point. Class discussions and facilitator's not-ending effort to motivate him with the project seemed the reasons for this progress.

**Water analysis:** Water analysis part was relatively more complex for some of the students than the other parts of the project. Students were required to solve a test which in fact aimed making them summarize what they had found that far. After answering the questions, they were given a password, then the students went water analysis section and by using it they came up with analysis results. One of the students mentioned about this issue. One student, who was actually very smart, complained about this issue regarding his dislike of QA. He found that part of the project boring. It was also "less exciting" part of the project for him (C3/S3).

> Researcher: What did you dislike about QA?
>
> C3/S3: For example, we made water analysis. I thought that we would reach the results by just one click; but it was not the case. We read through it, found out the password, and then we went to do the analysis. There was no other boring section other than this.

He also made his explanation why he found water analysis part boring. According to him, this part made them work more than other parts of the project. The interviewed continued as quoted below.

> Researcher: So you found that part boring?
>
> C3/S3: Yes, it caused a lot of work, you know. I also did not know that we would use the same password for each of them. I tried several times. I mean I did it wrong, so that was boring.

**Boring:** In this case, writing part was more boring for some of the students. What they wanted to do was playing and having fun from the game. This was why they did not like writing and reading parts for some of the times. One of them said that "Reading all the time indisposed the fun part of the game" and added "at first you made us turn the monitors off and write something. We thought that it would always be the case, and we won't play that much" (C3/S3).

#### 4.4.2.3. Comparison of QA with traditional classes

**Boring:** According to two of the students in this case, learning in school was much more boring than learning in QA. One of the reasons of this was **homework** issue. He compared learning in QA and learning in school and he said that he found school learning boring. He stated that "The classes are boring in school. The teachers teach, teach and teach, and we just listen. We study again after we go home. This is boring" and he also added that "you explained us here and we had a chance to practice it here at that time. We did not need to deal with it again after we went home" (C3/S3).

**Authoritarian teacher behavior in school:** Another reason why students found classroom learning was authoritarian teacher behavior. In other words, the other issue was the **discipline** imposed by teachers as related with the code above. One of the students mentioned about this issue, as quoted below.

> C3/S2: It is more boring in school, the teachers dominate more there. They say look "you did not do this" *[in an authoritative way]*, but it is not the here. When we did not do something, the teacher corrects us here, but school teachers do not behave like that *[Italics in brackets were added by the researcher]*.

In a similar way, the other student also mentioned about the same issue. This student did not like his science teacher at all, and he even said that his teacher suggested his parents making him work in somewhere during summer time so that he would be taught his lesson. His teacher, in fact, punishing him for not being a successful student at school, and nothing would be a reason to employ an elementary school student. The long speech was quoted below to make it clear that how a teacher influences his/her students.

> Researcher: You know, here you took notes, made research, and we discussed all together. Can you compare your learning experiences of QA with school learning?
>
> C3/S1: For example, we tell you the things we noted down. If it is true, you say true; if it is not, you say it is not true. But, if it was in school, my teacher would chew me out and would say "how did you do it this way?". Here you do not behave like that. So here is better.

Researcher: What would you say when you think about impressing yourself here and there?

C3/S1: I would not say every opinion of me.

Researcher: Why?

C3/S1: For example, some of my friends *[the names were omitted]* say something, but when I say the same thing and if it is wrong, then the teacher gets angry with me.

Researcher: Gets angry! What about here?

C3/S1: Here, S4 says something, S3 says something, I say something, but you do not say anything negative *[Italics in brackets were added by the researcher]*.

In the part of the speech, he also added that "my heart skips a beat" when he wanted to say something to his teacher. It was because he was afraid of his teacher considering that "if the teacher chews me out" (C3/S1). The same student, on the other hand, was very comfortable throughout the QA project. He never seemed shy while mentioning about his opinions. He explained the reason why he felt more comfortable in the organization and during the project: "I did not see and hear that none of the facilitators *[abla ve abiler]* behaved like that" (C3/S1) *[Italics in brackets were added by the researcher]*.

Although school management issues were very much difficult in school setting and in the organization, what the student expected was a more helpful approach to them by whoever teaches whatever. They just wanted to learn with the help of the teacher who did not rub their nose in it and broke their motivation; but rather helps them correct what was done missing by them and approach them in a more friendly way.

**Being able to express opinions:** One of the students expressed that he felt his opinions better and easier throughout the project, when he compared it with learning in school.

C3/S3: I express my opinions better here. I sometimes insist on what I want to say at school and I can express myself, too. However, it is easier in here, because everybody listens to you and there is no one interrupting me. Therefore, it is easier here.

**Crowded classrooms:** As it is known by many people, the classrooms in most of the government schools in this country are so crowded that the learning process has negatively been influenced. One of the students pointed out this issue and claimed that he found learning in QA as a better opportunity when compared with school learning, because this reason. As cited above (being able to express opinions), he talked about this issue and indicated that he sometimes was not able to talk in class since the class was too crowded. To remind, he said that "*[it is crowded in school]*, therefore there is too much noise. What I say is not heard at all" (C3/S3) *[Italics in brackets were added by the researcher]*. On the other hand, another student in this case, mentioned about the same issue in an opposite way. Luckily, his classroom was not so crowded that their teacher conducted activities that were not done in other crowded classes though. It was obvious that some of the students were not as lucky as some others who learn in un-crowded classrooms. He mentioned about the projects they sometimes involved in school.

> C3/S2: For example, our teacher once wanted us to investigate the organs in our body.
>
> Researcher: Did you do it as a group project.
>
> C3/S2: Yes, we worked as a group. There were not many people. I mean we were 18 students.
>
> Researcher: Do your classes consist of 18 students?
>
> C3/S2: No, just our class has 18 students.
>
> Researcher: That's good.
>
> C3/S2: The teacher said we can do this better with a small classroom *[the classroom with less number of students]*. I mean the teacher said it would not be possible to do with a crowded classroom *[Italics in brackets were added by the researcher]*.

**Likes science classes:** Two of the students indicated that they also like science classes in school. They are happy with their science teachers. One of them, for example, explained this by giving an example of what they did in one of the science classes they enrolled in.

> C3/S3: We make experiments. That is why I like science classes. For example, while we were learning dissociation, we had brought some

> materials from the science lab, like olive oil, nut etc. We dropped using drippers. We saw that some of them dissolved but some not. They stayed as they are.

**Does not like science classes:** It would be surprising if all the students thought in the same way; i.e. if all of them liked science classes. There was a student in this case who expressed that he did not like science classes at all. He was an underachievement student and he did not like his teacher; which seemed as the obvious reasons for his dislike of science classes at school. As he stated, his science grade was poor at school. What he also said about teacher dislike indicated the importance of teacher behavior towards the students. On the other hand, he was enthusiastic and spent much effort on this project.

> Researcher: What do you think about science classes?
>
> C3/S1: Science classes were associated with the experiments most of the time. It is kind of science thing I mean.
>
> Researcher: Ok, so how do you feel about science classes?
>
> C3/S1: I feel nothing.
>
> Researcher: Aren’t you interested in science?
>
> C3/S1: I don’t like it at all due to our teacher.

**Easy interaction with friends:** It is so obvious that in most of the government schools teachers do not let students talk with other students if they do not say something about the class subject. Therefore, students felt more comfortable in this project since they were able to talk to each other. This did not mean that the project group was unmanaged and there was a chaotic environment there. Rather, they sometimes were allowed to share their opinions with others and talk with others. In fact, they did not tend to talk about external issues. Nevertheless, they talked mainly about project-related issues. In addition to this, they were able to chat with each other thanks to chat opportunity in the environment so that the class was not noisy at all. What one of the students in this case talked about showed how the students were afraid of their teachers when they tended to talk in class.

Researcher: What would you say about interacting with your friends? Do you feel more comfortable in class or here?

C3/S1: Here! Actually I did not do it in class but I don't think it would be possible though.

Researcher: Can you easily turn to a friend and ask a question in class?

C3/S1: No!

Researcher: What about here?

C3/S1: Yes! For example, if the teacher hears anything, s/he would go crazy!

**Reading and experimenting:** Students were asked to state what they did in a usual science classroom. Since the students were from different schools, the responses they gave showed differences. First of all one of the students expressed that they just only read from the class book.

C3/S1: When there are no experiment equipments available, we just read. We do some staff from student workbooks. We read our books. Sometimes, friends do the experiments.

Researcher: Who?

C3/S1: I mean friends.

Researcher: Does not your teacher want everybody to do the experiments?

C3/S1: The teacher wants from everyone. However, most of the students don't do it.

The other student, on the other hand, said that they made experiments in science classes at school. He explained this by giving an example.

Researcher: What do you do in science lab?

C3/S2: For example, we investigated microorganisms. Our teacher took the blood of one of us.

Researcher: Did you look at it with microscope?

C3/S2: Yes, we saw the things like bubbles. They were bacteria. We saw those.

Finally, the last student indicated that he liked science classes and they sometimes did experiments there. Interestingly, they did not have a science lab in school.

> Researcher: What do you think about science classes in general?
>
> C3/S3: It is like math. Calculations also needed but we do experiments most of the time. We practice it with experiments. That is why I like science classes…
>
> Researcher: Do you usually go to science lab?
>
> C3/S3: We do not go to the lab. There is no lab in school, but just the equipment.
>
> Researcher: How do you do the experiments then?
>
> C3/S3: In the class.

**Writing vs. gaming:** Another similar issue was writing vs. gaming. As one of the students claimed so they wrote in school in addition to doing experiments. Nevertheless, they did not do any activity similar to QA project including game elements.

> C3/S2: There is a library in the school, so we do there *[in order to do research homework]*. There, we write and write, and then we read it to our teacher…When we look at our science books, we could not find any games *[Italics in brackets were added by the researcher]*.

**Feeling successful in QA:** Two of the students claimed that they felt more successful in QA project that in school. One of them, for example, noted that they were supposed to complete and bring their homework one day later their teacher assigned so. He also mentioned about the difference that doing a project made.

> Researcher: Where do you feel more successful, in school or here?
>
> C3/S2: In think in here.
>
> Researcher: Why?
>
> C3/S2: I progressed in a better way. We were not doing this type of things in school, but here we always do projects. The teacher says

> “bring it *(homework)* tomorrow”. It was not fun, though. *[Italics in brackets were added by the researcher]*.

The other student also said that he felt more successful in QA project because he liked projects, rather that lecturing. He said that “I like projects more. Practicing it is not the same with just listening” (C3/S3).

**Having fun in QA:** Not surprisingly, students found learning in QA more fun than learning in school. For sure, they had opportunity to have fun in QA environment but not in class. One said “We could not play, drive cars in school; but we can do it here” (C4/S1) and the other added “It is much more fun here” (C3/S2).

**Motivating:** Two of the students (C3/S1&3) expressed that their interest towards science increased after QA project. For example one of them noted that he normally did not like science classes but he liked learning in QA more. According to him “it would be better to learn in QA environment” (C3/S1).

**No projects like this:** All the students stated that they had never done a similar project in their school before. It was only group project that some of the students involved in as being different than regular school times. In those group projects, however, they only made literature research in either Internet sources or library resources, as they claimed so. For example, one of those students said that “No, we did not do *[any similar projects before]*. Once we investigated forest fires, and we went for planting. Nothing more!” (C3/S3) *[Italics in brackets were added by the researcher]*.

**Not similar to school:** Quest Atlantis project was not similar to school, as one of the students claimed, because it was a voluntary one. It was surprising that he seemed as a student who dislike school and he would not continue school if the schooling system was not compulsory. He said that “it was not like having class because we came here on our own accords. If it was in school, everyone would have to be there” (C3/S1).

**Permanent learning:** As it was known, this QA project utilized a constructivist way of learning; depending on a problem case, students investigated the 3D virtual world that was designed and developed as a technology rich learning environment to support students in their learning process. According to one of the students “it *[learning in QA-like learning environment]* was more permanent and not boring" (C3/S3) *[Italics in brackets were added by the researcher]*. He could think that learning in a problem-based learning environment where students actively involved in increased retain of information; they might also feel that they really learnt, not being taught.

**Similar to school:** One of the students stated that he found learning in QA similar to learning in school. According to him, both were similar to each other since "we make research in class and in here" (C3/S2). Moreover, he added that "I felt like having a lesson. For example, we go far away for making research. We listen to what they say and take notes" (C3/S2). What he said showed that QA project was similar to classroom activities in taking notes and making research.

#### 4.4.2.4. Student expectations about the improvements in QA

In this case, students were not very much familiar with commercial games. They rarely had a chance to play games like Need for Speed or GTA or Counter Strike. They did not have home computer so playing games was merely possible for them when they went to a friend's house that had a home computer and when they go to Internet cafes. This might be the reason why they did not made any comments about the aspects of the game or of the project that needed to be changed. What they expected was pure Turkish version of the game, a game full of items, and including more activities than Kızılırmak Park.

**Want to use in other classes:** All the three students stated that they wanted to use Quest Atlantis in other classes as well. In addition to science class, they wanted to see QA applications in computer, Turkish and social science classes as well.

Two of the students stated they would prefer QA use in computer classes (C3/S1&2). One of them claimed that they did not have Internet access at school but he wished there was: "For example in computer classes. In our school, there is not Internet access in our computers. We can play games like Quest Atlantis after having Internet access installed" (C3/S1). He, in fact, seemed to be interested in game play and having part of the issue; rather than learning.

Additionally, two of the students (C3/S2&3) said that they would like to continue using QA in their science classes. One of them suggested QA could be used as an additional resource to class activities. According to him, QA would be an alternative method since "we did not have a science lab" (C3/S3).

> C3/S3: For example we could watch the activity we did on a CD prepared through a video camera record or slides of it. We could watch it using a computer or DVD player. We could present it through a slide-presentation including all the works we did in the project including speeches we did.

Finally, the other class that the students wanted to be able to use QA was social science. All the three students interviewed suggested social science class. One of them, for example, said that he did not like social science classes, which was why QA would better be used. He said that "I do not like social science classes that much. It would be better within this environment" (C3/S1). There was another student who also would like to use QA in social science. He added that he, in fact, liked social science classes, but "it would be more fun" (C3/S2) using QA in social science class. The other student also made a suggestion for using QA. He said that "our neighborhoods, cuisines of different regions, which one does what, eat what, how have fun" (C3/S3). Another student also gave example of using QA in social science classes.

> C3/S1: For example, in social science class a project might be of discovering Turkey. Also, it could be about natural assets of Turkey and other countries. It could be about traveling Turkey… Social science classes would be more beneficial.

**Additional activities:** One of the expectations a student expressed was additional activities to be added to Quest Atlantis. Although there were other 3D worlds and many more activities available in QA scope, the students only were able to work on Kızılırmak-Park project. They could just walk and discover other worlds as much as they could do. It was because they did not know English well.

> C3/S1: More activities could be added to Quest Atlantis, I think. For example, we talked *[with NPCs]*, drove cars, and made water analysis. There is nothing I want to add but you know Quest Atlantis is over

> now. After it had done, it would be better if was a more about social science, I think *[Italics in brackets were added by the researcher]*.

**Being able to play more:** Not surprisingly, the students wanted to play more. One of them seemed that the project time was not enough for him. He did not have a home computer so that he was not able to play at home. However, what he expected was to play more: “I could not drive cars more, which I would like to do so. I would like to take my password and the game with a CD. I would want to do this” (C3/S3).

**No empty spaces:** One other student complained about a game aspect that required to be changed. According to him, the empty places within 3D environment should be filled with items so that there would not be empty areas anymore.

> Researcher: Have you ever felt like some aspects of QA need to change?
>
> C3/S2: Yes! There are empty spaces you know. You just go and go and move forward, but you cannot find anything there. For example that part *[need to change]*. *[Italics in brackets were added by the researcher]*.

**Nothing with the project:** According to the students, the project did not require any type of change. They said “everything was set up nicely” (C3/S3) and “it was a very-well done project” (C3/S1).

**Turkish game patch:** One of the students suggested a Turkish patch for QA so that they could be easily understand all the game parts. He said that “I think a Turkish patch should be applied to the game. I mean, we can better understand it in that way. Some of the things are in English, and they could be made Turkish with a patch” (C3/S1). Although it may not be possible applying a patch, what this student expected was a game environment where he could understand all the things easily.

### 4.4.3. Research Question – 3 – Challenges and Barriers

**The students give up:** This case study had started with nine students. However, only four of them completed the project. The remaining five students gave up (stopped coming to the organization). Students’ participations in the organization depended on voluntariness. Therefore, it was not possible to ensure students’ attendance constantly. The researcher called up the parents of each student in order to learn the reason for their absence. Each parent had a different response, though. For example one of them said that “it is too hot outside, so I do not want to send my child anymore”. Another parent, whose two children were in the group, said that “we have someone patient at home. My child is taking care of her”. It was weird that she was just a child, and it was hard to understand how she could be taking care of an ill person. Somehow, it was reasonable for the parent. Finally, two other parents of two students said that their son started to go another course, which was why they took their children from the organization.

**Crowded classrooms:** One of the students mentioned about how his teacher decide on doing a projects in their school. As he (C3/S2) stated that the teacher tended to do a project with only one classroom where the number of students was less than other classrooms. In the school settings, when the classrooms are crowded (which is actually the case in most of the government schools in the country), the teachers do not want to do some types of projects. In the case the student explained, the project was a group project (the students investigated part of body) and did not require the use of extra educational technologies. Nevertheless, other classrooms’ being crowded still influenced the teacher’s opinions and stopped him/her doing the project with other students. Considering the QA implementations in private school settings and in the NGO setting, and considering how the teacher made his/her mind considering the number of students in classroom; it would not be wrong to think that the use of QA in government schools would be a serious challenge (or may be a barrier in some of the settings) due to the crowded classrooms.

**Deficient conditions in schools:** When it comes to the implementation of QA in government school settings, some other barriers emerge such as deficient technical conditions in computer labs. QA requires the use of computer and Internet technologies. However, there are still some schools that do not have Internet access at the computer labs. As one of the students in this case (C3/S1) expressed, there was no Internet access in their computer lab, for example. Then, when QA is to be used in government school settings, lab conditions would be a serious barrier. The students claimed that they wanted to use QA in their schools as well; however that would not be possible, considering what they said about their school conditions.

**Deficient technical conditions:** In contrast to the students' opportunities in private school settings, the students participated in this case did not have computers and Internet access at home. They either employed "encyclopedia at home" (C3/S3) or other "library resources" (C3/S2) when they were supposed to make a research-homework. One of them also said that he used "the computer of their neighbor" (C3/S1). The students also said that they went to Internet cafés some of the time; but since "I needed to pay one Turkish lira, so I do not go; rather I try to do it using encyclopedia" (C3/S3). As can be understood what he said, it was not all about use of computer at home; the students was not in financially good conditions. In order not to pay for the computer usage or print-out at Internet café, the student tended to do his homework using what other resources available at home. Moreover, considering their opportunities in their home, it was not possible to ask students continue the project at home. It was only possible to complete the project within the time available in the organization.

**Gaming rather than learning:** As in all the other cases, the students sometimes tended to play (gaming) rather than learning. Especially one of the student's attention was hard to draw into the project. He (C3/S2) liked playing, going the places he never visited before, swimming in the river etc. When it came to the project, however, he was less interested at the beginning. Then, he suddenly became more interested with the project and completed it at the same time as his peers. He was asked to explain the reason of this during the interviews. He stated that "I used to get bored" (C3/S2).

**Not being able to discover the game:** The students sometimes had difficulty in finding out some of the items, NPCs or places. Although they were provided with a map of the park, they had difficulty while doing so. One of them, for example, said he "could not find the books" (C3/S1) and the other said he made a mistake with the water analysis part (C3/S3). Additionally, the game's other parts being in English did not let the students discover other virtual worlds since they did not know English well.

**Takes time to get used to:** Related with the above issues, the QA environment was new for the students and they were not familiar much with this type of software before. Therefore, the students needed some time to get used to the game environment. In fact, in order to overcome this problem, they were provided with some orientation time within that they were free to do whatever with the game. They freely discovered the game environment. Nevertheless, the time of the project composed of three weeks; that was enough time for the students to get used to the virtual world of the project. Regarding this issue, one of the students said that “since we did not know anything, we were wandering around” (C3/S1).

**Not being able to relate science class:** One of the challenges was that some of the students may not be able to relate QA project with their school works. In other words, they were not able to judge about the project and to say “this is a science project”. One of the reasons was that they were not familiar with those applications and they had never met anything similar in school settings. It was different type of educational implementation they had never been into. Since the learning environment was presented in a completely different way than they got used to, they had difficulty in relating with their school learning.

One of the students said that it was only water analysis related with science. He said about if he believed he learned something about science that “there was not so much. Only water analysis reminded me science classes. In water analysis, in points A, B and C, I took the notes down such as PH. Those were related with science classes” (C3/S3).

It seemed, what they thought about learning (or being thought) in school and how they were behaved by their teacher in their school influenced their attitudes and general perceptions toward an application. Even if they liked the project, they could not imagine that the use of the QA project in their school would be contributing to their science learning.

> Researcher: Do you like science classes in general?
>
> C3/S1: Normally, I do not like that much.
>
> Researcher: What about this project? It was also about science though.
>
> C3/S1: I liked this project a lot.
>
> Researcher: Do you think this project has increased your interest towards science.
>
> C3/S1: It did not change because I did not know it was about science. Even if I knew, I would not change, I think.

Researcher: Why?

C3/S1: It is because we do not do any similar projects in school. For example, we never play games in classes.

Researcher: What about research?

C3/S1: We do not do anything like Quest Atlantis, as we did here.

Researcher: So you never did a similar project at school, right?

C3/S1: No! For the first time!

**Student attendance:** In a similar vein why some of the student gave up coming in the organization, there were other students who did not join few of the implementation sessions. One of them said that “I get bored, and I wander around” (C3/S2). When the attendance depends on voluntariness, there emerges this type of challenges, unfortunately.

**The importance of facilitator support:** During the interview with one of the students, there emerged the issue of the importance of facilitator support. He pointed out that the help of the facilitator was essential since that was the first time they enrolled in such a project. What the student asserted here indicated the importance of facilitator support, especially when the learning environment is innovative.

Researcher: Have you ever had difficulty with the project?

C3/S1: No! I mean by getting help from you, I never had difficulty.

Researcher: What would happen, if you were alone while doing it?

C3/S1: I would be a little more difficult.

Researcher: How?

C3/S1: You have a great contribution to us.

Researcher: In which parts did you have difficulty?

C3/S1: For example, we did not know how to do water analysis because we do it for the first time. Therefore, we could not get water samples and talk to those people [NPCs]. We could not take notes. The things would go hard. *[Italics in brackets were added by the researcher]*.

### 4.5. Results of Case-4

The results of case-4 are presented under the following part. The demographics of students are explained as the first phase. After that, the results of qualitative analysis are provided regarding each research question.

#### 4.5.1. Demographics of Students

As in the previous one, this case study was conducted with a group of students in the same NGO located in İzmir, Turkey. There were 16 students in this group of which ten were female and six were male (Figure 4.4).

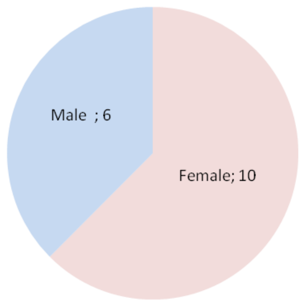



**Figure 4.4** Graph illustrating the distribution of gender

Since the ages of the students showed differences in this organization participated in the activity groups of the organization, the grades of the students in this case showed slight differences. In this student group, nine of the students were from 4$^{th}$ grade, two were from 6$^{th}$ grade and three were from 5$^{th}$ grade.

Students' status of having a home computer and a game console was examined and the results are presented in the Table 4.26. Half of the students (n=8, 50.0%) had home computer and seven (43.8%) of them had Internet access at home. Only four (25.0%) students had a game console like Atari or Play Station, but most of them (n=12, 75.0%) did not have any.

**Table 4.24** Students' having home computer and game console

| | Yes | | No | | Total | |
|---|---|---|---|---|---|---|
| | *f* | % | *f* | % | *f* | % |
| Home computer | 8 | 50.0 | 8 | 50.0 | 16 | 100.0 |
| Internet access at home | 7 | 43.8 | 9 | 56.3 | 16 | 100.0 |
| Game console | 4 | 25.0 | 12 | 75.0 | 16 | 100.0 |

Another item investigated in student demographic questionnaire was students' computer and Internet use durations (Table 4.27). Two (12.5%) students did not reply the item about computer use duration and four (25.0%) students did not reply the item about Internet use duration. Among the students who replied this item, half of them stated that they had been using computers for one year and below, while the other half stated that they had been using it for two years and more. Six (37.5%) students asserted that they had been using Internet for one year or less whereas five (31.3%) others asserted that they were familiar with this technology for two to three years. There was one (6.3%) student claiming that s/he had never used the Internet before. There was no student using the computer technology for more than five years and Internet for more than four years. Nevertheless, all the students had been using computers for at least one year and it was only one student who never used the Internet before.

**Table 4.25** The length of time that the students use computer and Internet

| | Computer use duration | | Internet use duration | |
|---|---|---|---|---|
| | *f* | % | *f* | % |
| Don't use | - | - | 1 | 6.3 |
| 1 year and below | 7 | 43.8 | 6 | 37.5 |
| 2-3 years | 4 | 25.0 | 5 | 31.3 |
| 4-5 years | 3 | 18.8 | - | - |
| More than 5 years | - | - | - | - |
| Total | 14 | 87.5 | 12 | 75.0 |

With another item in the questionnaire, students' Internet use frequencies were investigated and the results were presented in the table below (Table 4.28). There was one student who did not reply this question and one another who had never used the Internet before. Among the others, half of the students (n=7, 43.8%) stated that they had been using the Internet technology for a few times in a week, whereas four (25.0%) students had been using it for a few times in a month. Only three (18.8%) students claimed that they used this technology every day.

**Table 4.26** Students' Internet use frequencies

| | Internet use frequency | |
|---|---|---|
| | *f* | % |
| Never used before | 1 | 6.3 |
| A few times in a month | 4 | 25.0 |
| A few times in a week | 7 | 43.8 |
| Every day | 3 | 18.8 |
| Total | 15 | 93.8 |

The analysis of the item about the places where the students had access to the Internet resulted in a variety of groupings (Table 4.29). The results showed that four (25.0%) of the students access the Internet from home, whereas four (25.0%) others access this technology from either home or school and another place convenient to them (such as a relative's computer). Five (31.3%) more students stated that they employed Internet in Internet cafés only.

**Table 4.27** The places where the students access the Internet

| | Places to use Internet | |
|---|---|---|
| | *f* | % |
| Home | 4 | 25.0 |
| School | 1 | 6.3 |

**Table 4.29** Continued

| | | |
|---|---|---|
| Home & School | 1 | 6.3 |
| Home/ School & Somewhere else | 4 | 25.0 |
| Don't use | 1 | 6.3 |
| Other | 5 | 31.3 |
| Total | 16 | 100 |

Among the other types of the software, games were in the first place that all the students had been utilizing except for one (n=15, 93.8%) (Table 4.30). The other software types had been used by less than half of the students: presentation software were used by six (37.5%), word processor and drawing applications were used by five (31.3%), and spreadsheet applications were used by only three (18.8%) students in this group.

**Table 4.28** Number of students using computer software applications

| | Use of computer software use | |
|---|---|---|
| | *f* | % |
| Word processor | 5 | 31.3 |
| Games | 15 | 93.8 |
| Presentation | 6 | 37.5 |
| Drawing | 5 | 31.3 |
| Spreadsheet application | 3 | 18.8 |

The number of students and the types of the Internet applications they employed are summarized in the table below (Table 4.31.). The results show that all of the students who replied this item (n=14, 87.5%) had been playing single player games on the Internet. The other most frequently used Internet applications were listening mp3 files (n=8, 50.0%) and watching videos (n=7, 43.8%). E-mail, searching for information, flowing around web pages and watching films were the types of applications done by five (31.3%) students. Additionally, multiplayer gaming (n=4, 25.0%), social networking (n=3, 18.8%), chat (n=2, 12.5%), downloading (n=2, 12.5%) and uploading files (n=1, 6.3%) and posting on forum pages (n=2, 12.5%) were preferred by fewer students. Two (12.5%) students did not reply this question.

**Table 4.29** Number of students using Internet applications

| | Internet applications | |
|---|---|---|
| | *f* | % |
| Single-player gaming | 14 | 87.5 |
| Listening MP3 | 8 | 50.0 |
| Watching videos | 7 | 43.8 |
| E-mail | 5 | 31.3 |
| Searching information | 5 | 31.3 |
| Web (WWW) | 5 | 31.3 |
| Watching films | 5 | 31.3 |
| Multi-player gaming | 4 | 25.0 |
| Social networking | 3 | 18.8 |
| Chat | 2 | 12.5 |
| Download files | 2 | 12.5 |
| Forum postings | 2 | 12.5 |
| Upload files. | 1 | 6.3 |

Among the participants of this case, 11 (68.8%) students stated that they benefited from the Internet technologies while doing their homework (Table 4.32). There were five (31.3%) students claiming that they got in touch with teachers using the Internet (Table 4.36.). Two (12.5%) students did not give response to this item.

**Table 4.30** Students' purposes of using the Internet

| | Purposes of using the Internet | |
|---|---|---|
| | *f* | % |
| Homework | 11 | 68.8 |
| Contact with teacher | 5 | 31.3 |

### 4.5.2. Research Question – 1 – Student Perceptions

#### 4.5.2.1. The way the students used QA

The table given below (Table 4.33) shows the number of times that students logged in, the number of chat massages and e-mail that they sent.

**Table 4.31** Students' QA use statistics

| Students | Gender | # of logins | # of chat massages | # of e-mails sent |
|---|---|---|---|---|
| S1 | Male | 18 | 1 | 0 |
| S2 | Female | 13 | 0 | 0 |
| S3 | Female | 73 | 45 | 0 |
| S4 | Female | 16 | 6 | 0 |
| S5 | Male | 7 | 0 | 0 |
| S6 | Female | 12 | 11 | 0 |
| S7 | Male | 12 | 0 | 0 |
| S8 | Female | 24 | 1 | 0 |
| S9 | Female | 12 | 1 | 0 |
| S10 | Male | 11 | 11 | 0 |
| S11 | Male | 3 | 6 | 0 |
| S12 | Female | 2 | 0 | 0 |
| S13 | Female | 10 | 0 | 0 |
| S14 | Female | 5 | 0 | 0 |
| S15 | Female | 10 | 9 | 0 |
| S16 | Male | 1 | 0 | 0 |

#### 4.5.2.2. Student experiences

##### 4.5.2.2.1. Students' Experience of the Organization

**Duration:** Nine of the students who were interviewed stated that they had been continuing the organization for one year and below while three others stated they had continuing for two years. There was another student who joined the organization three years ago.

**Purpose*:*** Students' purposes for joining this organization showed differences. There were some students coming to the organization to learn, to improve their school success or for self improvement. For instance one student said that "I came here to learn, to gain knowledge" (C4/S6) and another said "to improve myself more and to know more people" (C4/S4) pointing on the potential benefit of this type of organizations, that was meeting other people. There were also some other students preferring to come to the organization to have fun. One student (C4/S5) mentioned that being able to use computers and the Internet in the organization was also a reason for the participation.

Some of the students were new in the organization: they had started the organization during the summer term. One student stated that she joined since she had no better alternative for the summer time.

> Researcher: What was your purpose for coming here?
>
> C4/S3: I came here to join summer activities.
>
> Researcher: Why did you prefer doing so?
>
> C4/S3: When I was at home, I used to go outside, and I did not enjoy it.

Students' responses indicated that their participation to the organization was either due to their friends' participation or due to the suggestion of their parents or teachers. They said that their parents or their teachers suggested them joining the organization as a way to support their school studies or as a better activity than spending hours in front of television. Related with this issue, for example one student stated that "instead of spending time outside and under the sun, it is better to be here. At least there is no sun here and we do not play outside. It is more fun" (C4/S8). At this point, it might be better mention about the weather conditions of the city where the organization was founded. The city is located at seaside and especially during the summer time; the temperature outside is very high all the time.

**Opinions*:*** Students in the NGO cases were also asked to state their opinions about the organization and the type of activities they liked doing most. In the organization, during the school time of the children, they are provided with activity times during which studies have been conducted to support their school success. In addition to these supportive study hours, students are provided with other activity hours including art and craft, computer and Internet, drama etc. For example, one of the children stated that he enjoyed learning in the organization since the approach in the organization was not strict as in the school and supported with other fun activities.

> C4/S5: This place makes me stay here. I think that this place is much better.
>
> Researcher: In what respects?
>
> C4/S5: They teach us on each type of subject.
>
> Researcher: What are the differences than school? Why do you like this place more than school?
>
> C4/S5: It is because they teach us every subject area, and then they make us have fun. We do not need to be silent and we can talk with our friends while having fun.

As there were students who liked studying their school subjects in the organization with the guidance of volunteers, there were also students who liked different activities than school work such as playing any type of games with friends, painting pictures, playing with play-dough, reading books together or any type of activities they did with a group of students. All the students stated that they liked participating in the activities in the organization. Moreover, according to the students learning was more fun in the organization than it occurred in their school.

#### 4.5.2.2.2. Students' Experience of QA implementation

**Voluntary participation:** In the organization, during the summer-activity-term, QA Kızılırmak-park-project was offered to the students as an alternative type of activity.

It was announced to the students with a meeting and information was provided about the project. Involvement to the activity depended on voluntary participation. Students who wanted to join the activity were signed for the QA-group. The activity time were arranged to be during the lunch time (free time) of the students. Students' responses for joining the activity group showed several types of reasons. Several students stated that they joined the group to have fun, while some other stated that they wanted to learn through the activity. For example, one female student said that "I participated in the activity to gain some knowledge" (C4/S6).

Other students mentioned about another reason, that was wonder and like. They stated that they liked the game and they wondered what would happen, and therefore they joined the group. As an example "*[I wondered]* how the activity to be, what we will be doing" (C4/S2) *[italics in brackets were added by the researcher]*.

Interestingly, there was a student who declared that he thought the activity was a real one and Kızılırmak-river was the representation of the real one. He said that he was wondering Kızılırmak, and he had a chance to see it thanks to the game: "I was wondering Kızılırmak very much, and I saw that it was such a nice place" (C4/S5).

There were three other responses for joining the activity group: enjoying computer activities, having something to do instead of waiting for an hour during the lunch time and enjoying making research. Students had much time for the lunch so that they could go home to eat something. On the other hand, most of the students in this case had spending their lunch time in the organization. One female student answered the question of her reason for joining the group as "Since after having lunch, I have to sit and wait here, which really bores me". The other female student mentioned about her likes of using computers so she preferred the activity. Finally, one male student stated that he liked doing research "I thought that it would be very beneficial. I sometimes like making research" (C4/S5).

**3D places to walk in:** Students were asked to share their opinions on their experiences and asked to define how they would describe QA. As one of the students stated that they needed to log in the game first with a username and password, and then you can see you avatar. None of the students interviewed knew the term "avatar", although they had been taught about it during the orientation session. Rather, they had been calling it "the man" or "the kid" with their name on it. The student said “You write your password. After you do this, you become the kid that appears in front of you. That is you and your name is written on it” (C4/S5). To sum up, QA was a 3D place in which they (or the kid/man in the screen) could wander around, according to the students.

The students also mentioned about interacting with NPCs characters they met while walking around 3D places. They stated that they found other people and they interacted with them by mouse click: “When we walk, we find the people and we listen what they are talking about. They talk to us and we listen to them” (C4/S7).

**Activity of solving the problem of Kızılırmak Park:** The students were asked to imagine they were mentioning about the project to a friend who knew nothing about the project. Many students stated that it was such an activity in which they were trying to solve the fish decline problem of Kızılırmak Park. They mentioned about QA as a research project in which they collected data (water analysis, pictures, notes etc.), visited the places in the park and talked to the people living there. Examples included “we walked around, gathered information, investigated fish deaths” (C4/S9), “I found people, listened to them and took notes that I bear in my mind; and then my project was done” (C4/S3), and finally “searching for the people, gathering information, trying to understand what was happening in Kızılırmak National Park, and the reason why fish were dying” (C4/S6). According to the students, this activity was a research where they collected data and tried to solve the problem of Kızılırmak Park.

**Contributes to learning:** All of the students stated that QA would be beneficial for other children and it would not have any negative influences on the children. Moreover, they added that learning in QA contributed to them.

> C4/S4: This project contributed to me.
>
> Researcher: In what respects?
>
> C4/S4: I have understood the environment more, and I have learned environmental awareness.

Another student mentioned about how the project in QA contributed her science knowledge [In this sentence science was referred to “hayat bilgisi” class which was an earlier version of science class taught in early classes in Turkish education system]. At the beginning of the project, she seemed so nervous and not self-confident. However, after some time and being successful in completing the parts of the project, she started relying on her knowledge and her success.

> C4/S2: I do not think that I will have any difficulty in science classes.
>
> Researcher: Good. What did you learn about science?
>
> C4/S2: I made research. I gathered information which may be beneficial for me. I took pictures and I saw similar pictures to the ones in our class book.

**Think they have learned:** Very related with the code explained above, all of the students interviewed stated that they had learned from the project. For example one of them stated that “the game gives information, we see many different things” (C4/S8). What they had learned was mostly depended on their effort; nevertheless, they also mentioned about facilitator’s and friends’ support in the learning process.

Students’ responses showed some differences including environmental awareness, the importance of protecting animals, game playing, making research and science related issues. To start with game playing, three students stated that they had learned about QA and some other game playing issues such as driving cars, discovering new places in a 3D environments.

There were other students who learned about science related issues such as erosion and the importance of trees. Since they conducted research in the project, there were another group of students stating that they learned about how to do research. For example, students stated that “I learned how to conduct research” (C4/S3) and “I learned how to conduct research in an easier way” (C4/S8).

> Researcher: What did you learn in the project?
>
> C4/S5: Making research, gathering information, and investigating the reason why fish were dying.

Three students also stated that they felt like a scientist while doing the research “I felt like a scientist” (C4/S9).

The students also gained knowledge about environmental awareness and the importance of animal protection, as they stated so. For instance, one student stated that “keeping the environment clean, not to pollute it, avoiding cutting the trees so that erosion not occurring” (C4/S8) and similarly another student added that “not to pollute the environment, keeping it clean and protect living beings” (C4/S9). To give another example statement, one student said that “I understood the environment better and I learned environmental awareness” (C4/S4). Students also mentioned about the importance of protecting animals as much as the environment itself. Since they understood “the reason why the fish die” (C4/S5), they realized the importance of “avoiding fishing a lot” (C4/S7) and “protecting fish” (C4/S6).

**Easy to finish:** Although at the beginning of the project, there were some students kind of nervous about the project and worried if they could not be successful. However, after the project finished, most of the students stated that it was easy to finish.

They were also asked to state their opinions on the student worksheet that they found thick and including many spaces to fill when they first saw the worksheets. Their responses showed that time was enough for them to fill in the blanks and also the worksheet helped them organize their data that they collected from the environment. There was only a child mentioning about how hard it was to fill the worksheet. On the other hand, she added that she could not believe that she were able to finish up that much work. She said “It has too many pages, it is this thick *[showing the amount of pages with her hand]*. For the first time in my life, I finished that much staff in three weeks” (C4/S6) *[italics in brackets were added by the researcher]*.

**Taking notes helped solve the problem:** Students agreed on the benefits of studying with a worksheet. According to them, the worksheet helped them organize what they found in the 3D environment.

> Researcher: You were not very much interested at the beginning. But, it changed during the project went on. For example, when I distributed the worksheets to you, you were one of the students who were complaining like “how we are going to complete it!”
>
> C4/S2: But it finished. We thought like that because it had many pages. But it was not the case

> Researcher: Why did you feel like that due to page size?
>
> C4/S2: Due to thinking about "how to finish it in three weeks"? I thought I won't be able to talk that many people.
>
> Researcher: Did it affect you in a negative way?
>
> C4/S2: Kind of.
>
> Researcher: How did you feel?
>
> C4/S2: I felt sorry since I thought that I won't be able to finish it. But then I became happy when I finished it.
>
> Researcher: Was it useful?
>
> C4/S2: Yes, it was because I wrote the information I gathered into the worksheet. Even if I forgot anything, I had a chance to remember.

**Fun game:** There were students defining QA as a game that they played and had fun with it. One student said that "we are walking around, playing game, there are people around and we talk to them by clicking on them" (C4/S4).

**Fun and learning together:** Students did not limit QA with game aspects of it; rather they stated that they learned in such a learning environment where they were able to have fun, too. One student said that "You not only have fun but also learn new things and you conduct research" (C4/S3). Another student answered the question of declaring positive and negative sides of QA by saying that "The positive side is making research; also we have chance to play game" (C4/S5).

Another female student stated that QA made Science more fun: "*[This project]* taught me that science was fun and the subject was nice" (C4/S3) *[italics in brackets were added by the researcher]*.

**Having different feelings:** One student emphasized a different point while she was explaining her experiences about the project. She stated that she went through different feelings while completing the project. She became sad and happy from time to time.

> Researcher: As you know we completed a project here with you all together. Can you explain the experience you had in Kızılırmak project?
>
> C4/S2: I had many different feeling while playing. Sometimes I was happy, but sometimes I was sad.

> Researcher: Why did you feel sorry?
>
> C4/S2: When I could not find or when I had difficulty or when my computer was broken down, I felt sorry.

**Increasing self-confidence:** The same student quoted above, mentioned about another experience she had. She was not self-confident and as she said she felt said and unsuccessful whenever she was not able to the tasks. However, the observations indicated that whenever she achieved doing something in the project, her self-confidence increased and she involved in the project more and more. She also stated the same issue by stating "you learn many things and you achieve the tasks by yourself" (C4/S2).

**No violence:** One male student stated about a characteristic of the game, that was the game did not include any violence issues. This student stated that he played computer games in Internet café and GTA was the game he played most. Comparing with other games he played, he found QA in-violent: "There is no violence" (C4/S10).

**QA characteristics that students like/dislike**

Students mentioned about their likes and dislikes they encountered in QA environment. The codes drawn from student data are explained under two main titles below.

**Likes:** Students liked showed some differences among the students. Some of them stated that they liked seeing themselves in the environment thanks to their avatars and being able to interact with their friends and other NPCs. There were other students who liked the project itself, being able to do research, being able to make discussions and being able to learn. On the other hand, there were students who liked some QA aspects which were for fun such as walking around, swimming or driving cars.

**Avatar:** Three students said that they liked avatars although they did not know the term; rather they referred avatars as the man or the kid. Being able to see themselves in the game represented by a character and to see their names on it was one of the things they liked in QA. By relating her avatar with herself, one student said "I can see myself" (C4/S3); and another student "we can see each other in the game, for example I can see my friend" (C4/S7).

**Walking around:** Seven students stated that they liked walking around 3D spaces: "Walking around with friends, I mean going the same place with friends" (C4/S6) and "wandering around" (C4/S10).

**Discussions:** Although discussions was not held in QA environment; rather we made discussions face-to-face, it was still the part of the project in which student discussed what they found and what they were thinking about the fish decline problem. One female student stated that she liked discussion parts in the project and she felt enthusiastic: "I liked it a lot to make discussions after we completed our tasks" (C4/S4).

**Driving cars:** Three students stated that they liked driving cars in the 3D environment. One of them was female and two were male. She replied the question of her likes in QA by saying that "driving cars" (C4/S3) and one of the boys replied the same questions as "driving cars and wandering around" (C4/S7).

**Interacting with friends:** Students got excited when they started to use QA because they were able to see each other in the environment. First, they were excited for their avatar, which they could move in the 3D environment. Then, they realized that other friends were also there in the 3D environment; they were able to see each other. During the interviews three of the students stated that they liked interacting with their friends, seeing them in 3D environment and chatting with them as their likes of QA. For instance one of them said that "For example I see my friends S6 and S3 in front of me as a human being" (C4/S7).

**Interacting with NPCs:** Two students also mentioned about interaction part, but this time not with their friends but NPCs located in the 3D environment. One of them mentioned about her like of QA by saying that "Talking to people in Quest Atlantis" (C4/S4).

**Learning:** While mentioning about students' experiences in the project, it was declared that students admitted that they had learned something from the project. Moreover, two of the students emphasized being able to learn in this environment as their likes. “I like acquiring knowledge about dying fish” (C4/S6). Another student stated that he liked learning new things: “Learning something new” (C4/S10).

**Project itself:** Four students stated that they liked the project itself; the problem case where they acted like scientist to solve it. They stated that they not only felt happy “when I first saw fish in Kızılırmak Park” (C4/S9) but also when they were “finish the project” (C4/S8). Also one of them said that it was making her excited: “Who is talking in Kızılırmak National Park, will I learn something, what am I going to find, will it be excited, and will I go into somewhere” (C4/S3).

**Swimming:** Four students stated that they liked swimming in the river or any other water pool. As in the other cases, students created their own games within QA environment, although they were not taught to do so. They stated that they got relaxed when they swam in the sea “I like swimming in the sea a lot” (C4/S6) and it was more fun diving into the water with friends: “*[I like]* swimming with my friends. Diving into the water and swimming there is more fun” (C4/S8) *[italics in brackets were added by the researcher]*.

**<u>Dislikes</u>:** Students had some dislikes as they had likes in their QA usage. Their dislikes included game bugs, the game’s stop running, getting lost, not being able to find a place or a NPC, long reading passages, taking notes, limited 3D area. Additionally, they mentioned about some potential side effects of playing computer games. According to them there could be the danger of game addiction, and also playing games for long time was harmful for eyes.

**Bugs:** Some of the students mentioned about some game bugs as their dislikes. According to them, facing with bugs while playing/doing project made them got angry. For example “when I try to go somewhere and push the keyboard, it just goes to the other way, and I go crazy when this happened” (C4/S6) one of the students said.

**Stop running:** Due to the low capacity of the computers and low speed of the Internet, some of the computers in the lab stopped running for a while, and students had to wait for the computer to start running again. When this happened students got bored, however, unfortunately, they had to wait for a while since there were no other computers available. One of them replied the question of her dislike by saying “when it got stuck” (C4/S6).

**Driving cars:** Interestingly, among all the cases, there was only one female student who found driving cars as something silly. In fact, at the beginning of the interview, she stated that she liked boy-games (such as soccer) more than girl-games. Additionally, she added that she liked driving cars, too. On the other hand, she admitted that she did not like driving cars in QA, since it was neither related with the project nor science. She said that “driving cars is such a silly thing” (C4/S6).

**Game addiction:** Two female students mentioned about a general critique made about computer games, which was game addiction. That was interesting that two children in that age group were talking about game addiction. That might be because their parents or their teacher imposed on their children by criticizing computer games. In the example below, she talked about her opinion about her dislikes of QA, although her opinions might be general for all the computer games.

> C4/S6: I guess I get caught up in the game.
>
> Researcher: What is happening then?
>
> C4/S6: I cry!
>
> Researcher: Do you cry?
>
> C4/S6: Yes, my eyes get wet.
>
> Researcher: Why?
>
> C4/S6: I do not want to give up, my eyes fill with tears, I do not want to stop playing; rather I want to play all the time.

**Harmful for eyes:** Although it was not specific for QA, one student mentioned about another side effect of playing computer games, that was playing games for long time (i.e. staying in front of screen) might be harmful for the eyes. She stated that “if you play for five-six hours, then it is harmful especially for your eyes” (C4/S8). As the code below, this code also might be related with student’s general opinions that were most probably influenced by her parents’ or teachers’ opinions.

**Getting lost:** Although students were provided with the map of the park area, they got lost in the park for some of the times. When asked to mention about their dislikes, some of the students pointed on this problem. One student said “Looking at the map and finding out the places of people. For example, Deniz *[the name of one of the NPCs in the park]*, I had difficulty while finding him. I try to go Deniz’s location; however I cannot find him” (C4/S7) and another one stated that “You sometimes get lost and cannot go the place you want to go” (C4/S9) *[italics in brackets were added by the researcher]*.

**Not being able to find items/NPCs:** Very related with the code above, students mentioned about another similar problem, which was not being able to find some items, places or NPCs in 3D environment. As an example on student said that “What I disliked was that when I had difficulty in finding an item which my friends had already found” (C4/S2). Another student mentioned about the difficulty of finding NPCs: “While looking at the map and trying to find, for example, Deniz; I had difficulty in finding Deniz. Because I go towards Deniz, but I cannot find him” (C4/S7).

**Long reading passages:** Students were required to read the passages that were presented as the speeches of NPCs and that provided information about fish-decline problem. Three students stated that they sometimes got bored while reading the passages, as their dislikes. On the other hand, they completed the task of talking to NPCs in the park.

**Limited 3D area:** One of the male students, who were mentioned above with some of his character details, complained about the limited size of the 3D area – Kızılırmak Park. He said that he disliked the project’s “being in the same place all the time” (C4/S10). As stated before, he was a computer-game-player; therefore, he found Kızılırmak Park smaller than he expected when he compared QA with other computer games he got used to play.

**Writing:** Although almost all the students indicated that they found taking notes useful and they did not get bored while doing so, there was one male student mentioning about writing part as his dislike: “I did not want to write” (C4/S1). He was a different student than any other students in this case. It was almost not possible to take him into the project. He had difficulty in focusing on the project; rather he insisted on play and fun part of the project. Details about him were to be given in the following part of the dissertation.

#### 4.5.2.3. Comparison of QA with traditional classes

While comparing the learning process that they had enrolled in QA with they had traditional school settings, students mentioned about a variety of different characteristics of this new learning environment. Moreover, they also mentioned about their opinions about their science classes in school setting.

**Better than school:** One of the students explained her opinions about QA when she compared her learning experiences in school, she said that she found learning in QA "better than school classes" (C4/S6). She also added that she thought the NGO was a better place and she was happy to be there.

On the other hand, two other students stated that they did not feel themselves learning as in the same type in their school. One of them said that "I do not feel as in class…It was not similar to the classes in school since it included gaming-and-learning. Because we do not involve in gaming-learning in school" (C4/S8).

**Easier than school:** Two students stated that learning in QA was easier than learning in traditional classroom: "It was easier than school lessons" (C4/S9). The other student mentioned about the instructional method – questioning – which she though harder than learning with QA. She said that she did not have difficulty in QA setting; on the other hand she found school harder.

> Researcher: What do you say if you compare learning in QA with learning in school?
>
> C4/S4: I feel very happy when I log in to QA. When I am in class, I feel like
>
> Researcher: Like how?
>
> C4/S4: The teacher asks too many questions
>
> Researcher: Actually, I also ask questions here.
>
> C4/S4: I do not feel the same though.
>
> Researcher: What is the difference you think?
>
> C4/S4: I do not know. The questions the teacher asks are too hard. But, the questions here are not like that.

**Similar to school:** Although there were students thinking about QA as either easier or better experience than school, there were some other students thinking that there were similarities between the two types of learning. According to some of the students, learning in QA was similar to learning in classrooms. In other words, there were similarities between learning in QA and classroom. For example making research in QA was similar to investigating a subject the teacher assigned. One of the students made comment about the similarity of QA to school by saying “For example in QA we made research. In labs and in classes we do the same” (C4/S10). Another student mentioned about worksheets as a similarity between QA and school. “I think it was similar to our lessons but it was easier. It was similar to our classes in that you gave us those worksheets” (C4/S7).

**Easy way of interaction with friends:** Two students claimed that interacting with friends was easier in QA-project-implementation than in school or classroom settings. In fact, in QA implementations, no strict rules were set for students to be silent and not talking with their friends. Rather, they were allowed to share any type of information or opinions with others. However, in general, they had been directed by the facilitator to focus more on their work and to avoid talking about something else in class. Still, the students stated that interacting with friends were easier in the organization. One of those students pointed out the problem of teacher attitude affecting teacher-student interaction. In fact what she was complaining about indicated the importance of teacher behavior, which was explained in this case as another emerging code, towards students in organizing the communication rules between the teacher and students.

> Researcher: What do you say if you think about interacting with your friends? Do you interact with them easily in school or in here?
>
> C4/S4: In school.
>
> Researcher: Why?
>
> C4/S4: Because during break-times in school, I do many things with my friends.
>
> Researcher: I see, but I meant the class hours, not break times.
>
> C4/S4: Here, I can talk in class…I raise my hand in school, but in here people understand each other when someone talks.
>
> Researcher: Does not your teacher recognize you when you raise your hand?

> C4/S4: Sometime does but sometimes does not…Then, when my parents go to parent-teacher meetings, my teacher says “S4 does not raise her hand, does not do this and that. And then, my parents hold my arm and ask me why I did not raise my hand.

The other student also mentioned about the easiness of communication. He pointed out the benefit of chat option in QA. After stating that he could interact with his friends only if he spoke silently in class, he said about QA that “it is not a problem here; you can use chat and follow others” (C4/S5).

**More successful in QA:** Seven of the students claimed that they found themselves more successful in QA than school. One of them, for example, said that she felt more successful in the project than school; she explained the reason by saying that “when I have difficulty here, I spend more time and effort on it. I do the same in school, but I still have difficulty there” (C4/S2).

Another student said that “I feel more successful here. It is because I become more knowledgeable here…I learn more and I feel myself successful” (C4/S5). On the other hand, one of those students mentioned about another point; which was having time than class. In this organization, we had one hour each day; however, in schools, the lesson hours takes 40 minutes in general. Additionally, teachers need to deal with some other issues before or during the lesson. That includes attendance check, classroom management, organization of the class etc. Therefore, the available time in schools diminishes. Even, when the lesson is to be implemented in computer lab, it takes more time to take students to labs, make them sit on chairs (either individually or with their peers), turning on computers etc. What the student mentioned about feeling successful in QA was kind of related with this issue.

> Researcher: Where do you feel more successful, in school or here?
>
> C4/S4: Here
>
> Researcher: Why?
>
> C4/S4: How can I say? When I continue investigating, I become more focused on it *[the problem case in QA]*. But there *[in school]* they give a subject, but the lesson finishes till I focus on the topic.
>
> Researcher: So you find the class time limited in school. *[Italics in brackets were added by the researcher]*.

**Having fun in QA:** Six students declared that they had fun during the implementation that was about science. One of those students said that "I not only have fun while learning, but also walk around *[3D places]"* (C4/S3) *[Italics in brackets were added by the researcher]*. Other students also stated that they had more fun learning science with QA when they compared learning in their schools.

**Motivating (increased interest toward science):** Five of the students stated that learning science with QA increased their motivation towards science. Among those there were students who dislike science as there were others who like science. Nevertheless in either case, the students declared that QA motivated them when learning a science subject. One of the students who stated that she liked science in school stated that she liked it more thanks to QA: "I used to love science a little bit; but I started loving it more since I came here" (C4/S3). Another student who disliked science explained how QA increased her motivation. She said "I did not know anything about environment. I was not knowledgeable about science since I started to learn it. After I came here, my interest towards science started to increase. I learned about environmental awareness" (C4/S4).

On the other hand, QA also aroused some students' curiosity. For example, one male student said that "I wondered what people would say, what kind of place the park would be, and how does it look like?" (C4/S5).

**Overlap with school subject:** One of the students stated that there were some overlaps between the subject of QA project with the subjects they covered in their science classes. He said that "You know there became erosion in Kızılırmak; we covered the same subject in school" (C4/S10). He also added that "It seems as if that the project time here is like the lesson periods in school" (C4/S10).

Another student mentioned about another common theme between school and QA-project. There were some pictures to support the project, and also the students were able to take pictures in 3D environment to confirm their problem solution. The student said that the pictures used in QA project were similar to the ones in their science books: "The pictures here, I mean I also see pictures in our science book, which helped me" (C4/S2).

**Teacher-directed vs. student-centered learning environment / Learning by doing:** Students found QA project "student-centered" when they compared it with their school. For example, one of the students stated about this issue while she was comparing the two.

> Researcher: Did you feel more successful in here or in school?
>
> C4/S6: Absolutely here. It is more fun here since there is no computer there, but here. Also here we learn by doing, but there teachers teach, and they do it on board. But here, we can do our studies by clicking.

Same student also added that "You learn by yourself, you gain knowledge, and you learn the information in the computer" (C4/S6). Another student also mentioned about a similar difference, which was about teacher's teaching method in class vs. facilitator's methods in the organization. Additionally, she said that she felt more successful in QA project.

> Researcher: Did you feel more successful in here or in school?
>
> C4/S8: More in here. For example, you also wrote on blackboard; however you wrote what we found, but the teacher writes to teach us. You let the things go. You explained first, and you always controlled us to see if we achieve.
>
> Researcher: Yes.
>
> C4/S8: It is better to see our success.

Four students said that they learned while doing the research. One of them also said that she learned "by experiencing".

It is a fact that each individual learn better with a different method. There was only one student who said that he preferred learning in school. The reason was related with his way of learning "*[I prefer]* learning in class because there is teacher teaching there" (C4/S10) [*[Italics in brackets were added by the researcher]*].

**Facilitating:** Students mentioned abut researcher's facilitating behaviors as a factor that helped students throughout the project. As explained above, the researcher's methods that she followed in class (research setting) was different than their teachers' teaching methods, as the students explained. As valid for a constructivist learning environment, the researcher never tended to tell directly the solution or teach any type of information to the students. Rather, she always guided students and encouraged them during the study. She also asked questions to make students analyze their findings, see the truths or decide on some of the information they collected.

In addition learning from their peers through collaborating each other, the students learned thanks to help by the researcher, as they stated so. For example, they said that “you helped us when we stuck” (C4/S7), and “when we did not know what to do or where to go, you helped us” (C4/S6).

**Reading books in class:** As it happened in other case studies, six students in this case declared that what they did in their science classes mainly based upon reading class book. The students mostly “mark student workbooks, read textbook, and write” (C4/S1). In one of the students’ class, the science teacher make them read a passage silently and then select a student to read the same passage to the class (C4/S4). Additionally, what another student said about the types of learning activities they done in school was very similar to those students: “We write down to our notebooks, we read, and then we do the activities in our student workbooks” (C4/S5).

**Other activities in science class:** Since this case study took place in a NGO setting, students were from different schools. Therefore, the activities they enrolled in their science classes showed differences. As explained above, in some of the schools reading and writing were main activities their science teachers employed in class. Other then writing and reading, the activities included experiments, brain storm, cognitive maps, and questioning. Moreover, the students stated that they never did a similar project like they did with QA in their school.

Three students said that they sometimes made experiments in their science classes. The experiments took place either in class or in science lab, if available though. Additionally, as one of them stated they sometimes were required to make the experiments at home due to the impossibilities (no science lab) in their school. She said that “Everyone makes the experiments; everyone observes. *[We make the experiments]* at home. There is no lab in school. We do in class, too” (C4/S4) *[Italics in brackets were added by the researcher]*. Another student mentioned about the experiments that they made as group work. They made the preparation and collected the materials first, and then brought them to class and shared their works with the teacher and other students in their class.

> Researcher: Do you make experiments?
>
> C4/S10: Yes, we do many.
>
> Researcher: Many! What kind of experiments? Can you give an example?
>
> C4/S10: For example, the experiment of worm living under the ground.
>
> Research: Did you bring worm to the class?
>
> C4/S10: But as a group. There are four groups in class composed of four to five people. The teacher assigns a page and we do it as a group.
>
> Researcher: So everyone makes. Do you make the experiments at home or at school?
>
> C4/S10: At school. We collect the materials, each of us selects a material of the experiment and we take it to the school and we make the experiments there.

The other type of activity that the students enrolled in school was brainstorm and concept maps. Three students mentioned about these activities. As understood from their responses, their school was selected as pilot-school so that they conducted these types of activities. One of them expressed that an exhibition was done in their school and they joined this occasion by their cognitive map studies.

> Researcher: What do you do in your science classes?
>
> C4/S2: Hmm, we do brain storming. Our exhibition depended on brain storming and concept mapping. Therefore, we implemented our science lessons in that way.

The other type of activity was questioning. The students said that their teacher asked questions related with the science subjects in school. When compared with the QA project, the students complained about the difficulty of questions their students asked. As stated before, although they were asked several question throughout QA project, they stated that the questions in school were harder, so what happened was that “we cannot answer when we there become subject matters that we did not understand” (C4/S3).

All the students interviewed in this case stated that they never did projects similar to the one they did with QA. What they did in terms of research was nothing more than making an information search on either Internet or encyclopedias about a person or a subject matter, as their responses indicated.

**Likes science classes:** More than half of the students stated that they liked science classes in their school. Moreover, they added that they found science easy and they were successful. Their grades were three or above (within the grading system over five). Some of them also stated that they enjoyed doing their science homework.

**Does not like science classes:** Although more than half of the students liked science in school, four students said that they either found science boring or they somehow disliked science classes. One of them, for example, stated that “they are really strict toward us too much in school. They always say “do this” or “do not do that” (C4/S6). The same student pointed out another factor that made her dislike science, which was course load.

> C4/S6: It is really boring to continue learning the same subject matter within the same week. It is so tiring to learn the same thing one day, and another day, and so on. We enroll in six-hour lessons; two hours afternoon, and four hours in the morning.

Another student expressed a big difference between the science classes in their school with QA science project; which was the difference of fun factor. She said that “Here we both learn and have fun, but there we just learn” (C4/S9). The other student mentioned about the pressure made on them in school: “I do not think good things about science, because they *[the science teachers]* excert pressure on us a lot” (C4/S4) *[Italics in brackets were added by the researcher]*.

**Crowded classrooms:** Another issue which differentiates learning with QA from learning in school was the number of students in classrooms. High number of students in classroom not only affected their interest toward the lessons but also their attitudes. The student, who was quoted above, said that she was not able to answer their science teacher’s questions when she was not clear about the subject matter.

She also mentioned about another reason which was the number of students in their classroom. According to her, another reason why she could not answer the questions was “because everyone is talking in class. We can forget easily what is in our mind” (C4/S3). The high number of students and the limited time also hindered the teacher to let every student talk in class. On the other hand, the number of students in class was limited in QA implementation, and the facilitator made each student talk and say whatever they know or think about the issue.

**Writing vs. gaming:** The final difference again was related with the methods the teachers used in science classes. In QA implementations, the students learned science subjects by trying to solve a problem statement including multiple dimensions in a MUVE environment. On the other hand, what they did in class was reading their books and writing the summary or all of it on their notebooks. Although the students enrolled in other activities (such as experimenting, storming or questioning) in their schools, the mostly used activity types were reading science books, writing it on their notebooks and filling up student workbooks. Five of the students mentioned about this issue. One of them said that she liked science a little, after QA she liked more. The reason was due to the difference among the learning methodology.

> C4/S3: I used to like science a little, but now I like it more since I started to come here.
>
> Researcher: What is the reason of this change you think?
>
> C4/S3: Because we also play here, but in school we just write.

**Authoritarian teacher behavior:** It is true for most of the government schools that the teachers behave in an authoritative way in order to ensure classroom management and in order to show their students that they are people whom students need to rely on and respect. When this is the case, the relationship between the teacher and the student is not close, at least when compared to the relationship between the facilitators and the students in the organization.

In this case, the students also mentioned about the difference between teacher behavior towards students in school and facilitator behavior in the organization. One student said that the relation between the students and the facilitator in the organization was warmer. What the student mentioned here was most probably due to teachers' authority in class and the pressure that they put over the students in order to ensure classroom management.

> C4/S9: Here, it is like we are all acquaintant; it is more lifelike and full of love. But there, the teacher is stranger. When we want to say something to the teacher, it is fully stressful and boring.
>
> Researcher: Why do feel stressed when you want to say something to your teacher in school?
>
> C4/S9: I do not know. The teacher is like a stranger so you feel anxious. It is not comfortable.

Another student said similar statements: "they are really strict toward us too much in school. They always behave like "go there, make it, do like this", but you never did anything like that" (C4/S6). The readers might think that the opinions of the students could have been influenced by the researcher's behaviors and this could be interpreted as research bias; however, this was not the case. The facilitator's behavior was in a way that the organization desired from all of the facilitators in the organization. As stated before in the dissertation, the researcher enrolled in some seminars in order to become a facilitator in this organization. Like all the other people in the organization, the facilitator was required to behave in a friendly way and close towards the students. Moreover, the learning approach in the organization was learner-centered so the facilitators' dominance on the learning process was not the case at all.

One of the students claimed that there were differences between facilitators in the organization and the teachers in school. She mentioned about hot authoritative teacher behaviors influenced students successes.

> C4/S6: Teachers get angry with us, but you are not like that so I feel more comfortable here. It is because the teachers say "why don't you know?" after making them explain the same subject for a few times when you do not understand.
>
> Researcher: Yes.
>
> C4/S6: Then, I get scared when the teacher shout at me and say "why don't you understand!". I don't know what to say and stay quiet. Then, the teacher asks why not I did not talk. Then, the teacher gets angry and beats us.

The same student also said that “you are not like them, you are much better than they” (C4/S6) and added another thing about the similar behavior of school administration like the teachers “Once the school admin came to our class, so we was afraid a lot. But, he beats us so bad” (C4/S6).

As it could be seen above, the students complained about teachers’ authoritative behaviors in the learning process. This was neither motivating for the students nor made them like learning in school settings, as their comments indicated so.

#### 4.5.2.4. Student expectations about the improvements in QA

Almost all of the students in this case were not used to play computer games that much. The types of games they played were very limited, too. Just two of them played action-adventure type of games. Most of the other children stated that they played games on the Internet web-sites (such as Barbie, mind games). Such types of games were developed on flash platform; i.e. they were accustomed to play small flash games.

**Extensive use of QA**

All of the students said that they wanted to use QA in other subject matters. In addition to science, they mentioned about computer, math, music, social science, and Turkish as other subjects in which they would like to use QA. The students wanted to use QA not only in classes they disliked, but also in their classes they liked.

Three students said that they wanted to use QA in their computer lessons. Most probably, they thought that QA, as a game, would be a great activity to pass time in computer classes.

Five students said that they would like to use QA in their math classes. Two of the students also added that they actually liked math classes and they liked QA much; therefore that would be better to use QA in math classes. One the other hand, as explained above, QA increased some of the students’ motivation toward any science. In a similar way one of the students, for example, said that she would like to use QA in math, which she did not like at all: “Math is always difficult. I did not like it at all". The idea of using QA might seem an opportunity to increase her motivation towards learning math.

Another student stated that she would like to use QA in music classes. She also explained the possible use of QA in music classes. This was in fact for the first time that one student wanted to use QA while learning music in all of the five cases in the study.

> Researcher: Would you like QA to be used in other classes?
>
> C4/S4: Yes, I would like.
>
> Researcher: Which classes do you think?
>
> C4/S4: For example, computer and music classes.
>
> Researcher: Our project here was about environmental issues, so we used it for science. I wonder your suggestion about the use of QA in music classes. How can it be used you think?
>
> C4/S4: For example, implementing some part of the music lessons in QA and some parts in class.

Another type of class that the students wanted to use QA was science. Four students stated that they would like to use QA in their science classes. It had again two dimensions, as in math: there were students who wanted to use QA due to the fact that they liked science; on the other hand, there were students who disliked science so that they wanted to use QA, which they liked much. This could provide them with not only learning but also having fun in the class. For example one of the students said that he wanted to use QA in science "It is because I liked the project a lot and it was about science" (C4/S7). However, in an opposing way, another student replied the same question as "in science. It is because I get bored in science classes" (C4/S4).

There was only one student who said that she wanted to use QA in Turkish classes (C4/S9).

**No need to change:** Different than private-school-cases (Cases 1, 2 & 3) the students in this case could not mention much about their expectations, which was most probably due to their limited game-play experience. In this respect, more than half of the students stated that there was no need for any change or improvement in QA or the project itself. According to them, QA was so good that it did not require any modifications.

**Being able to play at home:** There were two students mentioning about their expectations. One of them stated that it would be better if he had a chance to play QA at home, too. He said that “I wish it was install in all of the computers, including home computers. It would be better if installation CDs were available so that everyone could play it” (C4/S5).

### 4.5.3. Research Question – 2 – Facilitator Perception

As the researcher was the only facilitator during the implementations in the current study, the data came from her experiences. However, in order to prevent researcher bias, the researcher relied on data sources: such as observations and video records, field notes, and students’ opinions. Since the last two cases were implemented in the same setting; and mainly the emerging themes were the same, the facilitator perceptions were analyzed under the same heading regarding the implementations of cases 3 and 4.

#### 4.5.3.1. MUVEs as technology based materials

**Motivating learning environment:** It was the first time for the students in these cases to come across an online game-like setting, and it was their first opportunity to use it. Therefore, students’ interests were very high in general. Regarding its use in informal learning settings, it seems as a good opportunity that takes interest of the students, offers a learning opportunity by providing students with an immersive inquiry-based activity which makes them work on the project and trying to understand the dimensions of the problem. As the time can be settled up more flexible than formal learning settings, it is possible to say that arranging similar activities in informal learning settings is easier.

**Dynamic learning environment:** The implementations also showed that the narrative behind the learning activity makes it a dynamic and effective learning environment for the learners. Each day of the project they added more to their data set, and they collected data from different parts of the virtual world. This made the activity dynamic for the students, which also aroused their interests and kept them motivated throughout the project.

**Voluntary participation:** The participation was voluntary for the students; however, none of the students gave up due to the fact that they did not like either the environment or the activity. Unfortunately, some of the students gave up coming to the organizations; however this was not their decisions. Rather their parents showed a variety of reasons for not sending their children to the organization in general; such as the weather conditions, having someone sick at home, or going to another city for holiday etc.

**Learning by doing:** When the participation of the students in both cases is considered it is possible to say they were very much into the activity. They were trying to understand the cause of the problem by collecting data in the virtual world, talk to each NPC and get their opinions of it, find out and try to figure out the informative resources etc. It was an example of the activity of learning by doing. They were behaving like scientists in the environment and they had their field notebooks in front of them. Almost all of the students filled the spaces within the notebook with few exceptions. Although they were not participated in the project in order to learn something about science, almost all of them state that they had learned about environmental issues.

**Successful implementations:** Although problems were faced with related with students' attendance, the implementations were very successful in general. The time was enough for the students to complete the project in time. Although it was the first time they met with QA, they got use to it during the orientation sessions and they were very comfortable while using it.

**Too much work:** Considering the load of the work, including many sections to read was a disappointing part of the project for a few of the students. These students did not want to spend too much time on reading. In fact, most of them did the activity; however, they did not seem having much fun of doing it. For some of the students, writing activity was also the same. When they first saw the student field notebook, they were afraid of not being able to finish it. It seemed doing too much work for them at first. Nevertheless, as stated above, all the students were able to finish the project and they had fun in general.

**Student interaction:** The students were very comfortable in interacting with each other throughout the project. This was a result of the general nuance of the learning environment. Nevertheless, moreover, the students were able to see each other and follow their progresses as well. The students did not tend to use chat or e-mail options of the environment as they were in the same place. They also did not know English so that they were not able to talk to others online in the QA.

#### 4.5.3.2. Opinions on students' learning

**The importance of scaffolding:** As this was a complex learning activity with a variety of different dimensions affecting the core of the problem, scaffolding was so important to perform during the implementations. For sure, the field notebook was very helpful in guiding students in organizing their work and the data they collected. Field notebook gave clues to the students about what to do next to successfully complete the activity.

Scaffolding was also conducted through classroom discussions. For several times, classroom discussions were held in order to make students share information with each other, and think about the problem more as considering about others' perceptions of it. The facilitator asked questions to the students to make them think about the activity and to make them decide on how to use the data they had collected that far.

Scaffolding was more important for the younger students. It was because they could easily come up with a wrong solution to the problem. The class discussions showed that each student constructed their own meaning and found a reason of the problem according to the data they came across in the virtual world. Although the expected situation was that the students' responses were similar to each other, it was not the case. For sure, in constructivist learning environments, the students construct their own meaning from the experience they have. However, in that case, what they constructed as the knowledge was missing most of the time. Most of the young students were only thinking about a single dimension as the main reason of the problem. It seemed, through talking with NPCs, whomever they were convinced by more, they made their decisions accordingly. They did not realize other dimensions might also be important. Therefore, especially if worked with the young group of students, the facilitators should control students in each step and should make them realize all the important aspects of the learning material, as they can easily miss some information and come up with a wrong or missing knowledge structure.

**Successful to get accustomed to technology:** Although the students were not very active computer users and most of them did not have home computer, they could easily got accustomed to this new technology environment. None of the students had used a similar game environment before; nevertheless, they learned it after using it for a while.

**Student disinterest:** Although most of the students were very much into the learning activity, few students were interested in the gaming and having fun in the game. One of these students was a shy student and he was not comfortable in talking to the facilitator; even during a personal talk he was very close to the outside. He seemed as a student with special needs. The other students were disinterested in the activity, most probably, because of the fact that they were in the organization just to have fun, not to learn. In few of the lessons, they participated in the class activities and they collected some part of data set; however, they were trying to have fun most of the time rather than dealing with the project.

**Effective way of learning:** After they collected the activity, all the students stated that they learned about environmental issues. In fact, for some of the students the activity was not a science activity, whereas for some others it was. However, in both conditions, the students showed that they had learned information about ecology issues throughout the project. The students may possible thought that it was not a science activity, since it was very different type of activity than the ones they were familiar with in school setting. It was the first time for them to learn in a MUVE setting, so it was not similar to their experiences of science classes. It was not only an effective way of activity, but also fun.

**Transfer of learning to daily lives:** Very related with the code above, it is possible to say that students may have problems in transferring the knowledge they gained in similar activities. Therefore, scaffolding and facilitator guidance is very important during these projects. The facilitators should give students well so that they were aware of the knowledge they gained and how to transfer it to the real settings.

On the other hand, there were students mentioning about how they transferred the knowledge. They were aware of the fact that how important it was to protect their environment, the trees and the animals. They were also aware of the fact that there might be several other reasons behind an environmental problem as environment is a complex system.

**Collaboration and competition:** Collaboration and competition were the emerging themes as the students learn in MUVE. The students who learned the environment before and who did some of the tasks before their peers helped others during the project. Moreover, they competed with each other in order to complete the project first. For example, in the final case study, the student who completed the project felt very proud of herself.

#### 4.5.3.3. Opinions on facilitator role

**Being a facilitator is very important:** The role of the facilitators are so important since it is a complex learning activity and students may easily get lost in the virtual environment, may lost in the activity, or may construct wrong knowledge system. The facilitators should control the students frequently and control their works in order to overcome it. Through asking inspiring questions to the students, the facilitator should be proficient enough in guiding students' during the activity. In the current study, besides asking individual questions to the students, the facilitator held class discussions and made each student talk about his/her opinions and listen to others'. In some complicated parts of the project, such as interpreting the analysis results of water analysis, the facilitator used blackboard to write the results and to let students try to comment about it. This activity in both cases was conducted as a classroom activity rather than the students were left as individual learners.

**Classroom management is difficult:** When it is about using a game-like environment in an informal learning setting and as a summer-time activity, it is hard to manage the class. The students are in front of computers, so they can easily dive into another type of activity. Since it is a non-governmental organization, some of them may tend to misbehave or may make noise. When the learning environment is informal it may turn into a challenge to manage the student group.

**Hard to implement with crowded student groups:** As the activity requires a close follow up of the students, it is hard to implement with crowded student groups. This also affects the classroom management issue. Therefore, for similar type of implementations, it is better to have small groups of students, if possible.

**The importance of being technology literate:** The facilitator of any similar activity should not only be technology literate but also should be knowledgeable about the learning environment, QA in this case. Since facilitator of the activity is the only responsible person in the class, s/he should be proficient enough in overcoming technical problems as much as they could do. Moreover, the facilitator should know every aspect of the activity and every attribute of the environment in order to better guide the students throughout the activity. For the people who do not know the environment, a seminar is needed.

#### 4.5.3.4. Suggestions

**Parent support is needed:** As it is a non-governmental organization and the students' attendance is voluntary, taking parent support is very important. If they are introduced the project and if they are informed about the benefits of the activity for their children, then they can take responsibility on their child's development. Since QA is an innovative environment for the students. It is, for sure, more different one for their parents. Seems like a game environment, the parent may regard MUVEs as pastime activities as it is very much different than the learning activities they get used to. The parents should be informed about the fact that it is a learning activity, and something more than a game.

**Effective as special interest group activity:** It seems that similar activities can be conducted with small group of students in informal learning setting. As the implementations were successful, more implementations can be done with the students who are interested in ecological issues and their environment.

**Other subject areas:** Other studies can be conducted in different subject areas. Further research may show different implementation issues regarding a different type of learning activity.

**Pure Turkish interface:** The students had difficulty in using the environment due to language problems. As the students did not know English, they could not use every aspect of the environment. Although the facilitator arranged an orientation session, it was not enough to show each single type activity or facility in the environment. Therefore, the use of a pure Turkish environment would be better for these students to make them easily use the environment effectively.

#### 4.5.4. Research Question – 3 – Challenges and Barriers

**Deficient conditions in schools:** The students were from government schools; that meant they did not have deficient conditions in schools for this type of implementations. For example, one of those students claimed that "here we play individually; but there two people use the computer at the same time, and they interfere saying like "no let's play this one"" (C4/S3). When the students had to use the same computer with other students, then there might emerge conflicts among the students.

**Technical problems:** It was ordinary to have computers crashing up some of the times during any type of project. Inevitably, this problem occurred during the implementation. This made one of the students feel sad as she had the same problem with the computer she used. She said that "I feel sad when my computer is out of order and I cannot play" (C4/S2).

**Lose of interest:** It was not surprising to see the students losing interest some of the times. This was an extracurricular activity and took place in an organization's context. Therefore, students sometimes tended not to continue; rather they played with friends outside, for example. This rarely happened, but this was still a challenge to take students' interest to the project. For example one of the students answered the question of his reasons for getting bored by saying that "What bores me? Sometimes I do not want to play, I mean I do not want to do research, and I sometimes feel tired" (C4/S5). Simple reasons he indicated, but this might easily affect his continuance with the project.

There was another student who never seemed interested with the project but just playing the game. The student was really disinterested and was not able to explain himself with words (i.e. he seemed as like shy, not-talkative and disinterested all the time). What he only did was to play, going from somewhere to another within the game environment. During the interview, the reasons of his disinterest were asked by the researcher. In fact, it was not easy to take responses from the student during the interview. He tended to gave short responses most of the time.

> Researcher: What did you learn about science?
>
> C4/S1: I saw fire, I saw cars crashing.
>
> Researcher: Where did you see those?
>
> C4/S1: In the book.
>
> Researcher: I meant Quest Atlantis. What did you learn about science?
>
> C4/S1: I did not learn!
>
> Researcher: Why?
>
> C4/S1: I get bored, I do not like. That's all.
>
> Researcher: Which one you don't like: science or research?
>
> C4/S1: Research
>
> Researcher: How did you feel when you heard you were supposed to fill the notebooks?
>
> C4/S1: I get bored!

As can be seen from the conversation above, he was not interested in the project part, so that he did not learn anything. Most probably, he was not aware what was going on in the project, if he knew that was about science, though. He even did not know the name of the park and the name of the NPCs in the park. Having disinterested children in classroom could be a big challenge for the implementers of this type of environments.

**Gaming rather than learning:** Very similar to the issue above, another code emerged was gaming rather than learning. Several of the students tended to play more, but not to spend any effort on the project/learning part. The same two students as above mentioned about this issue (C4/S1 & 5).

> Researcher: How did QA changed you interest toward science?
>
> C4/S1: Playing games!
>
> Researcher: I always see you bored here. You even did not want to answer my questions. Why?

C4/S1: I want to play the game. I do not want stop playing. I feel bored.

Researcher: Do you get bored when you make research?

C4/S1: Yes!

Researcher: Can you explain more?

C4/S1: I get bored when I make research.

Researcher: How do you feel when I say come on S1, find this or do that?

C4/S1: I feel bad.

……..

Researcher: Did you like playing more?

C4/S1: Yes!

Researcher: Why did not the subject take your attention, you think?

C4/S1: I am bored of doing project.

Researcher: Do you feel the same when you are at school?

C4/S1: Sometimes!

This student was completely a different student than any other student participated in this study. He was not interested with the project at all, but just gaming. Even the students who tended to play the game were interested in the project from time to time, at worst. However, this student was completely out of interest. He even said that "I sweat and I feel nervous *[while doing research]*" *[Italics in brackets were added by the researcher]* (C4/S1). Having disinterested students in class might be a critical challenge for the teachers to take their interest toward the subject matter and the project.

**Not being able to discover the game:** Four of the students mentioned about the difficulty of finding out some places or items in the game environment. For example, there were students who were not able to take pictures (C4/S4) or to find some NPCs (C4/S5). Another student claimed that "I cannot find or have difficulty in finding" and she felt when this happened like "I get bored it the parts that I had difficulty" (C4/S2). This could be a challenge during any implementation if students were not able to find something necessary; therefore, facilitator role gains more importance.

**Not being able to relate the project with science:** Four of the students claimed that they did not think that they found the project as related with science classes. For example, one of them said that “it is not same; science is different, computer is different” (C4/S8). She thought that it was a computer lesson. Although the project was a science project, she thought differently, most probably, because the environment in which the project took place. Another student also said “more different than science” (C4/S6). This student group was composed of four grade students and that might be a reason why they had difficulty in regarding the project as related with science.

**Deficient technical conditions:** As in case-4, the students in this case were children of low-income families. Therefore, their opportunities were limited: they did not have home computers or Internet access at home. When needed, they used computers either at a relative’s home (C4/S3) or Internet cafés (C4/S5). They also tried other methods of finding information: “I look up the encyclopedia. We have less number of encyclopedias. If there is no information in it, I go to Internet café” (C4/S8). She tried encyclopedia first in order not to “pay money” (C4/S8). When the students needed to print out something, they went to grocery (small sized local market).

Since most of the students were fourth grade students, they were not allowed to go to Internet café alone. Rather “I go there when older people come with me: elder brothers or sisters. My parents do not want me to go alone” (C4/S5). Considering the deficient conditions the students had, it would emerge as a challenge if someone wanted to implement this type of study and if students’ studying at home was needed. This would not only cause money-related problems for students (since they needed to go to Internet café) but also might result in some safety problems.

**Student attendance:** As mentioned above, students’ attendance to the implementation sessions sometimes turned into a problem when they did not want to join a session. It was a problem since the time was limited. Moreover, they were not -able to do a part of the work when they were absent, especially when a different activity was done with the whole student group.

**Writing is boring:** Students required completing their worksheets; however, few of them could not complete. One of them explained the reason as “writing is boring” (C4/S4).

**Takes time to get used to:** It was innovative environment for the students. Therefore, students needed some time to get used to. In fact, orientation was done at the first week so that students got used to the game environment. When time passed, the students were much more familiar with the environment, though. One of the students, for example, said that "I thought it would be difficult, but as I played it became easier" (C4/S3).

### 4.6. Cross-Case Analysis

After giving the details of the results for each case study in the previous parts, the results of analysis across the cases are provided in this section. The results are organized within the same order as the results of other individual cases. The similarities and differences of the cases are discussed in this chapter.

#### 4.6.1. Demographics of Students and Teachers

Gained through a questionnaire, the demographic information of students and teachers were investigated in the previous sections and the results were compared and contrasted in this part.

**Students:** This study was conducted with four different student groups selected from three different settings, of which two were private schools located in Ankara and one was a Non-Governmental Organization located in İzmir. Totally 69 students (37 were male and 32 were female) and two teachers (two female-science teachers) participated in the study. In all the settings the implementations were performed by the researcher. In the formal learning settings, the teachers were too loaded to learn using QA-MUVE, so that the researcher was asked for facilitating the activities. In the informal learning setting the researcher was the only responsible person during the implementations.

When we look at the *Social Economic Status (SES)* of the students; it is possible to easily say that the students in either the formal or informal settings show very much similarity with each other. However, on the other hand, there is a high difference among the students in formal versus in informal learning settings. The students in formal learning setting were the children of parents with high SES. All the students had home computers with Internet access. More than half of the students had a game console, too. The majority of the students in these groups had been using computer and Internet technologies for more than five years; many others for 4-5 years. Games were among their most favorite software application of computer usage for all the students, with exceptions of two (one from each school). The games they had been playing were commercial games with high graphical structures. All the students had been using computer technologies in order to do their homework, except for two students (one from each school). Besides having access to computer technologies in their home, the students were able to have the opportunity of using it in school (one student using a computer individually). They had also a chance of listening to the classroom activities aided by computer technologies. Both schools had a science lab, too.

When looking at the SES of the students in informal learning setting, the demographics show just the opposite. The parents of most of the students in informal setting were graduated from primary or secondary school and social class level of most of them were low. Their SESs were low, too. Mothers of most of them were housewives and fathers were self-employed. The students were attending government schools. In each case, half of the students had home computers; however few of them had Internet access, too. Few students had a game console at home. Majority of the students had been using computers for 2-3 years in case-3, and 1 year or less in case-4 respectively. Computer games were their mostly used type of software; however only a few of them had been playing games like GTA, Need for Speed etc. Most of the students had been playing simple java or flash games they found on the Internet web-sites. It was the first time for all of the students coming across an environment like QA. Majority of them stated that they had been using computer technologies for doing homework. However, they had been using computers Internet cafés as they either had no Internet access at home, or a printer. Considering the conditions of the schools these students had been educating, it is possible to say that the schools were government schools including too many students in the same classroom. Many students mentioned about the deficiencies of their schools: for example, some of the schools did not have a science lab at all.

When both learning environments are compared, the difference among the students can easily be seen regarding the SES of the families, and the opportunities the students had either in school or at home.

**Teachers:** Considering the demographics of teachers: both had been teaching in private schools, both had special interest towards technology use and both were a female science teacher. The teacher in C1 was more experienced than the teacher in C2. The technology-based implementations they had been using were mainly limited to PowerPoint presentations. They had also showing videos of pictures to the students related with the subject matter. The first teacher had also been using educational software in class. Both had computer and projector in class. The first had also a smart board, too.

### 4.6.2. Student Perceptions

Research question-1: What are the perceptions of students using MUVE?

**Students' experiences**

Sub research question-1: How do students perceive their experiences that they have while using MUVE?

The table below shows the cross case analysis of students' perceptions. The codes regarding the case are marked with the symbol (✓).

**Table 4.32** Students' experiences

| | C1 | C2* | C3 | C4 |
|---|---|---|---|---|
| Easy | | | ✓ | ✓ |
| Difficult/complicated | ✓ | ✓ | | |
| Fun & learning together | ✓ | | ✓ | ✓ |
| Developing skills | ✓ | | ✓ | ✓ |
| Environmental consciousness | ✓ | | ✓ | ✓ |
| Long reading & writing | ✓ | ✓ | ✓ | ✓ |
| Technical problems and bugs | ✓ | | | ✓ |
| 3D experience | | | ✓ | ✓ |
| Helpful discussions | | | ✓ | ✓ |
| Limited time | ✓ | ✓ | | |

* In fact student data could not be collected from this case. However, the researcher put symbols here depending on the general observation results.

As the table below shows, it was generally the same how the students experienced the activity and how they named their perceptions of it. On the other hand, there were also differences among the responses of the students in formal versus informal settings. For example almost half of the students in both formal learning settings were complaining about the difficulty of the project. As another code here showed they found the implementation time of the project limited. This may be the reason why they found the project complicated. On the other hand, in informal learning setting, the students found the project easy, even though most of the students were younger.

Another difference was related with an additional supportive activity: discussion. Since the time was limited, discussions could not be done in formal learning settings. In fact, the facilitator again tried to guide each student, common activities could not be held. Therefore the students in informal learning settings found discussions as helpful for them as they experienced learning in a complicated learning environment.

Student data also showed that students found the activity beneficial for their development. However, there emerged slight differences among the cases. For example, in the first case study, the students stated that the activity developed their inquiry learning and scientific learning skills. According to these students, the activity was a reinforcing activity for classroom activities. On the other hand, it was not a part of school work in informal learning setting. Therefore some of the students could not relate the activity with their science classes. However, they still asserted that they learned and gained some skills through learning in QA (such as environmental conscious). The majority of the students who spend effort on the project and who cared about it pointed out that they learned not only issues of science but also other things: such as making research. This code came from all the cases regardless of the setting and SES levels of the students. Moreover, the activity combined learning and fun together.

The majority of the students liked QA setting regardless of the learning setting. However, as some of the students in formal learning settings had been playing computer games with high quality graphics. These students did not like QA setting and they found it so “simple”. On the other hand, especially for the students in informal learning setting, QA was a very well structured type of environment and it was fun. They liked the graphics of it, too. The results indicated that as they played more computer games over time, their expectations and likes changes too.

**Comparison of learning**

Sub research question-2: How do they compare learning experiences in MUVE with learning in traditional classrooms?

The table below shows the cross case analysis of students' opinions of comparing traditional learning with learning in QA. The codes regarding the case are marked with the symbol (✓). The word "S" refers to school whereas "QA" refers to QA setting.

**Table 4.33** Comparison of learning

| | C1 | C2 | C3 | C4 |
|---|---|---|---|---|
| Increased interest (QA) | ✓ | NA | ✓ | ✓ |
| Complicated (QA) | ✓ | | | |
| Fun way of doing homework (QA) | ✓ | | | |
| Authoritarian teacher behavior (S) | | | ✓ | ✓ |
| Boring (S) | | | ✓ | ✓ |
| Being able to express opinions (QA) | | | ✓ | ✓ |
| Crowded classrooms (S) | | | ✓ | ✓ |
| Fun way of learning (QA) | ✓ | | ✓ | ✓ |
| More successful (QA) | | | ✓ | ✓ |
| Teacher-directed vs. student centered (S vs. QA) | | | | ✓ |

The results showed that all the students stated that the science activity they performed with QA increased their interest, either towards science or environmental issues. Only the students who did not participate the activities much, in formal learning setting, stated that the activity did not change their opinions toward science.

According to the students in formal learning setting, the activity was complicated when they compared it with other science activities in traditional learning setting. However, on the other hand, some of them also stated that the activity could be a way of doing homework, which would be more fun than classical way of doing homework.

Different than the students in private school setting, the students in informal learning setting were from government schools. Therefore, their responses were slightly different from the others especially in terms of teacher effect on students' learning. The students mostly talked about the influences of authoritative teacher behavior on them and how it affected them in the learning process. The teachers, not to generalize but depending on students' responses, were very much authoritative, they valued discipline as a way of ensuring classroom management, they got angry at students and they punished them when they do something wrong or when they are not able to answer teacher's questions. This resulted in students' losing their self confidence in front of their teacher, afraid of asking questions when they missed something in class, and getting nervous when they wanted to answer a question or did not understand something as first explained by the teacher.

As opposed to how they are behaved by their teachers in their schools, due to the mission of the organization, they are behaved in just the opposite way. Not only by the researcher, but also by other facilitators in the organization, the students were supported and encouraged so that they believed in themselves. This had much influence on students and how they started believing in themselves as successful individuals. This may not be interpreted as researcher bias. As stated before in the dissertation, it was the general approach that the organization expects each facilitator behave in the same way. The researcher also attended to seminars in order to become a facilitator in the organization. Therefore, the approach towards students was always positive and supportive. The students who dislike science due to their teacher realized that science is not that bad and they started to like it.

Students' responses of feeling more successful in informal learning setting and being able to express opinions easily can be due to the behavior of facilitators toward them. However, the project had also influences on it. As they realized that they solved such a complicated problem case, they were very surprised and were proud of themselves.

Teachers' behaviors to the students may also be the reason of feeling bored in school. Contradictory to that, the students enjoyed doing the activity and learning in the QA-MUVE.

The common theme in this part was that the students found learning through QA fun as they had been in a game-like environment. Besides this the students in informal learning setting found the activity as learner centered as opposed to the classroom activities, which were teacher directed. According to these students, QA was more fun way of learning not only because it was a game-like of environment but also it allowed them actively participate in the learning process. The classroom activities were mainly held through reading books and summarizing them to their notebooks. On the other hand, QA let them "not being taught, but learn" as one of the students claimed.

### 4.6.3. Teacher Perceptions

Research question-2: What are the perceptions of teachers/facilitators about using MUVE as a supportive educational material?

**MUVEs as educational materials**

Sub research question-1: How do they perceive the use of MUVE as a technology based educational material?

The table below shows the cross case analysis of students' opinions of comparing traditional learning with learning in QA.

**Table 4.34** MUVEs as educational materials

| | C1 | C2 | C3-4 |
|---|---|---|---|
| Learn-by-doing | ✓ | | ✓ |
| Beneficial, effective, dynamic | ✓ | ✓ | ✓ |
| Visual learning | ✓ | ✓ | |
| Permanent learning | ✓ | | |
| Not-completely successful | ✓ | ✓ | |
| Multiple intelligence | | ✓ | |
| Motivating | | ✓ | ✓ |
| Much reading | ✓ | ✓ | ✓ |
| Successful implementation | | | ✓ |
| Student interaction | | | ✓ |

There were only two common themes regarding the opinions of teachers/facilitator about using MUVEs as educational materials. Although naming differently, each of them agreed that QA was an effective learning environment for the students. Since QA let students working on the subject matter actively and do a scientific inquiry-based activity, two of them stated that QA was beneficial in terms of allowing learning by doing. Moreover, QA supported the learning activity visually.

The difference among the formal and informal learning settings emerged as a code about the implementation in general. In the formal learning settings, the teachers said that it could have been more successfully applied. In other words, the implementation did not meet their expectations much. There were several reasons behind it. First of all, time was quite limited in these setting in order to a complicated learning project using computer and Internet technologies. Second, the curriculum was so strict and everything had already been planned. Therefore, the implementations, due to the challenges and problems, could not be so successful. On the other hand, both teachers agreed that it is a useful environment considering that almost half of the students benefited from it through doing the activity. About the same issue, the case was different in informal learning setting. The implementations were successful even though the students were younger. In these cases, the time was large enough for completing the project.

The teacher in C2 and the facilitator in cases 3&4 declared that MUVE was a game like environment, which motivated the students. Another common code was that the reading activity was too much for the students, which might turn students' motivation down.

**Opinions on students' learning**

Sub research question-2: How do they evaluate students' learning in MUVE?

The table below shows the cross case analysis of students' opinions of comparing traditional learning with learning in QA.

**Table 4.35** Opinions on students' learning

| | C1 | C2 | C3-4 |
|---|---|---|---|
| Already interested in computers | ✓ | ✓ | ✓ |
| The importance of scaffolding | | | ✓ |
| Disinterested students | ✓ | ✓ | ✓ |
| Fifty-fifty | ✓ | ✓ | |
| Inquiry-based learning | ✓ | | |
| Analytical thinking | | ✓ | |
| Students can follow their own progress | | ✓ | |
| Effective way of learning | ✓ | | ✓ |
| Transfer of learning | | ✓ | ✓ |
| Collaboration | | | ✓ |
| Competition | | | ✓ |

All the teachers/facilitator agreed that the students were children of new generation, meaning that they had already been interested in technology; specifically computers and games. Therefore, game-like environments could be used as supportive materials for students' learning.

Although there were disinterested students in informal learning setting, in the formal learning settings, the number these students were higher. It was like fifty-fifty of the students like the activity and QA, whereas the other half were not be interested in it much. There were several reasons behind that, in fact. First of all, the implementations took place at the end of the semester; all the grades had been submitted by the teachers to school administers. The students knew that; they also knew that they would not be graded from the activity. As one of the teachers agreed so, some of the students value the learning activities that were graded and they spent more effort on it. As she also declared, this was one of the hallmarks of the existing educational system. Second, the students complained about time issue: the stated that time would not be enough for them to complete the project. However, few of them did not even try so. Third, the students complained about English interface as a barrier for them. Even though most of the students knew English, at least more than the students in cases 3&4, they mentioned about this situation as the reason why they had difficulty understanding QA. The teacher in the first case also blamed herself as not being successfully enough in motivating her students. In fact, this was the common issue in both formal learning settings. Teachers could not embrace the activity as a part of their classroom activities. Although they were very much positive about it, they could not reflect the importance of the activity to their students. Rather, it was introduced to the students as a project conducted by a researcher from a university. As the teachers did not place the activity effectively into their classroom, few students did not want to be a part of it considering that it was not something presented by their science teachers. Additionally, the students in the formal learning setting had been enrolled in other studies before, which may be another activity that they did not want to be a part of a research project.

The teacher of the case 2 and the facilitator of the cases 3&4 agreed that the activity was beneficial for the students in transferring what they learned into their daily lives. As the teacher stated, QA activity was a good way of learning about real life issues. Through QA, it was possible to let the students experience a complicated environmental problem.

The codes only emerged in informal cases were collaboration and competition. These emerged among the students as they working throughout the project. In fact, the same codes emerged in formal learning settings as well. However, the teachers did not mention about it during the interviews.

Finally, the importance of scaffolding was also the code declared by only the facilitator. Although the teachers underlined the importance of teacher existence in the classroom, they did not mention about this fact.

**Opinions on teacher/facilitator role**

Sub research question-3: How do they perceive their role during the implementation of MUVE?

The table below shows the cross case analysis of students' opinions of comparing traditional learning with learning in QA.

**Table 4.36** Opinions on teacher/facilitator role

| | C1 | C2 | C3-4 |
|---|---|---|---|
| Open to computer-based implementations | ✓ | ✓ | ✓ |
| Contributing for teacher | ✓ | | |
| Should be proficient | ✓ | | ✓ |
| The importance of teacher/facilitator | | ✓ | ✓ |
| Likes teaching with technology | | ✓ | ✓ |
| Hard | ✓ | | ✓ |
| Easy | | ✓ | |
| Should take role in the material development | ✓ | ✓ | ✓ |

Regarding the role, both teachers and the facilitator were interested in computer-based implementations. Therefore, they all liked the activity in general. Teacher2 and the facilitator also liked teaching in a computer-based learning environment.

According to the teacher of C1 and the facilitator of cases 3&4, it was important that the teacher should be proficient not only in terms of being master of the subject matter, but also knowing students, being computer literate and knowing the MUVE better and using it effectively. As the teachers take the facilitator role in the process, the more they are proficient, the better they facilitate the activities.

Interestingly, the teacher in C2 regarded teaching in MUVE as easier than teaching in class. In fact, she even did not take an active role during the implementations. She was in class; however, the implementations were done by the facilitator. In the normal situation, when she took her students to computer lab for science-related activity, it was the computer teachers facilitating the activities. Therefore, it is normal that she thought in that way. On the other hand, the other teacher and the facilitator found the activity hard to execute. There were several reasons behind that. It was hard because it was hard to manage the class in a computer lab, to attract students' attention the learning activity, and to follow each student's progress. Moreover, being a facilitator in a constructivist learning environment was harder than classic teaching methods: talking about a subject matter in front of the classroom. In the constructivist activity, however, it requires of the teacher to act as a facilitator not the transmitter of the information.

One common code emerged in all the settings were that it was important that the teachers should take part in the development stages of the material as well.

**Suggestions**

Sub research question-4: What are their' suggestions about using MUVE in classrooms?

The table below shows the cross case analysis of students' opinions of comparing traditional learning with learning in QA.

**Table 4.37** Suggestions

| | C1 | C2 | C3-4 |
|---|---|---|---|
| Additional time for the implementation | ✓ | ✓ | |
| Shorted activity | ✓ | ✓ | |
| One-to-one curriculum integration | ✓ | ✓ | |
| Informing parents | ✓ | | ✓ |
| Student education | ✓ | | ✓ |
| Teacher education | ✓ | ✓ | ✓ |
| Special interest group activity | | | ✓ |
| Homework | ✓ | ✓ | |
| Less number of students | | ✓ | ✓ |

There were several suggestions made by the teachers and the facilitator. The common issue was the requirement of teacher education. Before doing a similar activity, it was important to take teachers to a educational seminar and to teach them how to effectively use the environment.

The teachers in the formal learning settings mainly mentioned about the same issues. First of all, they suggested that mote time should be allocated for a similar activity. On the other hand, it was not possible to do even though the facilitator asked for it. Second, they mentioned about the necessity of one-to-one curriculum integration. What they wanted to see the same content existing in the science book to be placed in the virtual environment. Even though, constructivist way of learning does not limit the learning with text books, the teachers were very much depended on the curriculum and they were supposed to complete it as in the same way it was told. Third, the activity should be a shorter one according to both teachers. Due to time limitation, which was the problem that could not be overcome, shortening the activity may be another possible solution of using QA in formal learning settings.

Finally, related with the same issue, both teachers suggested that the activity could be given as homework. That might be a solution, but asking students this complicated activity at home individually may cause other problems emerge.

The teacher in the case2 and the facilitator suggested that these activities could better and more effectively be conducted with less number of students.

The facilitator also suggested that the activity could be implemented as a special group activity. This could also be a solution for time limitations and the influences of curricular issues in formal learning settings. The students could work in groups according to their interest areas, so that they could be more motivated.

#### 4.6.4. Challenges and Barriers

Research question-3: What are the challenges and barriers of using MUVE as a supportive educational material in formal and informal educational settings?

The table below shows the cross case analysis of students' opinions of comparing traditional learning with learning in QA.

**Table 4.38** Challenges and barriers

| | C1 | C2 | C3-4 |
|---|---|---|---|
| Innovative way of learning | ✓ | | ✓ |
| Classroom management | ✓ | | ✓ |
| Curriculum | ✓ | ✓ | |
| Teacher load | ✓ | ✓ | |
| Disinterested students | ✓ | ✓ | ✓ |
| Time | ✓ | ✓ | |
| Inexperienced teachers | ✓ | ✓ | |
| Requires time to get used to | | ✓ | ✓ |
| Parents | ✓ | | ✓ |

The only code emerged in all the settings were disinterested students. It could be a challenge to draw attention of the students to the MUVE. In fact, it could be more challenging to draw their attention to the learning activity embedded in the MUVE. As explained above, there could be several reasons behind student disinterest such as the importance of grading and time limitations. The other issue to be pointed out was the interest of the students focused on gaming rather than learning. Therefore, this type of implementations required extensive teacher attention. Additionally, it requires a good classroom management method.

In the formal learning settings, the structure of the existing educational system may become a challenge or barrier in the implementation of a game-like environment. For example, the curriculum was prepared in a way that showed almost all the things and the activities to the teachers to be executed. The dilemma was that even though the curriculum was a constructivist one, it did not allow teachers to place other types of activities, such as this one. It was very hard to schedule the implementations and find out free time in the computer labs, in formal learning settings. Curriculum was already full and the teachers were trying to complete each activity. Therefore, even though the teachers wanted to do this activity in their classes, the curriculum was not so flexible to easily do it so. Another issue regarding the educational system was teacher load. The loaded the curriculum was, so the teachers. The teachers had other responsibilities in their schools besides curricular tasks. Therefore, they could not even find time to login to the environment and try to learn it. Time was another construct, very much related with the issues above.

The other code emerged in formal learning settings were inexperienced teachers in technology use and integration of technology to their classrooms. Although both teachers were computer literate, they were not effective enough facilitating the activities and learning how to use QA. They also mentioned about the fact that there were many other teachers having the same problem. Especially the senior ones had difficulty learning new technologies.

Parents were another challenging issue even though they were not present in school setting. For formal learning settings, parents were challenge as they did not allow their students play a computer-game at home. Therefore, the students could not continue doing the project at home. For informal setting, on the other hand, they took their students from the organization. Therefore, the students could not participate in the activity. Therefore, parents should be informed about these implementations. Parents were only emerged as a code in C1, C3&4.

Considering the time limitations, as learning how to use the environment required extra time. Both the second teacher and the facilitator mentioned about this issue.

# CHAPTER 5

# DISCUSSION, CONCLUSION AND IMPLICATIONS

This research study was conducted in order to investigate what was happening in a learning context (either formal or informal) in which a technology-rich learning environment was used in order to support students' learning. In this respect, Quest Atlantis, a multi-user virtual environment, also known as a meta-game, was used in four different contexts. Two of the studies took place in different private schools and two others took place in a non-governmental organization. Students involved in learning activities in QA about a science subject, specifically about an environmental problem occurring in a national park. In this respect, the researcher investigated students' and teachers' perspective and illuminated the challenges experienced while conducting this type of implementations in either formal or informal learning settings. The purpose of this chapter is to discuss the important findings considering the literature and come up with conclusions that this study might contribute to the educational practice. Moreover, opinions regarding the implications of this study and suggestions for further research are also provided within this chapter.

## 5.1. General Discussion of the Findings

As the first section of the final chapter, the findings gained through the multiple cases of this research are discussed in accordance with the findings from the literature. As the study investigates three major issues including student and teacher perception, and implementation challenges, details of each issue are provided as a separate section.

### 5.1.1. Student Perceptions

#### 5.1.1.1. Student Experiences

The use of QA as a supportive tool for educational activities is such a unique experience for the students to have. In the specific use of Kızılırmak National Park project, an inquiry-based learning environment, the students have a chance to experience an environmental problem, see its results on people and ecology, collect data and try to find clues on the problem acting as if they are scientists or researchers. MUVEs and other virtual worlds existing in computer games are known as virtual environments in which students (users or players) walk around and complete specific tasks while, at the same time, interacting with virtual objects, the content, the NPCs and each other (Ketelhut et al., 2005). The students named the experience they had in this environment, in parallel with the definitions of MUVEs and games. According to the students, QA is a 3D place where they can walk around, have fun and interact with other players (either they know or not) and with NPCs. At the same time, QA expected to allow learning as including the educational activities. From the students' perspective, QA is a 3D place including educational activities and projects, and it is a planned and well-designed game with educational purposes. In other words, QA allows having an experience of fun and learning together. Therefore, the students are not only able to learn new concepts in a technology-based learning environment, but also have fun at the same time, as game-like environments are their favorite activities in general. Most of the students are aware of the fact that QA is not a fun gaming environment, but it also provides learning opportunities for them. In fact, in general, learning is imposed to the students as a "work" *(such as schoolwork and homework)* that should be done before they are allowed to play, this is like "eating one's vegetables before getting dessert" (Barab, Arici & Jackson, 2005, p. 15). In other words, as the authors state, the students have to do their homework beforehand if they want to have fun through playing computer games. Learning is turned into an activity that *must* be done, not like other activities they *like* doing. This results from "by over-theorizing and over-valuing product and under-valuing the rich processes of learning, the joy, fun, challenge, and meaning have, in part been stripped out of educational activity. Learning is reduced to work, to academics, or becomes simply the activity of being a student" (Barab, Arici &

Jackson, 2005, pp. 19-20). Instead of letting students play games only as a fun or pastime activity, these environments can be used for learning purposes as well. In other words, the use of game-like environments can combine fun with learning: the students can have fun while learning about theoretical information as they really involve in the learning as active participants. Except for considering computer games and MUVEs as leisure time activities and imposing learning as a *must* type of activity, with the use of games and MUVEs, learning can be turned into a more fun activity for the students as using their existing interest towards games and MUVEs.

**Involving in learning activities using QA:** As being among their most popular pass-time activities, computer games and MUVEs are motivating environments for the students (Dede et al., 2005a; Tuzun, 2004). Their existing interest towards these environments may possibly be used in either formal or informal learning settings within planned activities so that they are used to support students' learning with the activities. Measuring the achievement of students in order to decide on how much they learned was not among the purposes of this study. Although not being measured or not being investigated through standardized test, the students interviewed claimed that they thought that they learned thanks to the activities they enrolled in QA. Moreover, the teachers interviewed supported students claims. Most of the students doing the activities in QA setting stated that they thought they learned.

Some of the students think they learn in QA setting and the learning activities are reinforcing for their learning of classroom activities. What they learn is related not only with the activities conducted (such as the Kızılırmak Park Project) but also with other aspects that they experienced (such as use of MUVE and how to conduct research). Students think that they learn about science related issues: learning issues about environmental awareness, influences of fertilizers on the environment, the importance of protecting environment and animals, the causes of erosion etc., just to name a few. Moreover, the students think that they gain other abilities: such as making research, behaving like a scientist, collecting and analyzing data, investigating how people may have different perceptions, using a MUVE, learning in a game-like environment etc.

As can be seen from the results of this study, the students participated in the case studies not only had fun but also indicated that they learned. Prensky (2001) claim that there is a relationship between learning and having fun: when the students have fun, they are more motivated towards learning. According to him, the more students have fun, the more students are relaxed, the easier they learn. Moreover, when the students have fun, they want to use QA more and they are much more motivated towards learning. In other words, they are more willing to learn and participate actively into the learning process, since games and MUVEs are their favorites.

MUVEs are settings in which students can learn while discovering 3D places, doing quests, and through data collection and analysis. The literature about computer games and MUVEs also indicate parallel findings and show that students learn more than their peers who learn through traditional methods. Regardless of the type of the game (either edutainment or commercial), the use of games may result in learning (see for example Lim, Nonis and Hedberg, 2006; Dede, Ketelhut & Ruess, 2002; Dempsey et al., 1996). Additionally, students, learning through a MUVE, learn more than their peers, learning through traditional teaching methods (Dede et al., 2005b). Warren, Dondlinger and Barab (2008) indicate that the use of commercial games "not only appears to improve student learning of subject matter, but also affects the ways learners process content and reflect on their own learning" (p. 116). In a similar study using Taiga world in QA, the original version of Kızılırmak National Park, the researchers found "strong evidence that QA intervention supports transfer to externally developed, high-stakes achievement tests" (Barab et al., 2007c, p. 768). In another study, Ketelhut, Dede, Clarke and Nelson (2006) report that students learn biological content as participating in the learning activity in a MUVE more than they would learn through a traditional teaching method.

It is for sure that learning may not occur in all types of game-like learning environments. In other words, involving activities in computer games and MUVEs do not ensure student learning all the time. According to Squire (2002), the way the game has been structured and the activities are situated, the types of activities as supportive methods of student interaction and learning, the quality of information and content are all important factors in order to enhance the occurrence of learning. Learning requires something more than letting the students play an educational game or moving around 3D virtual environments in a MUVE. Aimless walk within 3D virtual words do not mean engagement (Lim, Nonis & Hedberg, 2006). It is also very much depended on “the creative coupling of educational media with effective pedagogy to engage students in meaningful practices” (Squire, 2002, pr. 30).

As stated before, computer games are criticized as having violent game aspects, and that was the most common reason of people who do not want to use game-like environments for educational purposes. However, the designers and scholars developed QA-like settings depending on educational aims. Some of the students and all the teachers in the current study appreciated this characteristic of QA as not including violent themes but also as including educational ones. Moreover, as one of the students said, QA filled their minds with positive nice things. QA is beneficial for the children, as the students interviewed expressed so. As opposed to other commercial games that they play in Internet cafés, QA is non-violent at all.

In the current study, the students enrolled in immersive learning activities within virtual worlds designed with the purpose of curricular activities. Within this learning experience they are continually supported through feedbacks, guidance and scaffolding. According to Warren, Dondlinger and Barab (2008), playing games puts students in immersive environments that strengthens their knowledge construction and ensures transfer of knowledge. Besides supporting their learning of science in school, the immersive virtual environment used in this study can also be counted as an opportunity for the students to learn issues of ecology, to experience it and to easily transfer it to their daily lives. In the current study, the students were able transfer their knowledge from activity related issues to issues regarding real-life; such as after seeing the fish decline problem and investigating the possible reasons and results, they realized that they should protect animals and trees in their life, and they should care of environment surrounding them.

Some of the students in formal educational settings related their experiences with learning (fun and learning together). It was not surprising as the implementation took place in a learning setting and the activity was presented as a learning activity to them as a supportive one for their curricular activities. However, on the other hand, the students in informal learning settings also mentioned about how contributive QA for their learning. In fact, it was summer time, and they even did not continue school at that time. The project was not introduced as a lesson-like or science activity, too; rather it was presented as a water-quality project taking place in a game-like environment. Most of them indicated that they preferred coming to the organization since they did not have any better choice: they did not have home-computers, and did not have a chance to attend any private-summer-school (including various activities) due to their low income. According to these students, QA contributed to their learning about environmental issues, and they were happy to participate in this project and to have a chance to use QA. They not only learned about the issues in the project, but also learned using a MUVE environment.

Learning through games, as Squire and Jenkins (2003) put into words as quoted below, is quite a different experience than the students get used to in traditional learning which they engage in school:

> About much more than memorizing names or dates for a test; it is about finding joy and fascination in the world, asking questions and engaging in inquiry, developing expertise and participating in social practice, and developing an identity as a member within a community (p. 29).

As can be seen from the above quotation, well designed computer games and MUVEs have the potential to support learners with experiencing the learning occurrences, so that the students may go steps further from memorizing facts and issues to really understanding the content and issues and have a sense of it. They can also see the results of their acts and decisions within the MUVE activity, which they may not have a chance to do so in real life settings, at least in their schools.

The students mentioned about the help of their friends and of facilitator while they were doing the projects/quests. Collaboration emerges as the students learn in this immersive learning environment. Collaboration can be regarded as the social activity required for knowledge construction according to socio-constructivists (Dickey, 2005). The students share information with their friends, especially when they are the one who found information or a resource when most of others are not able to. The students who are more computer-competent and who learn the environment before take the leadership role in class and help other students in general. Besides helping each other and sharing information, they think of and discuss opinions together with peers about the aspects of the problem they are working on. Collaboration is not only good to share information with others, but also a motivating factor in MUVEs (Dede et al., 2005a). Collaborative learning has the potential of supporting students' communication and critical thinking skills (Roberts, 2005). It also gives students a chance to see other's perspectives (Veerman & Veldhuis-Diermanse, 2001). Moreover, as QA allows multiple users, students are able to see each other in 3D environment and follow what everybody is doing. They can not only see where other students are going, but also see how they progress via clicking on their avatar and displaying their q-pods, online portfolios.

The observations showed how some of the students losing their confidence and feel disappointed when they were not able to find something or to do a task. This can be explained as academic efficacy meaning that "students' belief in their ability to master curricular knowledge and skills" (Dede & Ketelhut, 2003, p. 15). In other words, students who do not believe in themselves while doing an academic task can easily give up trying. In complex learning environments, the low level of scaffolding may result in student disinterest and low level of academic efficacy. Lim, Nonis and Hedberd (2006) also point out the importance of scaffolding in complex learning environments and say that when students are not provided with scaffolding then "they might suffer cognitive overload that, in turn, might then result in disengagement" (p. 226). Therefore, it is possible to say that scaffolding is a critical issue and teachers ensure providing enough level of scaffolding for their students especially if they are using game-like immersive and complex learning environments as supportive activities to curricular activities. Good level of scaffolding is required and it helps to improve student achievement, whereas the low level of scaffolding in inquiry-based activities may cause students be confused and lose their interest.

Collaboration among the students can also be regarded as a way of scaffolding. Other studies also mention about the collaboration as an emerging theme in MUVE-learning settings (see for example Barab et al., 2007d). As Reiser (2004) asserts that peers or adults, who are more experienced, can scaffold to the students especially if they are learning in a complex learning environment. This concept is also very much related with the term "zone of proximal development" described by Vygotsky (1978). Zone of proximal development is known as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). The students, in this study, were provided with opportunities to share what they had found with other peers through classroom discussions so that they could not only know others' perceptions but also learn from others through this collaborative activity.

Scaffolding can also be provided through the use of informative and guiding tools. In the current study, the students were given worksheets including parts that should be filled by them. There were students, in this study, complaining about the number of pages of worksheets, at the beginning of implementation. Nevertheless, after the study completed, they stated that worksheets helped them a lot in organizing the data they gathered. Data organization made them remember everything thanks to the notes they took. Moreover, the students said that worksheets allowed them to process the project easier and faster. For the students, it seemed boring at first due to the thickness of the worksheets; however, they realized how useful it was later on. The worksheets did not only work as a data organizer, but also as a scaffolding tool by giving clues to the students about what to do next and what type of further information or data to collect. The tools used for scaffolding students' learning in a complex learning environment are important dimensions of the process since, as Reiser (2004) claims, these tools "enable students to deal with more complex content and skill demands than they could otherwise handle" (p. 273).

The experience that the students have is not only about collaboration but also about competition: as the students work through the project, they tend to compete with each other as to be the first doing a specific activity, finding a specific item or place, or finishing up the whole project. According to Neal (1990), competition is one of the factors to ensure student motivation (cited in Amory et al., 1999). Competition is as much important as collaboration in the learning setting in terms of including cognitive dimension (Feng et al., 2005). Competition may have influences on students' learning when considered within two different conditions: 1) extrinsically motivated students may compete with their peers so that they spend more effort on their learning, and 2) intrinsically motivated students may compete with themselves and try to do better than their previous scores, which helps students improve their learning (Van Eck & Dempsey, 2002). The emerging constructs, collaboration and cooperation, in the social and immersive learning environments using computer games and MUVEs can be regarded among important factors having positive influences on students' learning most of the time. The friendly competition among the students also increases their motivation and learning performance by stimulating their interests to learn more (Burguillo, 2010).

**Student interest toward using QA:** The results of this study indicated that, most of the students liked QA; and most of them liked the Kızılırmak National Park project, too. Tüzün (2007) also come up with the same conclusion commenting on three separate studies. The observed implementation sessions showed that the students were highly motivated to log in to QA and start using it, especially in cases taking place in informal learning settings. This type of motivation is called as intrinsic motivation (Byrne, 1999) meaning that the person's willingness for doing something that comes from inside rather than being aroused by an external reward. Moreover, the teachers participated in this research claimed that QA-like settings improve students' motivation, and therefore might be used accordingly. The results drawn from this study are similar to those exist in the literature. Research studies show that computer games and MUVEs have motivating power over the students (Dede et al., 2005a, Dede, Ketelhut & Ruess, 2002; Dede & Ketelhut, 2003; Barab et al., 2007d; Tuzun, 2004; Squire, 2005; Wentwoth & Lewis, 1973; Tüzün et al., 2009). Besides their likes of activities and the project, the students also like game issues they found in the virtual environment, such as swimming, driving cars, or wandering around virtual worlds. According to Dede et al. (2005a), the mysterious story of virtual worlds and the complex problematic situations to be solved increase students' curiosity and interest towards the applications and learning science. Accordingly, in the current study both the overall QA-MUVE and the virtual world in which the implementations took place have a narrative influencing the types of activities and changing the experiences students go through.

Students' high level of motivation, especially of the students in informal learning settings, may be due to the novelty effect of using a game like learning environment. Novelty effect is described as "the increased effort and attention research subjects tend to give to media that are novel to them" (Clark, 1983, p. 449). This effect may disappear as the time moves on, meaning that as the students become familiar with the innovative environment their interest may decrease. In other words, the use of game-like environments in learning settings may increase student motivation due to novelty effect. As the students spend more time in MUVE setting and they involve more into the project, then the effect of novelty decreases. Depending on a longitudinal study of examining students' perceptions toward computers in education, Krendl and Broihier (1991) claim that students' interest toward computers decrease over time. The authors point out to the influences of novelty effect as students use technology for years: students' interest towards learning with computers decrease over time. Even though the researcher in the current study introduced QA to the students as earlier as possible, the study did not last for years. Therefore, it would be possible to say that high interest of the students, especially of the students in informal learning setting, may be due to the novelty effect of the innovation. As the students become more familiar with the innovation, their enjoyment of it may change over time. Considering that students may react differently towards different applications of technology use, it is apparent that more studies are needed investigating students' perceptions toward learning with MUVE or computer games. Further research is needed in order to make it clear if the novelty effect influences students' high motivation of using game-like learning environments.

Although this study and many others claim that games and MUVEs increase students' intrinsic motivations and take their interest to the learning, it may not be the case all the time. As the results of this study indicated, some of the students are not motivated towards learning through these types of environments. Not-surprisingly students may show different reactions to different activities. In the current study, some of the students (the students in formal learning settings) stated that the Kızılırmak National Park project was hard for them to understand as it was a complex one; whereas other students in the same classes said just the opposite (i.e. the project was quite easy for them, and they were able to complete it in a short time). These students' negative reactions to the activity was more like an excuse, as their teacher agreed on so. Their excuse was not persuasive, though. In fact, Taiga was designed and investigated with a 4$^{th}$ grade class, using a designed-based research approach (Barab et al., 2007c). In other words, the developers of Taiga improved the narrative and the design issues depending on the results they got in that study. It was surprising that the 7$^{th}$ graders, especially in two of the best private schools in Ankara, complained about its difficulty. $7^{th}$ grade was selected since ecology subject covering related issues exists at that grade's curriculum. More surprisingly, in cases of informal learning settings, the students were younger (there were many $4^{th}$ graders) and they were quite successful in completing their projects. There might be several reasons behind this. First of all, the time was limited for the students in formal learning settings so that they were not able to concentrate on the project. In fact, in order to overcome this problem, the students were introduced with QA one semester before the implementation. Moreover, although their teachers tried to make the students spend more effort on the project, it seemed the teachers were not convincing enough to make the students believe that the activity was a supportive classroom activity to science curriculum. In other words, the students, unfortunately, were aware of the fact that it was a part of the research and it was not compulsory indeed. If the teachers cared more about it and embrace it as an important project needed for students' learning and for supporting science curriculum; then the students could behave differently. Another reason might be that the implementation time was at the end of the term because the associated subject matter was the final one in their curriculum. Due to this reason, all the grades were submitted by the teachers and the students knew that. In other words, the students knew that this project would not have any influences on their grades. The project, for some of the students in formal learning settings, unfortunately, remained as a study conducted by someone else out of their school. Finally, according to some of these students in formal learning settings, the graphics of QA was not attractive and good enough. All of these students have home computers and they play computer games whose graphics are better than QA, they claim so. Therefore, QA did not motivate these students more.

Considering that each individual has special needs, likes and each student may learn better through a different method; games or MUVEs may not serve as the best motivating learning environment all the time for all the students. Squire (2005) points out this issue and says that playing computer games may not take interests of everyone even if they are the young generation, and it would not be true to say that playing games are charming to everyone. This idea is in fact valid for every other teaching/learning method. Therefore, teachers should prepare a variety of opportunities for students' learning so that each student feels comfortable while learning and has a chance of learning through a variety of experiences.

**Student Autonomy:** In the cases of formal learning settings, the students had already been familiar with the term avatar; however, the students in the last two cases met with this term within this study for the first time. The students internalized their avatars with themselves. For example, during the interviews, they were mentioning about that *kid* or *man* on the screen as a representative person of themselves. Whereas some of the students wanted to make their avatars just at themselves, there were other students who were trying to make their avatars very much different than their own appearance.

The use of avatars as a way of personalization of students and a way of navigation through the virtual worlds made students internalize their virtual characters with themselves. They use the word “I” or refer other virtual characters with the name of their friends, who are navigating them, while mentioning about their experiences (Turkle, 1984). According to Barab et al. (2007c) the existence of the narrative within this experience is also a factor behind this internalization, because it helps students being immersed in the virtual environment more. Moreover, thanks to taking the role of their avatars, the students are able to have a sense of empathy and learn being someone else (e.g. being a researcher/scientist in this project).

The students participating in Kızılırmak park project claimed that they felt like a scientist conducting research in there. Having investigated motivating issues of learning science in a MUVE, Dede et al. (2005a) also conclude in a similar way, which is students feel like scientists as they study through an inquiry-based scientific problem. The literature claims that it is more than feeling, though. Besides feeling like a scientist, the students learn acting like scientist using scientific methods for problem-solving (Barab, Gresalfi & Arici, 2009). Students learn scientific approach “through their own active observation, measurement, experimentation, tinkering and hypothesis testing” using the information and other resources embedded in the virtual environment (Jenkins, 2002). In fact, game like environments gives students a chance to experience a specific role, that is almost not possible to have in their daily lives (Shaffer et al., 2005.)

During game play or participating in an immersive activity in a MUVE, the students construct a relationship between themselves and the role of the virtual character. With this type of involvement, the students experience being someone else, and although they have this experience in the virtual conditions, this has influences on their real lives as well (Barab et al., 2010). In terms of learning science in a MUVE, the current project and other similar projects allow learners to feel the importance of their existence in the learning process. In other words, these types of learning environments give opportunity for the learners to be active participants in their learning process. As opposed to being told by their teachers what to do, they make decisions and act accordingly within the guidance of the teachers. They not only discover the problem situation, but also develop their own hypothesis and through collecting data they test it, and finally they come up with a solution. This autonomy in the learning process is a good motivator for the students and an important supporter of their learning (Dede et al., 2005a). This learning style is also necessary for educating scientifically literate students, which is one of the aims of education in the current era (Dede et al., 2005b).

Dede et al. (2005a) claim that moving around in 3D spaces is also an important factor making students feel like they are actively participating in the learning process as it creates “a sense of authenticity” (p. 6). Even though it is a virtual experience, the students do something more than just sitting and listening to their teacher in their classroom. Besides giving them the chance to feel autonomous in the learning process, the students should also be given a voice in developing goals of the education depending on their needs and expectations (Steinkuehler & Squire, 2009).

**Student Likes and Dislikes:** As this study indicate, most of the students like learning through MUVEs (Tüzün et al., 2008; Bayırtepe & Tüzün, 2007). In the current study, for almost all the students, it was the first time using a MUVE/game environment in the scope of an educational application. For the school cases, that was the first time for the students to meet with such a learning environment in the borders of school. For the informal learning setting, it was the same. In addition to use QA for the first time, non-of the students had had a similar experience before.

There were many different attributes of QA that the students liked. In the formal learning settings, students’ likes were mainly about learning side of QA. In addition to play the game, the students liked learning through the game, interacting with friends while completing educational tasks in 3D world, and the project that they completed as part of the class work. For those students who complete the project, QA was an easy learning environment and they liked learning about science and finishing the project, too. Moreover, the students liked collecting data, making research and therefore developing their scientific and inquiry skills in QA environment. What these students disliked, on the other hand, included the connection problems (technical problems during the implementations), limited time of implementation, and long reading passages. For some of the students, this activity with loaded work and much reading required caused them lose their time that they were supposed to spend for SBS exam. According to this group of students, who played other commercial computer games, the graphical structure of QA was not that good and it was kind of boring when they compared it with other games they played. They also disliked QA since all the activities took place in computer environment that they did not like spending much time in front of computer screen.

In the informal learning setting, first of all, they liked QA; the game itself, students' being presented in 3D environment through avatars etc. The students again found out fun parts and created their own games. Although no car existed in the virtual world, they were able to find in other virtual worlds since they had time to investigate other worlds. As different from the first case, however, the students did this investigation after the study completed. Besides driving cars, the students liked swimming in Kızılırmak-river as a fun activity, too. They also liked walking around and discovering new places, interacting with their friends and NPCs, meeting unrealistic situations (not dying in the river). Students refer clicking on NPCs as a type of interaction, because those characters are designed in a way that they provide with different choices (links) through that interaction between the student and the NPC change accordingly. In addition to their likes of fun related activities, they also liked learning, the project, making research, doing water analysis, attending in class discussions, and reading passages. As opposed to private school cases, in this setting, the students had almost no dislike about QA. The reason might be their perceptions about computer games were limited. In other words, they did not play as much as their peers in private schools. Most of the games they played were limited with simple Internet games (flash or java games). It is not to say that those games are useless. Rather, those types of games are more appropriate to make a small demonstration (Squire & Jenkins, 2003). Moreover, the literature indicates that "complex games are generally more challenging and therefore offer more potential in the classroom" (McFarlane, Sparrowhawk & Heald, 2002, p. 11). There were only few students who played games like GTA, Need for Speed, Counter Strike. In fact, those were the students who stated their dislikes of the game regarding game design issues. Students' dislikes included English interface, bugs, game's stopping running (due to technical deficiencies), getting lost in 3D worlds and not being able to find items and NPCs, doing water analysis, long reading passages and writing. They did not like English interface since they did not know English at all. Moreover, as can be seen from the results, some of students liked some activities (such as water analysis, reading) whereas some others did not like at all. It was interesting that the students mentioned about their critics as well: playing computer games may cause addiction or may be harmful for children's eyes.

#### 5.1.1.2. Comparison with Traditional Learning

**Learning Science within a MUVE:** In general, students learn about science and scientific issues in a classroom environment, very much isolated from the outside world. In most of the cases, science is taught to the students with the use of books. If the students are lucky enough, they have an opportunity of a science lab in their school; if they are not, all of their science learning activities take place in the classroom environment. Unfortunately, as the current study indicates, especially some of the government schools are lack of equipment, specifically a science lab or some supportive materials for learning science. Therefore, most of the students are not able to find a chance to go beyond reading and listening about science and to apply their scientific knowledge in real life settings. In most cases, it seems not possible to let all the students learn science through an activity in which they are actively taking part, especially when the classrooms are crowded, the curriculum is strict and the opportunities are deficient. As Dede et al. (2005b) claim, in available classroom conditions in schools "real world data collection is challenging to orchestrate" (p. 1). This is why these students are lack of the scientific skills and they are insufficient when they are supposed to apply scientific information in real life.

It is not just about conditions of science labs or classroom environments. Security, cost and time are other constraints influencing teachers' methods of teaching science. When we consider about the case in the current study, most probable, it would be impossible to create a situation in which there is a similar problem occurring and it is influencing large amount of people. It would also be impossible to take the all students to that place, which is probably in another city, and to make them work as scientists and try to solve the problem. It would not only be hard to afford, but also be challenging for students' security. It would also require much more time to take students to that place, to ensure their security and accommodation etc. when compared with the current activity taking place in a virtual environment that could be used in a computer lab environment.

Considering that one of the most important goals of education in our era would be to "create scientifically literate citizens" (Dede et al., 2005b, p. 1), the curriculum should include scientific activities through which the students study on inquiry learning activities in which they study on a problem situation, construct hypothesis, collect data and test their hypothesis. Most importantly, the students should act actively within this process under the guidance of their science teacher. It would not be wrong to say that, when the opportunities are limited, computer games, simulations and MUVEs can work as good learning environments through which the students can experience a real-life-like situation/problem case. Moreover, the use of these environments in classrooms offers potential for inquiry learning activities, which is quite important for learning science (Ketelhut, Dede, Clarke & Nelson, 2006).

National Science Education Standards define inquiry as a type of activity for the students to construct scientific knowledge. According to NSES (1996) inquiry is a

> multifaceted activity that involves making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations; reviewing what is already known in light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results (p. 23).

As this definition indicates, it would not be wrong to say that the activity used in the current study is an inquiry learning activity including constructing students' own hypothesis, data collection, observation, use of multiple resources, analyzing and interpreting data collected and come to a conclusion. In other words, this type of immersive inquiry based learning activities can help students learn scientific content, be scientifically literate, and know how to apply scientific knowledge in their real life. MUVEs seem to have the potential of offering inquiry-based learning activities to the students as supportive materials for their science learning.

Similar projects may increase students' inquiry and researching skills, while increasing their interest towards making research as if acting as real scientists. Thanks to depending on problem-based approach to learning, it may also help students improve scientific literacy skills (Dede, Ketelhut, & Ruess, 2002). Besides increasing students' skills, MUVEs allow students develop their computer literacy skill, too. Moreover, it is a good way of learning and practicing school subjects, at least for the students who like this type of learning activities taking place in computer environment.

Being scientifically literate citizens is one of the requirements of the new era; however, Ketelhut (2007) asserts that many students fail in learning science in schools, and students' low level of self-efficacy towards learning science may be an important factor behind it. Self-efficacy is the term by Bandura (1977) meaning that the belief that the person has the ability of successfully performing a task or executing a behavior. However after conducting a study, she finds out that "self-efficacy has no effect on the diversity of sources from which students collect their scientific data" (Ketelhut, 2007, p. 109). She explains this outcome may be the result of differences in students' self-efficacy of scientific inquiry in classroom environment versus in the MUVE setting or the effects of students' motivations toward learning with a MUVE, as she gets the first data set before the study begins and the second data sets after the students participated in a learning activity taking place in a MUVE (Ketelhut, 2007).

Learning in a MUVE is easy for the students who pay attention to the project and really care about it. However, it is surprising when it is hard for the 7$^{th}$ grade students whereas it is so easy and can be completed by 4$^{th}$ grade students not only in this study but also in others (Barab et al., 2007c). The results of another study show similarities with the former findings: learning in game-like environments is easier than learning in school for the students (Dede, Ketelhut & Ruess, 2002). When time is enough and students are given enough support and encouragement, they can easily solve these ill-structured problems.

**Motivating:** The results indicate that, for some of the students, the science classes are usually boring; the students are passive receivers of information, while the teachers have the dominant role of transmitting knowledge. Not only some students participated in this study do not like science, but there are many other students who do not like science or social science classes (See for example Turkle, 1984; Lim, Nonis & Hedberg, 2006). Some students are not engaged into the idea of schooling, too (Dede, Ketelhut & Ruess, 2002).

There are students talking about not attending school as it would not be compulsory (Shaffer et al., 2005). Moreover, students lose their interest towards schools, teachers and lessons, if they do not like their teacher or the way the classes are performed. Although constructivist learning takes the children to the center of learning process and supporting, motivating and encouraging them throughout this process, and making them believe in their successes is of importance, it seems it is just the opposite in practice in some of the schools.

On the other hand, in the current study, the results indicate that the majority of the students like learning in a MUVE setting. They also say that it motivates them toward learning activity as it does not include only learning but also fun aspects. Barab et al. (2007c) also mention about a similar finding. In their study, the teachers also commented on student participation and their "uncommon enthusiasm toward the curriculum" (p. 762).

As the current study shows that some of the students do not like science classes that they attend in their schools. However, those students were very much into the science activity, Kızılırmak National Park project, and very much motivated towards learning science concepts and working on the problem. Tüzün et al. (2009) also claim that students have high level of intrinsic motivation and low level of extrinsic motivation while learning in QA.

**Student-Centered vs. Teacher-Directed Learning:** In our era, educational practices should be planned around learners who are playing the central role in the learning process. U.S. Department of Education (2010) also offers a learning model in National Education Technology Plan – 2010 that places students to the center of the learning process and supports their learning with other dimensions such as teachers, tools, communities etc. According to the model, technology based materials, for example game-like environments, are giving support to students' learning by providing immersive learning environments.

Science depends on experiments and can be learned effectively through participating in learning activities. Unfortunately, as the student results indicate, science labs are not efficient and adequate, if they exist so. Students cannot find opportunity to make experiments most of the time. If their teacher is really willing to make students have this experience, than what they do is making the experiments in class or at home, depending on the type of experiments. In this process, either the students are assigned to bring the materials or they do the experiments as groups or they do are supposed to do the experiments at home. However, the use of MUVEs, games and simulations may give another opportunity for the teachers to let students make experiments in a computer environment, where there is no need to bring or buy other equipments. As in this study, the students also practice a problem case as if it really occurs without going anywhere. Walking around the virtual environment, they can collect data, analyze it, get other people's opinions and see what really happens in the environment. While doing this the students learn not being taught by the teacher, as the students express. The only responsibility of the teacher is than to help them in this process and guide them so that they do not construct wrong knowledge structures.

Student responses indicate that in MUVE like settings students learn, but in schools they are taught. MUVEs allow students to progress according to their learning capacity, they get help from their peers and collaborate with them, and they get the support of the facilitator whenever they need help. On the other hand, in traditional learning settings, they just do whatever their teacher wants them to do: it is, most of the time, sitting back and listening to the teacher, doing homework, and being respectful. However, MUVE allows them to learn in a problem-based learning environment where the students are active participants. Providing immersive and challenging educational activities, MUVEs have the potential to engage students more into the learning (Dede, Ketelhut & Ruess, 2002; Dickey, 2005). This may ensure permanent learning and retain of information.

Schools still seem more teacher-directed rather than being learner-centered as places where constructivist approach is used. Game-like settings can provide opportunities to the students to learn by doing (Rappa, Yip & Baey, 2009). As opposed to being taught by the teachers who generally write on the board, in MUVEs students do whatever to do by themselves, gain knowledge through their participation and active involvement in the learning setting; i.e. they learn by experiencing, of course with the guidance of the teacher required. Student interviews show how the instructional approach used can make a difference in students' opinions. As they said, their teacher writes something to teach on the board; but the facilitator (the researcher in these cases) write whatever the students think about the problem case and whatever they found in terms of key issues. The activity, in fact, is not teaching, but facilitating with the continuous support of students throughout the project. It is not important to tell them directly what to do; rather, to guide them in a way that they find the truth by themselves, after a detailed analysis and thinking about the important aspects of the problem.

Within a learner-centered educational approach, there emerges a need to support more communication between the learner and the teacher (or any other person taking part in the learning process) in that teacher takes the responsibility of guiding the learner in the process (Dewey, 1938). According to Dewey (1938), a question emerges at this point, that is "how these contacts can be established without violating the principle of learning through personal experience" (pp. 8-9). This requires a very-well organized educational process in which opportunity for self experience is provided for the learners and the role of the teacher does not limit this experience; but, rather supports learners by facilitating the learning activities.

In QA implementation the students were able to collaborate with each other and ask questions and get help from their peers during the project. Expect for a few students who are disengaged to the activity, all the students are in to the activity, which is very much motivating and increasing their responsibility to be taken on their own learning. The interaction in MUVEs is not limited to the chat or e-mail options. The structure of the MUVE allows students to interact with NPCs and some objects as well. This is a motivating issue for the students to communicate with digital characters and to get information from them regarding the problem case (Dede et al., 2005a).

The students claim that the use of MUVE allows better communication and more interaction with their peers. Students' responses clearly indicate that in schools, seems like especially in government schools, student interaction is regarded as misbehavior by the teachers and it is not allowed due to management related issues. Shaffer et al. (2005) note this issue and claim that "whereas schools largely sequester students from one another and form the outside world, games bring players together – competitively and cooperatively – in the virtual world of the game and in the social community of its payers" (p. 106).

**Number of Students:** The main type of activity is reading text books and writing summaries to the notebooks, in the majority of the schools. On the other hand, MUVEs allow students learn in a learning environment where they also have fun due to gaming issues. Moreover, involving in the problem-based projects in MUVEs show students what they can really achieve when they actively study on a subject matter. The students, then, find themselves more successful in learning with a MUVE. Moreover, this long-term projects may provide students with a different opportunity than doing paper-based homework and bring it to the next class.

Classrooms in government schools are more crowded in metropolis most of the time when compared with private schools. This causes too much noise in the classroom in case of low level of classroom management and of the situations where students talk to each other. Activities taking place in MUVE of game settings require less number of students since management of students is much more difficult in these environments, and also the number of computers is less than the number of students in classrooms. Moreover, the less number of students is also required so that each individual student can be given a chance to talk during class discussions about the project and express their opinions, as much as anybody else in class. Considering the importance of planning learning activities according to students in constructivist learning environments, it would not be wrong to say that the number of students in classrooms should be as less as possible so that the teachers are able to be interested in each student individually and arrange the learning according to their individual needs and differences.

#### 5.1.1.4. Student Expectations

The students suggested that projects like Kızılırmak Park, can be given as homework and it would be a fun way of making homework; however it requires some other conditions. First of all, all the students should have home computer and Internet access. Second, they should be able to receive help whenever they need so; therefore, there should be someone online most of the time, follow student progress, and give students guidance. Third, the activities should always be supported with face-to-face ones. Forth, parents should be informed about this project, about the importance of it and about its differences than the type of computer games that they are opposed. And finally, the students should be scaffold with beneficial resources and tools.

The students want further use of QA-like settings in many courses as supportive educational activities. Depending on their likes and positive attitudes toward these environments, they may improve their achievement in the classes. In fact, the students do not only want QA is integrated to the classes they do not like; they also want to apply QA activities in the classes they like.

Students have some suggestions about QA as well regarding design issues. Those who play computer games much expect to see better graphics in the environment. Moreover, students would like to have more avatar options, have their own places in 3D world (home of each student), and more active NPCs (not just standing; rather moving around and speaking). They also want a leveling system. In fact, the game has a leveling-like system; it is called shard flower. Shard flower includes seven petals; each refers to a social commitment. The most the students complete quests, the more the lumins they have. When students gain lumins, the related petal brightens up. However, due to the limited time available, the students could not be introduced this application. In fact, most of the students did not know English well, that is they could not be introduced with some aspects of QA in order not to mass their minds.

### 5.1.2. Teacher and Facilitator Perceptions

#### 5.1.2.1. Perceptions about MUVEs

Interviews with the teachers indicate that they use computer technologies in their classrooms; however, the technology-based activities they prepare and present to the students are “simple, non-critical thinking activities” such as presenting the content of the text book as a PowerPoint presentation (Lowther et al., 2008).

MUVEs, considering QA as an example of it, are effective and visual game environments using dynamic structure that differentiates them from other simple games. Whereas other edutainment games include repetitive and simple activities, educational MUVEs include a variety of activities in a variety of subject areas. With the use of a strategy (adventure-like) setting, MUVEs are exciting environments for the students; they draw students’ attention and enhance their motivation (Gredler, 2004, Jenkins, 2002). Besides increasing motivation of the students, MUVEs are good, successful learning opportunities to support learning outcomes and they present students with a different learning experience. In other words, they are useful for the students. Schrader, Zheng and Young (2006) also claim that teachers find games socially important.

MUVEs are enriching and beneficial learning environments, and they have the potential in supporting student’ learning as computer-based learning environments. They can either be used in formal or informal learning settings as supportive learning activities. The results of this study indicate that MUVEs and computer games may provide with an opportunity to the students learn better, if planned systematically and used appropriately. They are supportive educational tools for permanent learning; students may not only use them at school, but also use them for practice at home if they have required equipment though. These types of implementations require long time of implementation, too.

As being technology-based materials, QA like learning environments are not only appropriate for students learning and doing school activities, but also for the schools whose mission is to integrate technology to learning. QA is a nice game environment with the logic it is depended on. QA is beneficial for the students since it allows inquiry-based learning and learning by doing (Dewey, 1938; Shaffer et al., 2005).

### 5.1.2.2. Opinions on students' learning

Students are open to learn through technology. Considering that the students are already accustomed to new technology more than their teachers, and they can easily learn new computer technologies, MUVEs as technology-based environments using computer and Internet technologies are appropriate and motivating learning environments for the students. Although the students may need some time in getting used to the environment, then they become familiar with it. Moreover, they are suitable to be used in formal learning environments, which are strict about the implementation of game-like environments. It is because, QA is an educational MUVE by including only educational quests, used only with educational purposes by teachers worldwide and it is not allowed to be used by any other person non-authorized.

MUVEs and computer games are immersive environments (Gredler, 2004). The curriculum that uses MUVEs immerses students "in the digital experience" (Barab et al., 2007c, p. 762). In the activities to support a constructivist way of learning, the students are provided with problem statements, clues, and given continuous guidance; then they are expected to think about it and act/comment/perform on it so that construct knowledge. As Shaffer et al. (2005) advocate, game-like environments allow students "think, talk and act in new ways" thanks to the immersive virtual environments they include (p. 105). Waiting for the students comprehend information through the projects like QA requires long period of time, but result in learning most of the time, if planned and applied appropriately. It is in fact a useful and successful type of application for students to practice a constructivist way of learning, and have a real-life-like experience. Thanks to QA-like learning materials, students can practice theoretical knowledge that they are taught in classes because QA allows students learn by doing. Squire and Jenkins (2003) also think in the same way as they say MUVEs and computer games are "imaginary worlds, hypothetical spaces where players can test ideas and experience their consequences" (p. 8).

Learning in game-like settings include student activities rather than educating them in a way that they tend to memorize facts and issues. In game-like settings, the learning is "about joy and fascination in the world, asking questions and engaging in inquiry, developing expertise and participating in social practice, and developing an identity as a member within a community" (Squire & Jenkins, 2003, p. 29). Rappa, Yip and Baey (2009) also emphasize how beneficial the role taking, being a member of community, and having a voice in developing identity for the students. In these settings, through involving in immersive learning environments, the students take more active role in their learning. They engage more in their knowledge construction process rather than receiving information as passive listeners. The use of QA as supportive materials results in enhanced learning of theoretical concepts (Lim, Nonis and Hedberg, 2006). In addition to this, the students can follow their own progresses.

Besides giving them the opportunity to learn about science related issues, the QA project made it possible to learn about real life issues and to see the many dimensions of an environmental problem. In other words, QA lets students experience real-life issues beyond learning about theory. Thanks to the project implemented in QA setting, it is possible to make students responsible for their environments. QA gives opportunity for the students to construct knowledge on the related subject matter. Engaging in inquiry-learning in QA environments, students need to spend effort on their learning process because it is a type of learning that they need to actively participate and solve a multi-dimensional environmental problem. In other words, they need to use their brain. This, in most cases, results in permanent learning. McFarlane, Sparrowhawk & Heald (2002) group the types of learning in game-like settings into three: (1) Students learn through engaging task that include content situated to the game environment, (2) students construct knowledge interacting with the content, and (3) as a result of game activity, students' skills increase. As the authors claim, game-like settings support students in knowledge construction and as they develop skills.

In addition to provide students a visually rich learning environment (Kirriemuir & McFarlane, 2004), MUVEs improve students' imagination and appeal to various senses of them. Providing with visual objects, game-like environments arouse students' imagination and interest (Squier & Jenkins, 2003). Thanks to visual support MUVEs provide, students can keep the subject matter in their minds in a better way. MUVEs also address multiple intelligences.

The results of this study show similarities with other studies. The teachers believe in the effectiveness of these environments. According to their opinions, MUVEs enhance students' skills, such as creative thinking, collaborating (McFarlane, Sparrowhawk & Heald, 2002), scientific thinking (Nelson et al., 2005), analytical thinking, problem solving (McFarlane, Sparrowhawk & Heald, 2002), analysis and synthesis. On the other hand, further research is required in order to see MUVEs benefits to the students' skill developments. These types of projects are helpful in educating students as scientist of future. Integrating MUVEs and computer games in to the existing system can make learning more fun and effective for the students. It also helps students develop computer literacy skills, which is a requirement of our era.

This study was an opportunity to experience learning in a MUVE setting; which may change their opinion about game-like environment as they are not always for fun, rather they can be used as learning environments as well. In fact, students are accustomed to learn from text book. They are supposed to read course books and theoretical knowledge are being taught to them by their teacher. Therefore, learning from game-like environments may turn into a handicap since students are not used to learn through these environments, most of the time. The students may think that computer games are free time activities and they are to have fun not to learn or study. However, the study showed just the opposite. The students gained an idea of the use of game-like environments as part of classroom activities.

**Situated Learning:** The traditional way of learning emphasizes the idea that there is true information out there of the individual and the responsibility of the school is to transfer that information into the heads of the students either from the teachers' heads or from the textbooks. That information is expected to be true in the past because it came in useful; therefore, it needed to be passed through to next generations in order to make them be successful in their lives (Dewey, 1938). In this educational approach teachers and text books had the most important role in transmitting the information and desired skills. As Dewey (1938) stated "books, especially textbooks, are the chief representatives of the lore and wisdom of the past, while teachers are the organs through which pupils are brought into effective connection with the material" (p.3). However, as the time passed, the stereotyped beliefs about learning and teaching have started to change. The importance of learners' individual characteristics and of active participation of the learners has been considered important depending on the educational research studies and on the results they achieved.

Game-like settings are influential as enabling situated learning practices (Shaffer et al., 2005). These environments are relatively new technology-based environments and let teacher provide their students with tools that situate theoretical content (Barab et al., 2007c). These environments let students learn thanks to experiencing abstract issues as real-life problems. Involving in active participation in game-like environments let "develop the situated understanding, effective social practices, powerful identities, shared values, and ways of thinking of important communities of practice" (Shaffer et al., 2005, p. 108).

Students are more able to integrate what they learn through their daily lives as situated learning activities allow them to learn the information in context, so that it is not abstract anymore (Shaffer at al., 2005). It is the context of virtual environments promoting "a sense of embodiment that gave value and meaning" to students actions (Barab et al., 2007c, p. 777). Dewey (1938) also emphasizes the fact that "there is an intimate and necessary relation between the process of actual experience and education" (p.7).

Although it was a virtual experience, the students had a chance to collect data, do water analysis, find out notes and take pictures in Kızılırmak National Park. Game-like environments allow students easily have this experience (Steinkuehler & Squire, 2009). According to the students, learning in QA allows to experience a learning which was like real-life activities. Without going anywhere, they are able to conduct activities in a real-life-like setting. QA provided a simulated environment that allows students experience a problem setting or enroll in a learning activity as if it really occurs in real life.

The main purpose of Kızılırmak National Park was to situate learning of environmental issues (mainly water quality concepts) in a MUVE setting where students were able to investigate an environmental problem (decline in fish population) as if it really occurred. Although presented in a virtual way, the students were able to see how different groups of people reacted to the problem from a different perspective, how the problem affected the natural cycle in a negative way and what kinds of changes occurred within the park due to the problem.

MUVEs can be regarded as computer applications allowing situated learning since they have the "capability to create immersive, extended experiences in the classroom with problems and contexts similar to real world" (Dede et al., 2005b, p. 2). Kızılırmak National Park project, specifically, was an example of situated learning. All the information, that was necessary for the students to understand and solve the problem of fish decline, was situated in the QA virtual environment. In this respect, all the virtual places (e.g. showing the traces of the influences of cutting trees on the river and fish population), materials and items (e.g. books, notes, pictures), and NPCs (thanks to interacting with these characters and getting information about the problem) all served for the students on the purpose of solving the problem. Situated cognition includes "tool use and leveraging off physical affordances" (Bereiter, 1997, p. 298).

Nevertheless, there was a challenge regarding the situatedness of the activity in a learning process. The students may have difficulty in realizing that they are learning about a specific subject matter. In other words, they may not be aware of learning about some issues. Bereiter (1997) also mentioned about this problem by claiming that "the main weakness of situated cognition is its situatedness" (p. 286). Although situating knowledge in a learning environment might be a powerful method in enabling students learn real life issues, this might also turn into a challenge if the transferability problem cannot be overcome. Although motivating, students may have difficulty in transferring knowledge from virtual world to real life. The teacher or any other people using these types of environments, utilizing situated learning, may face with the problem of students' not being able to realize that they have been learning about a specific topic and to transfer that just-learned knowledge to traditional learning settings that still uses test-based evaluation methods, however. At this point, an important role falls over teachers / facilitators who should pay more attention in guiding the students and making them realizing the core issues of the situated-learning material.

Especially within an innovative curriculum that utilizes the properties of constructivist approach, it is important to situate knowledge in the learning activities so that the students can be given the opportunity to see the value and practice of what they have learned in real-life-like situations. As known by most of the people, who used to be a student sometime ago, there are many subject matters in the curriculum that are abstract to the students. Moreover, some of the information learned by the students may not be made sense of some of the times. To put it another way, the students sometimes are not able to understand why they are learning a specific subject matter; which they think that information will never be necessary and it seems, for them, that they will never use it throughout their lives. At this point, therefore, situating knowledge in appropriate learning instances might be a good way of preventing this problem. Moreover, as Brown, Collins and Duguid (1989) asserted that “by ignoring situated nature of cognition, education defeats its own goal of providing usable, robust knowledge” (p. 32). Therefore, educational practices should support situated cognition activities. In other words, situated learning practices should not be ignored by educationalists, teachers, curriculum developers etc. Especially, curriculum developers have been added to this group purposefully considering Turkish educational practices. It is because, in Turkey, in addition to preparing the curriculum, they also plan step-by-step instructions that needed to be followed by the teachers while implementing the curriculum.

As Bereiter (1997) pointed out in the quotation below, the transferability of learning depends heavily on experience. What he meant by this saying it was emphasizing the importance of using learned-knowledge in other contexts.

> The transferability of this learning to ‘knowledge work’ in out-of-school situations is, of course, chancy; but it seems reasonable -to assume that students who have had years of experience in explicitly working with knowledge will have an advantage over ones whose experience had been limited to the traditional kinds of scholastic learning and doing in which knowledge, as such, is seldom the object of attention (p. 298).

Although the students may have difficulty in transferring their knowledge that they learn through a situated learning activity, it will be easier for them when they get used to learn through this method. Unfortunately, although it is a constructivist curriculum, the mostly used materials in schools are text-books. It is not to say that the text-books do not contribute students' learning at all. Rather, considering that it is a constructivist curriculum and the necessity of this era requires more active individuals who are able to use their knowledge effectively in different contexts; therefore, the classroom activities should be designed in a way that students take active role in it. Regarding games and depending on the results they achieved in the studies they conducted, Barab et al. (2007c) express that the use of games in education make students involve in the learning activities and the content more.

**Textbooks vs. Games:** It is a well known issue that the textbooks are widely used in education, specifically in Turkish education. Their advantages (like cheap, convenient, and easy to use) make them the mostly preferred educational materials, it seems. Textbooks were the main educational materials in the past, as they are now; although the educational systems and objectives have been changing. It is not said merely to criticize textbooks, they have also many advantages of usage as known. Rather, the point is that there has emerged a need for a change in educational practices with the changing needs of societies and therefore the educational objectives. However, as the students participated in this study claimed so; the changing educational system and the new curriculum did not change the fact that textbooks are still the mostly used educational materials in our schools. Although the importance of providing students with rich learning contexts and meaningful learning situations have been pointed out by many educational scholars, especially when it is about the constructivist way of learning; the reality in educational practices do not go beyond reading textbooks and writing what the teachers say to notebooks for some of the students. In schools, when the subject matters "are presented without proper grounding in authentic context-of-use, they run the risk of becoming disembodied fact to be memorized without application" (Whitehead, 1929 cited in Barab et al. 2007c, p. 775). Therefore, it is critical, especially in constructivist learning environments, to provide students with learning environments where the subject matters are situated.

Rutherford (2005) points out to science textbooks and comments about the place of science textbook in the education, and criticizes that "science is a grand human adventure, but you would not know it from reading science textbooks" (p. 371). Therefore, engaging the students within rich and meaningful learning contexts helps making them “develop an appreciation for the contextual value of the content while also beginning to identify the relevance of the underlying to-be-learned content when it is situated in other context” (Barab et. al., 2007c, 751).

Barab et al. (2007c) mention about the term “situative embodiment” in their study referring to “leveraging game-design methodologies and technologies to situate the learner and the content” (p. 751). According to them, situative embodiment “involves more than *seeing a concept* or even a context of use; it involves *being in the context* and recognizing the value of concepts as tools useful for understanding and solving problems central to the context in which one is embodied” (p. 751). No doubt, being in the real context where the being-learned-concept to be used would provide for students a great opportunity to make sense of the issues in their minds. Nevertheless, considering the opportunities had in an educational institution, putting students within real context all the time for supporting meaningful learning is not an easy job, especially with large number of students coming from low income families in government schools. Simulations have been known as materials modeling reality which help students realizing how to use their knowledge in real life situations and the reasons why they are learning it (Hertel & Millis, 2002). Having the potential of promoting real life learning, simulations are promising powerful resources especially when it is not possible to put students in a real situations due to several reasons. Experimenting, for example, a dangerous chemical reaction, investigating DNA molecules, moving among the layers of the earth, or playing with the solar system would not be possible for students, most probably, to enroll into in school settings. Simulations either presented in computer environment or not may help teachers and students making meaning on such abstract issues.

#### 5.1.2.3. Opinions on teacher role

Teachers say that they are open to technology, follow the related developments and believe in the effectiveness of technology related applications in classrooms. However, their background on integrating computer and Internet technologies to their classes is not sufficient. If they have opportunity in their school, they try to integrate technology. They like being a teacher in such a learning environment where technology (computers, projector, smart boards etc.) are used. Unfortunately, their most common type of technology-based activities do not go beyond preparing PowerPoint presentations, which usually includes the same content existing in textbook, or preparing and sharing course content with the students through a learning management system.

The success of this type of implementation is very much depended on the teacher. Successful technology-based implementations not only depend on teachers' willingness to do so, but also based very much on their professional skills. The teachers should know their students' skills and needs well. They should also be proficient in their field. Moreover, they should be computer literate, and have enough experience of integration those technologies to their classes. In order to make teacher role easier during computer-based instruction, the implementation should be systematic and well-planned.

Being a teacher in a MUVE is nice experience for the teachers. However, it is at the same time hard with some respects. Teachers should ensure student concentration, control each of them so that they know what each student is doing with the project and help student if they need so. Therefore, it is hard when there is a single teacher in the computer lab when the implantation is conducted with crowded classrooms. Although the cases took place in private school settings where there are approximately 25 students in each class, which is less than most of the government schools, the teacher still mentions about the problem of crowded classrooms. Considering that each student may ask questions, has difficulty with the project, and requires close follow up by the teacher, it would not be wrong to say that the use of MUVEs and computer games are easily applied with less number of students when there is a single teacher in the classroom. If the teacher does not take care of each student, then they can go out of task and may easily dive into fun side of the environments.

It is interesting that one teacher believes in the easiness of being a teacher in the implementations like QA. Since the students work in front of computer screens and the learning is not based on the teacher; the teacher interprets it as an opportunity diminishing her teacher role. However, it is just the opposite. Considering the design and development phase of computer-based applications, applying them in class as facilitator and doing all these considering students' individual needs and developments, it can be said that it is harder than lecturing, for sure. The reason of her perception may be that the researcher took the facilitator position whereas she not contributed to the implementation at all.

Field teachers have limited time to implement the curriculum determined by MoNE. They have a loaded schedule and they have almost no other time in order to do any other type of activity. Even all the activities to be conducted in classes are created by MoNE, so the teachers are in fact not flexible to change the curriculum in practice, even if it is a constructivist one. Regardless of the number of students in classrooms, their individual characteristics, the available conditions, or other needs and requirements, all the teachers need to implement the same curriculum in their classes. As stated before, they have almost no chance to implement a different type of activity in their classrooms. Therefore, the implementation of QA is pretty much affected by limited time available in schools. In the first case, an extra hour (which was actually reserved as extra study time) was added for the implementation; and in the other two cases the project time was arranged according to the time available, which was taken from their available time to implement a technology-based activity in computer labs. School administrators and teachers, who believed in the effectiveness of using MUVEs, are very important in making this arrangement. However, the implementation time, in cases 2 and 3, still could not go beyond three hours spent in computer lab.

In MUVE-based learning settings, as the students' autonomy in the learning setting increases, teachers' role requires a change (Tüzün et al., 2009). The teachers should act as not a lecturer but a facilitator. The teachers should take a facilitator role during the implementation of any type of constructivist learning activity, including QA. In the constructivist curriculum, the teaching methods should go beyond lecturing; however, the students still mention about the same type of activities that was used 20 years ago, when I was a student at elementary school. Even the teachers agree on the idea that lecturing makes students sleep in class, due to the load of theoretical knowledge in the curriculum, teachers still employ lecturing. They also value lecturing method considering that they should teach students.

MUVEs give teacher opportunities to apply a variety of teaching methods. In other words, MUVEs allow enhance teacher's possibility of using some other teaching methods than lecturing. Moreover, MUVEs and computer games allow teachers follow the students' activities while they are working on inquiry-based problems and evaluate their performances (Jenkins, 2002) as these environments have supportive tools: e.g. teacher toolkit in QA.

#### 5.1.2.4. Suggestions for the use of MUVEs

For the use of QA-like settings in formal education, each student should have a computer in class so that the implementation of MUVE and game-like learning environments would be much easier. In other words, it requires good technical conditions. In formal learning settings, the computers are located in computer labs. It requires extra time to take students from their classes to computer lab, make them sit, arrange the class etc. Moreover, when there is a technical problem occurring (such as not working computer or not working mouse), the teacher loses more time from the implementation. Each lesson hour is limited with 40 minutes, and these problems result in time lose. Moreover, the students' lose of their attention and motivation if they sit in front of a computer that has a technical problem. Therefore, the technical conditions should be improved so that the computers do not stuck while working, and should be controlled periodically so that all the student computers work.

Considering that teachers cannot easily adjust class time for technology-based implementations like QA, they can be applied to give homework to the students. However, the use of QA, even as a way of doing homework, requires continuous support for the students, preparing quests and other activities, embedding them to virtual worlds, which still requires extra time than curriculum activities. Moreover, in order to give these activities as homework, all the students should have home computer with Internet access. However, according to 2010 statistics by Turkish Statistical Institute, only 41.6% of households have Internet access at home. More than half of the students do not have access to Internet at home. Therefore, giving MUVE activities as homework do not seem possible considering students in public schools.

Although the teachers agree on the need to implement MUVE in a longer time, the available conditions in schools do not let this. Considering the limited implementation time available in schools, the activity may be minimized as a solution. The reading parts and the overall issues in the activity may be diminished.

Even the studies were conducted in private school settings, the teacher interview result indicated that ensuring classroom management and following up students' progress is so hard in computer-based implementations, with 25 students. Therefore, less number of students in class may make it easier to implement MUVE settings in formal settings.

In order for successful implementation of MUVEs and computer games in formal learning settings, it is important that the teachers should have enough experience regarding the use of these environments. Therefore, teachers should be educated through seminars. After making them computer literate, it is important to make teachers knowledgeable about how to integrate computer and Internet technologies to their classes. Moreover, they should be educated so that they can use these technologies in an effective way; they should be able to do more than preparing presentations. Besides this, they should always be provided with technical support throughout the implementation process. Thomas (2004) also emphasizes the importance of teacher support during the implementation of MUVEs in formal educational settings.

The implementations in informal learning settings seem easier and more flexible. Therefore, another possible way of implementing MUVE activities in formal learning settings can be constructing student interest groups and working with the students who are interested in a specific subject area. As the extracurricular type of learning activity, the students may enroll in similar activities. Accordingly, the activities would not be limited with the available limited time allocated for field teachers, and also it can be performed by the students throughout a semester or two.

### 5.1.3. Challenges

Although the use of MUVEs and games in educational setting may have contributions to the learning process and the students, there are challenges to be overcome while doing such and implementation, in either formal or informal learning settings. Making a review of literature on this topic, Kirriemuir and McFarlane (2004) come up with a similar conclusion; that is the use of games, especially those of commercial ones, is really a challenging process. Although there emerge challenges in informal learning context, more challenges are faced in formal learning settings (Kirriemuir & McFarlane, 2004).

MUVEs and computer games can be used in either formal or informal learning settings, especially if they are designed on educational purposes. Nevertheless, there are challenges that can turn into be a struggle in using these environments for supporting students' learning activities. As the innovative learning environments, during the implementation of MUVEs and computer games, it is possible to face with many challenges, most of which are not under designers' control (Van den Akker, 1994).

#### 5.1.3.1. Teacher Related Challenges

**Teacher load:** Teachers are full of curricular stuff, as well as many other responsibilities their school administrators give to them. They have difficulty in making extra activities with their students, if they really want to do so. Implementing a MUVE or computer game in formal education, the teachers need to spend time before the implementation to get prepared, to arrange the activities, to design and develop the materials (if not prepared by any other person), to arrange the learning settings, and to prepare the students. These types of implementations require more effort for the teachers in order to better provide students with effective learning activities; they should spend extra time and effort. Although the results of this study indicate that the use of game like environments in classrooms causes additional load to the teachers' schedule, there are other studies claiming just the opposite. That is the use of these environments reduces the load of teachers (Allen et al., 1982, cited in Dempsey et al., 1996).

The teachers have very limited time remaining after all other responsibilities, if it remains at all. In the current study, the teachers could not allocate time even to investigate the project as a whole and walk in the 3D environment by themselves, although the researcher tried to make them do it. According to Atkinson (2009) "using open-ended virtual spaces can be challenging and time consuming for teachers" (p. 23). McFarlane, Sparrowhawk and Heald (2002) also point out the same issue and say that complex game environments are more challenging for the teachers since they require teachers spend more time and effort on understanding the environment and its infrastructure. As they also state “the more complex games are, the greater the need for mote teacher preparation” (p. 16). Kirriemuir and McFarlane (2004) also mention about the same issue, which is that time is a serious obstacle for the teachers to play the game and get familiar with it. Therefore, teacher load seems a serious barrier of these implementations. Through increasing the number of teachers in schools, their daily course hours may be diminished, and therefore, they can work more on extra activities like QA for their students. Another solution would be to lessen their task and curricular loads.

**Classroom Management:** Good classroom management methods are required in order for a better and peaceful learning environment. The use of game-like environments for educational purposes challenges classroom management issue. It is even more challenging with the use of complex environments (McFarlane, Sparrowhawk & Heald, 2002), like QA. It is so likely that the students may easily dive into gaming rather than conducting educational tasks. It is nice to increase their interest through game-like environments; however, the use of fun elements should be decided well. There is a fine line between combining fun elements with educational content. It is because the students may lose focus due to those elements. The students may lose attention due to any interesting or fun object they face while trying to find a quest, for example (Lim, Nonis & Hedberg, 2006). Regarding QA, the existence of cars in the virtual environment, for example, may dissuade students from doing educational activities, and may pull their attention to racing each other. Therefore, each item in the environment should carefully be planned and placed.

Moreover, the computer lab environments make it more challenging for the teacher to manage the classroom well and to control the students. As Kirriemuir and McFarlane (2004) point out teachers have many responsibilities in game-like settings as ensure classroom management. The students are sitting in front of computer monitors, and it is almost not possible to see each student screen at the same time. The students may be interested in something else rather than doing the class activities, if their monitor is invisible to the teacher. The teachers should ensure classroom management so that the students’ interests do not go away due to charm of play or any other fun element exists in computer and the Internet. In order to overcome this challenge, monitoring software may be utilized; therefore, the teacher can easily follow what each student is doing.

**Being Inexperienced on Technology Use:** Even in private schools that values technology use in education, the teachers' experiences and skills on using and on integrating computer and Internet technologies to their lessons are limited. They use computer technologies in order to visualize content most of the time using presentations. Although the young generation of teachers has taken computer-aided instruction classes during undergrad education and all the teachers attend to seminars including computer literacy workshops, the teachers are still not very competent in this respect. Even if the teachers are computer literate, this does not mean that they effectively integrate computer technologies to their classes.

Computer-based instruction is relatively new in Turkish education system. Excluding the teachers who participated in research projects using MUVEs and computer games, it would not be wrong to say that teachers never used this type of environments at all. It is not only innovative for the students, but also for the teacher. Teachers' making this type of implementations and integrating these technologies to their classes on their own records does not seem easy yet. As Shaffer et al. (2005) assert "even if we had the world's best educational games produced and ready for parents, teachers, and students to buy and play, it's not clear that most educators or schools would know what to do with them" (p. 110). As being non-game players most of the teacher are not aware of these technologies. Moreover, the teachers who play the game do not have adequate experience and knowledge of integrating these technologies to their classrooms, as they think games are not for education but to have fun.

#### 5.1.3.2. Student Related Issues

**Attendance:** When time is limited, it is too hard to repeat the activities one more time. The students can miss a different activity type or a new attribute just introduced when they are absent. If they do not have a home computer or Internet access, this may turn into a challenge. Therefore, it is an important challenge to provide with student attendance during the project, especially if it is a short-one. The teachers should be able to create other opportunities for those who cannot participate any implementation session. Considering the difficulty of doing these implementations, it seems as a big challenge to provide with extra opportunities, however. In addition to the school, the activities can be done by the students at home. However, other challenges may be faced with accordingly. If the students have a chance to use the MUVE/computer game at home, they should be supported with guidance either through online teacher support or any detailed type of guiding material. Due to the activities they have to be with their friends (such as going on a visit) or the ban their parents imposed on using the computer, the students may not always be possible during the implementation. In fact, as stated before, more than half of the students in the country do not have access to Internet at home. Therefore, these activities are more challenging than the use of other materials, like textbooks.

**Parents:** The results indicate that how important are the parents for the educational practices, even if they are not directly present in the learning context. QA is a game like environment and unfortunately, for some parents, computer games are bad type of activities restraining their children from studying their homework or SBS, although this cannot be generalized. Turkle (1984) assert that parents want the best for the development of their children; however this changes when it is about computer games. Their existing attitude and belief towards computer games make them act as opponents. In order to prevent the ban by the parents regarding computer use or game playing activities, they should be informed about any type of implementation using MUVEs. It is because when the parents say their child "turn the computer down and do your homework", what their child say like "I am studying" will not convince them most probably.

In informal learning settings, the parents may also challenge the learning activity in a different way. They can make students give up attending the organizations due to several reasons, such as family related issues.

**Disinterest:** The students may show disinterest toward MUVE applications. It is in fact not because they do not like those environments; rather due to some other reasons, as the study indicates. The students like the environment even if they do not want to complete the project. When the students feel that the activity is an extracurricular activity, not a part of their classroom activities, and put into their classroom for research purposes, they show disinterest. Being selected as a study group also causes students decreasing their interests. Moreover, students know it will not last for long time, and then they will not use the environment in their classes anymore. These types of reasons influenced some of the students in formal educational settings, so that they did not want to participate in the project.

The results of this study indicate that, in formal learning settings, some of the students care being graded of an activity they put effort on. However, Tüzün et al. (2009) mention about an opposing condition depending on the study they conduct: according to them students had “decreased focus on getting grades” (p. 74).

Considering the worksheets used in Kızılırmak Park project, there were students complaining about the thickness of it. As one of the teachers claimed, the project was over for some students at that point when they first saw it; it is because they thought that they would not be able to finish it and it required too much work and too much reading and writing activity, which is not fun for them. In informal learning setting this challenge can easily be overcome as time is enough for the implementation and for completing the project. Moreover, the students feel more successful when they see that they can finish a loaded and complex project. However, in formal learning settings, this turns to be a big challenge. When the students give up doing or lose their motivation, then it is hard to motivate them again. Also, the time is so limited and there is no opportunity to increase it. Therefore, students may lose their interests.

Student disinterest towards the projects may also result from their high focus on gaming activities as they use a game-like environment. Therefore, in order to overcome this challenge teachers ensure classroom management well. They should make intervention “to get students back on course to engage in the learning task” (Lim, Nonis & Hedberg, 2006).

Nelson and Ketelhut (2007) claim that the use of MUVEs in informal learning settings results in low level of student engagement most of the time. However, in the current study, most of the students in the informal learning settings were highly engaged to the learning activity.

#### 5.1.3.3. System Related Issues

**Time:** In informal learning settings, the educators may be more flexible in arranging different type of activities and planning the implementation time since there is no strict curriculum available. However, in formal learning settings it is just the opposite. Arranging time for classroom activities rather than the curricular ones is a challenging issue. It is hard for the teachers as they do not have enough time in setting up these activities. They may spend fewer hours in teaching the same subject with a different type of activity in class (Lim, Nonis & Hedberg, 2006). It is even harder for field teachers to arrange time for technology-based activities to be applied in computer labs. Computer labs are more like places owned by computer teachers. The schedule of computer labs is almost full with computer literacy classes, already. Therefore, very limited time is remaining for computer-based activities of field teachers. Besides this, the teachers have difficulty in allocating time for computer-based activities due to the curricular load.

Kirriemuir and McFarlane (2004) assert that time that the teachers and the students spend on getting familiar with the games is a challenge. The study resulted in same issues, too. As innovative learning environments, students and teachers need to spend time on the environment before the exact implementation starts. These orientations sessions are so important that students and teachers use the environment more effectively when they are used to it. However, it also creates challenges as time is so restricted in formal learning environments.

Another challenge related with time issue in formal learning settings includes the class hours. Each lesson takes 40 minutes, and as MUVE implementations take place in computer lab, it causes losing time to take students there, control attendance, and make students be ready for the activity. The lesson time is already restricted and time allocated for MUVE implementations is already limited; therefore, time is a challenging issue in formal learning settings.

**Curriculum:** Turkish elementary education curriculum is so strictly planned that the teachers are almost not able to do something else than curricular studies. Regardless of students' individual differences, their skills, characteristics, needs and requirements and regardless of available conditions, the teachers are supposed to implement the same curriculum since each single activity has also been prepared by BoE. The teachers are also given teacher books that are like cook-books as showing each single step to be followed. It is a big contradiction of new curriculum. Lim, Nonis and Hedberg (2006) mention about the same challenge as they faced in QA mediated lessons in a primary school in Singapore, where the teachers have a loaded curriculum that they need to complete throughout the educational year.

The new curriculum seems to be open to technology-based innovations as depending on constructivist approach when compared to the previous one. However, making such implementations is, at the same time, still a struggle due to including many activities supposed to be conducted within the educational year. Teachers are not comfortable in changing the curriculum and adding more activities to it.

There are activities within the scope of new curriculums that has been added in order to allow students make practices. Therefore, computer-based implementations can be conducted as student support activities. Nevertheless, the curriculum has been prepared in such a way that it is too loaded and every single activity to be done by teachers is already provided. Therefore, if there is to be an extra activity, it should be very short one since there is almost no time remaining from other curricular events. Even if the teachers are willing to use game-like environments, or any other computer-based application, they are pretty much bound to curriculum. In other words, they have to complete the curricular activities first. Considering the curriculum load and the time available, it is possible to say that the curriculum load is challenging for the teachers who want to make extracurricular activities similar to QA.

Although the curriculum is a new one, in order to make it flexible for the teachers and the students, it needs a change. The teachers should be provided with a more flexible curriculum so that they can make arrangements according to their students, and they can do different types of activities to support students' learning, including the use of MUVEs. According to Barab, Ingram-Goble and Warren (2009) "meaningful curriculum can be designed that sits at the intersections of real and fantasy, or of mandatory and voluntary participation, or of working and playing" (p. 991).

**SBS*:*** In the first chapter of this dissertation, it was explained that Turkish curriculum was re-established based on constructivist approach. Nevertheless, there are standardized exams applied in order to place elementary school students to higher education institutions (such as Anatolian high school). The exam is called as SBS. The exam used to be applied after 6$^{th}$, 7$^{th}$ and 8$^{th}$ grades while the studies had been conducted. Then, the exam structure was changed; and it was applied only after $8^{th}$ grade. Then, after the final change, currently the students take the exam after $7^{th}$ and $8^{th}$ grade.

The case studies implemented in school contexts showed that it was a big challenge to employ QA like educational materials in formal learning contexts due to the standardized test, SBS, which required students to learn merely curriculum content and to focus mainly on the issues situated in their course books. Unfortunately, rather than being interested in learning the subject matter, the students seemed they paid more attention on tests and spent more effort to increase their test-achievement-skills in order to be successful in the exam.

The students very much focus on SBS exam that they may not want to do extra activities than the information existing in their books. QA like activities are not a part of curriculum yet, therefore, they are extra-curricular for the students. Therefore, the students, who value SBS exam much, may not want to be included in these activities, considering they are losing their time for studying SBS. They may feel uncomfortable considering that it is a game environment and will retain them from studying. Therefore, it is important for the teachers to motivate these students toward game-like learning activities, as they are not used to learn through these materials yet. In order to ensure this, they should believe in these activities and regard them as the necessary activities for the students' learning. This may be through a system change in the current educational system.

#### 5.1.3.4. Technology Related Issues

It is apparent that as QA runs on computer and uses Internet access, the technical deficiencies may pose problem when this innovative implementation is to be wanted. Other researchers point out the same potential of implementation challenges (for example Thomas, 2004). Besides designing and developing a MUVE according to the needs for students' learning, which actually needs a great effort and time, preparing the learning environment for the implementation is also a challenging part (Tüzün, 2007). Installing the software to computers, creating student accounts, ensuring the operating factors of the computers, trying to support computers with ups devices etc. are all among the technical related issues to be considered for the implementation of computer-based innovations.

**Deficient Lab Conditions:** In most cases, the number of students is more than the number of computers in formal educational settings. It is possible to arrange number of students in informal learning settings; however, such an adjustment is not possible in formal learning settings. All the students need to be given the same opportunity in the learning environment, and each of them should be able to use a computer in a QA like setting. They may be collaborative activities that allow students to share the same computer. Nevertheless, it may not be the case all the time considering the importance of individual studies as well. Also, MUVEs allow for student collaboration even if the students use different computers. However, students do not like sharing the same computer with their friends while using MUVE setting. They argue each other easily and get bored while it is the peer's turn. Therefore, there should be enough number of computers in the lab so that each student is able to use one. This is also an important factor affecting classroom management.

Besides enough number of computers, the capacity of them and the Internet speed are other challenges. If these issues are not well in quality, it is hard to run MUVE environments which employ visual objectives and require time to upload. In order for electricity cut, there should be UPS devices in the computer labs. When the electricity is cut, the Internet connection is lost or the computer stop running; and then the students easily lose attention and motivation. Moreover, the planned activity cannot be implemented, too. Good technological infrastructure is needed so that there is no time lost on uploading and downloading materials and objects, and no problem had while using the MUVE or computer game environment.

**Characteristics of MUVE / Game:** When the interface is in another language other than students' mother language, there may be problems emerge. Even if the activities are prepared in Turkish, the students need to interact with the interface in order to do some activities (teleporting, uploading their works, or changing the view angle). In the first case study, the students had to interact with QA interface in order to upload their works. However, the interface was in English and the students had difficulty in uploading their works. Even after two weeks, there were students having difficulty with doing the same thing. In another study by Lim, Nonis and Hedberg (2006) QA was used in a formal learning setting in Singapore in order to investigate students' engagement levels. Their study also shows that students' inability in understanding the language of setting result in low level of engagement. Therefore, it is better to use such environments using students' mother language.

## 5.2. Conclusions

This research investigated the use of MUVEs in formal and informal learning settings. The results showed how MUVEs and computer games might be beneficial in terms of increasing student motivation and their active engagement within the learning process, and how positively they have influences on students' learning. Students are self-motivated towards learning through game-like environments. They liked QA, showed interest learning through it, and moreover they learned as engaging learning activities embedded in QA.

The teachers also find game-like environments motivating and useful for students' learning. They also think that MUVEs enhance student skills like problem-solving, science-literacy, critical thinking etc. However, they have difficulty in facilitating the activities themselves due to not having experienced on the use of MUVEs and time related problems. Teachers' schedules are too loaded with curricular activities that they hardly arrange time for MUVE implementations.

The use of MUVEs in informal settings is much easier since these environments are more flexible than formal learning settings. The students show high level of interest towards QA as an innovative environment. The issue of scaffolding and facilitating the activities are so important, at least as they are in formal learning settings, since the students can easily lose attention to learning activities.

Either in formal or informal learning settings, during the implementation of MUVEs, there are many types of challenges influencing the implementations. The challenges can be grouped under four main categories: (1) student related, (2) teacher related, (3) system related, and (4) technology related. The educators or teachers should plan these activities considering any type of challenge possibly occurs.

## 5.3. Implications for Practice

This study showed the positive perception of the students towards learning in a MUVE. Moreover, the results showed how a MUVE/game setting is used as a supportive material to constructivist way of learning; the power of these environments on student development. Therefore, educators, teachers, instructional designers may benefit from the results of this study developing similar learning activities.

This study has implications on motivating students during the learning process taking place either in formal or informal learning settings. In addition to the use of the results of this study in using MUVEs as motivating learning environments, the results might be used to plan and arrange other learning activities including common characteristics that the students like. As the results of this study indicate that students like to experience learning and gaming together, they may be provided with other similar activities.

MUVEs and computer games have the potential as learning environments when carefully planned, integrated and managed during the process. The results of this study indicated what teachers and students might face with in terms of reactions, barriers, and challenges, as well as good practice principles. There are many issues influencing the implementation process. Therefore, teachers or educators may think about these issues while planning to use a MUVE or computer game for supporting students' learning. It is not as easy as using textbooks in class; rather it requires a detailed and well-planned process considering what may happen. Management issues are of vital importance in a learning environment where MUVEs or computer games are used, since students may lose interest from the learning content and may dive into playing more easily.

The use of MUVEs may not be suitable for all the students. Therefore the individual differences should be considered by teachers/educators. It is well known that, especially in constructivist learning settings, students have individual differences which affect their knowledge construction. MUVEs can be provided as alternative learning methods.

The results of this study may provide as good practice of technology use in formal learning settings. Although it is a case study, it shows how teachers have struggle when they want to implement activities of MUVEs. Even though the cases in formal learning settings took place in private schools which value the use of computers by teachers, the teachers could not be very successful enough in using it. Although the teachers believe in the effectiveness of similar applications, they have almost no time for trying to learn innovative learning environments.

Moreover, this is a process not only influenced by students, teachers, technical infrastructure; it is also affected by parents as they either allow their children spend time in front of a computer and playing a game.

### 5.4. Suggestions for Further Research

This study investigated the use of MUVEs in formal and informal learning settings. It provides with a foundation for the scholars and researchers interested in the games and MUVEs. Since this study had limitations, some other studies overcoming those limitations may shed more light to the use of games-like environments in education. Therefore, in this section of the dissertation, suggestions for future research studies are given below based on the results found and discussions made.

- To begin with, this research included four case studies conducted in two private schools and one NGO. Although the results of the study may shed light on the implementation of QA, MUVE and games in general, in learning settings, studies to be conducted in other contexts may give further results.
- Secondly, it was a single type of MUVE, QA, which was utilized in the scope of this study. The use of other MUVEs may provide with other results, as well.
- Students' and teachers' opinions about students' learning were gathered through interviews. However, this study did not aim to investigate students' learning and achievement scores, measured through achievement test, they had using the MUVE, QA. In fact, there was a reason behind omitting that: it was a constructivist learning environment and students had already been presenting their work through their worksheets and their opinions in

discussions. It was not aimed to grade students' works. Moreover, the time within which this study was conducted was not suitable for that kind of investigation. Therefore, the use of examination was not interested in the scope of this research. However, the use of games and MUVEs as a way of assessment, or maybe, as a factor of increasing (or not) student achievement may be another research interest and may provide with different valuable results for the field.

- In school cases, due to reasons of teacher load, curriculum load and time deficiencies; the research period was short when compared to the studies conducted in NGO settings. In other words, the available conditions in the formal learning environments did not allow the researcher to make, for example, research which uses the same environment throughout the whole semester/educational year as a supportive tool for different types of classroom activities. Maybe, this would be difficult process since the design part (the design and development of the virtual worlds) takes time and is not an easy process. However, this type of research would give more reliable results on student motivation. In fact, the students were introduced with QA as earlier as possible to overcome innovation effect. Nevertheless, it was still a single type of activity that the students participated in. On the other hand, investigating students' and teachers' perceptions using of the same environment with a variety of learning activities for different subject matters may give additional results.

- This study attempted to make a case study in a government school. However, due to the firewall system which is managed by the MoNE, it could not be executed. As QA uses Internet resources and utilizes the objects stored in an online server, the firewall did not allow the program to be run. Interaction with the official people responsible from this networking system, however, did not result in any solution to the problem. If a possible solution to this problem is found, then the use of QA in public schools may provide interesting results. If the study was done, the students had been using QA as peers; two students using a single computer. Moreover, since there are more students in the classes, and there are less number of and lower-capacity computers in computer labs, there may emerge different results of challenges and other implementation issues depending on many social and other dimensions the government schools have.

- The case studies of this study were conducted in science and social science areas. Making research (such as math, language) in other subject areas may provide differing results.
- The teachers participated in this study was not able to take the facilitator role in the implementation. They, somehow, could not find to login QA and spend time in the learning environment used in the implementation. They had a loaded schedule, but it was their class where the implementations were done. Therefore, as being the teacher of the classroom, taking more active role in the implementation process may result in different implementation issues. Similar studies can be conducted with other teachers who are more technology literate and willing to use computer technologies, games and MUVEs in their classrooms and who have time for this implementation.
- The teachers said that it would be easier to implement the project if it was an activity designed and submitted by MoNE as part of the curriculum. Making large-scope of research design, working with MoNE for the implementation and integrating the project as part of the curriculum may be another extensive research study.

# REFERENCES

Airasian, P. W. & Walsh, M. E. (1997). Constructivist cautions. *Phi Delta Kappan,78,* 444-449.

Allen, J. P., Chatelier, P., Clark, H. J., & Sorenson, R. (1982). Behavioral science in military: Research trends for the eighties. *Professional Psychology, 13,* 918-929.

Amory, A., Naicker, K., Vincent, J., & Adams, C. (1999). The use of computer games as an educational tool: Identification of appropriate game types and game elements. *British Journal of Educational Technology, 30(4),* 311-321.

Anderson, J. L. (2008). *The kids got game: Computer/video games, gender and learning outcomes in science classrooms*. Unpublished doctoral dissertation, Boston College, Boston.

Antonacci, D. M. & Modaress, N. (2008). Envisioning the educational possibilities of user-created virtual worlds. *AACE Journal, 16(2),* 115-126.

Arici, A. D. (2008). *Meeting kids at their own game: A comparison of learning and engagement in traditional and 3D MUVE educational-gaming contexts.* Unpublished doctoral dissertation, Indiana University, Bloomington.

Atkinson, T. (2009). Second Life for educators: Instructional resources. *TechTrends, 53(4),* 23-25.

Bakar, A., İnal. Y. & Çağıltay, K. (2006a). *Use of commercial games for educational purposes: Will today's teacher candidates use them in the future?* Paper presented at the meeting of World Conference on Educational Multimedia, Hypermedia & Telecommunications - ED-MEDIA, Orlando, FL – USA.

Bakar, A., İnal. Y. & Çağıltay, K. (2006b*). Interaction patterns of children while playing computer games.* Paper presented at the meeting of World Conference on Educational Multimedia, Hypermedia & Telecommunications - ED-MEDIA, Orlando, FL – USA.

Bakar, A., Tüzün, H., & Çağıltay, K. (2008). Öğrencilerin eğitsel bilgisayar oyunu kullanımına ilişkin algıları: Sosyal bilgiler dersi örneği. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 35,* 27-37.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84(2),* 191-215.

Barab, S., Arici, A., & Jackson, C. (2005). Eat your vegetables and do your homework: A design-based investigation of enjoyment and meaning in learning. *Educational Technology, 65(1),* 15-21.

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

Barab, S., Sadler, T. D., Heiselt, C., Hickey, D., & Zuiker, S. (2007a). Relating narrative, inquiry, and inscriptions: Supporting consequential play. *Journal of Science Education and Technology, 16 (1),* 59-82.

Barab, S., Dodge, T., Tuzun, H., Job-Sluder, K., Jackson, C., Arici, A., Job-Sluder, L., Carteaux Jr., R., Gilbertson, J., & Heiselt, C. (2007b). The Quest Atlantis project: A socially-responsive play space for learning. In B. E. Shelton & D. A. Wiley (Eds.), *The educational design and use of simulation computer games*. Rotterdam, The Netherlands: Sense Publishers. 159-186.

Barab, S., Zuiker, S., Warren, S., Hickey, D., Ingram-Goble, A., Kwon, E. J., Kouper, I., & Herring, S. C. (2007c). Situationally embodied curriculum: Relating formalisms and contexts, *Science Education, 91(5),* 750-782.

Barab, S., Dodge, T., Tuzun, H., Job-Sluder, K., Jackson, C., Arici, A., Job-Sluder, L., Carteaux Jr., R., Gilbertson, J. & Heiselt, C. (2007). 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.* Rotterdam, The Netherlands: Sense Publishers.

Barab, S., Gresalfi, M. & Arici, A. (2009). Why educators should care about games. *Educational Leadership, 67(1),* 76-80.

Barab, S., Ingram-Goble, A., & Warren, S. (2009). Conceptual Play Spaces. In R.Ferdig (Ed.) Handbook on Research on Effective Electronic Gaming in Education (Volume III). New York: IGI Global.pp. 989-1009.

Barab, S. A., Gresalfi, M., Dodge, T., & Ingram-Goble, A. (2010). Narratizing disciplines and disciplinizing narratives: Games as 21st-century curriculum. *International Journal for Gaming and Computer Mediated Simulations, 2(1),* 17–30.

Bassey, M. (1999). *Case study research in educational settings.* Buckingham: Open University Press.

Bayırtepe, E. & Tüzün, H. (2007). Oyu-tabanlı öğrenme ortamlarının öğrencilerin bilgisayar dersindeki başarıları ve öz-yeterlik algıları üzerine etkileri. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 33,* 41-54.

Bensley, L. & VanEenwyk, J. (2000). *Video games and real-life aggression: A review of the literature.* Olympia, WA: Washington State Department of Health Office of Epidemiology.

Bereiter, C. (1997). Situated cognition and how to overcome it. In D. Kirshner & J. A. Whitson (Eds.) Situated cognition: Social, semiotic, and psychological perspectives. Hillsdale, NJ: Erlbaum. 281-300.

Best, J. W. & Kahn, J. V. (1993). *Research in education*. Boston: Allyn & Bacon.

Board of Education (2005). Curriculum Development Studies by Board of Education (Talim Terbiye Kurulu Program Geliştirme Çalışmaları). Retrieved October 13, 2009, from http://ttkb.meb.gov.tr/programlar/prog_giris/prg_giris.pdf

Bodner, G. M. (1986). Constructivism: A theory of knowledge. *Journal of Chemical Education, 63(10),* 873-878.

Bowman, R.F. (1982). A Pac-Man theory of motivation. Tactical implications for classroom instruction. *Educational Technology 22(9)*, 14-17.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18(1)*, 32-42.

Byrne, P. (1999). *Intrinsic motivation in the computer science classroom*. Galway, National University of Ireland. Retrieved July, 04, 2011 from www2.it.nuigalway.ie/publications/TR/abstracts/pb.ps

Burguillo, J. C. (2010). Using game theory and competition-based learning to stimulate student motivation and performance. *Computers & Education, 55(2)*, 566-575.

Chen, J. X., Yang, Y., Loftin, B. (2003). *MUVEES: A PC-based multi-user virtual environment for learning.* In proceedings of the IEEE Virtual Reality 2003 (VR'03). IEEE Computer Society Press: New York. April 2003, 163-170.

Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research*, *53(4)*, 445-459.

Cobb, P. (1994). Where is the mind? Constructivist and sociocultural perspectives on mathematical development. *Educational Researcher*, *23(7)*, 13-20.

Cole, M. (1996). *Cultural psychology: A once and future discipline.* Cambridge, MA: Harvard University Press.

Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: SAGE Publications Inc.

Creswell, J. W. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research (3rd ed.).* New Jersey: Pearson Education, Inc.

Damer, B. (1997). Inhabited virtual worlds: A new frontier for interaction design. *SIGGROUP Bulletin, 18(2),* 21-26.

Dede, D., Ketelhut, D. & Ruess, K. (2002). *Designing for motivation and usability in a museum-based multi-user virtual environment.* Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, CA.

Dede, C., & Ketelhut, D. J. (2003). *Designing for motivation and usability in a museum-based multi-user virtual environment.* Paper presented at the American Educational Research Association Conference, Chicago, IL.

Dede, C., Clarke, J., Ketelhut, D. J., Nelson, B., & Bowman, C. (2005a). *Fostering motivation, learning, and transfer in multi-user virtual environments.* Paper presented at the American Educational Research Association Conference, Montreal, Canada.

Dede, C., Clarke, J., Ketelhut, D. J., Nelson, N., & Bowman, C. (2005b). *Students' motivation and learning of science in a multi-user virtual environment.* Paper presented at the American Educational Research Association Conference, Montreal, Canada.

Dempsey, J. V., Lucassen, B. A., Haynes, L. L. & Casey, M. S. (1996). *Instructional applications of computer games.* Paper presented at the 1996 annual meeting of American Educational Research Association, New York City.

Dewey, J. (1938). *Experience and education.* The Kappa Delta Pi, USA.

Dickey, M. D. (2005). 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.

Driscoll, M. P. (2005). *Psychology of learning for instruction.* Boston: Allyn&Bacon.

Duffy, T. M. & Cunningham, D. J. (1996). Constructivism: Implications for the design and delivery of instruction. In David H. Jonassen (Ed.), *Handbook of research for educational communications and technology.* New York: Simon & Schuster Macmillan, 170-198.

Ertmer, P. & Newby, T. J. (1993). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly, 6(4),* 50-71.

Feldman, L. (2006). *Case study: Camp Global Kids: A case study of bringing a global youth development model into teen second life.* In proceedings of Second Life education workshop at the Second Life community convention, D. Livingston & J. Kemp (Eds.), San Francisco, 11.

Feng, K.C., Chang, B., Lai, C.H., & Chan, T.W. (2005). *Joyce: A multi-player game on one-on-one digital classroom environment for practicing fractions.* In proceeding of the Fifth IEEE International Conference on Advance Learning Technologies (ICALT'05), July 2005, 543-544.

Fraenkel, J. R. & Wallen, N. E. (2003). *How to design and evaluate research in education.* New York: McGraw -Hill Company.

Fontana, A. & Frey, J. H. (1994). Interviewing: The art of science. In Norman K. Denzin & Yvonna, S. Lincoln (Eds.) *Handbook of qualitative research* (pp. 361-376). Thousand Oaks, CA: SAGE Publications Inc.

Gall, M. D., Gall, J. P. & Borg, W. R. (2003). *Educational research: An introduction.* Boston, MA: Pearson Education Inc.

Gillham, B. (2000). *Case study research methods*. London: Continuum.

Gredler, M. E. (2004). Games and simulations and their relationships to learning. In D. H. Jonassen, (2nd Ed) *Handbook of research on educational communications and technology*. Mahwah, NJ: Lawrence Erlbaum. 571-581.

Harris, A. L. & Rea, A. (2009). Web 2.0 and virtual world technologies: A growing impact on IS education. *Journal of Information Systems Education, 20(2),* 137-144.

Hertel, J. P. & Millis B. J. (2002). *Using simulations to promote learning in higher education: An introduction.* Stylus Publishing, LLC: USA.

Jarmon, L., Traphagan, T., Mayrath, M. & Trivedi, A. (2009). Virtual world teaching, experiential learning, and assessment: An interdisciplinary communication course in Second Life. *Computers & Education, 53,* 169-182.

Jenkins, H. (2002). Game theory: How should we teach kids Newtonian physics? Simple. Play computer games. *Technology review.* MIT Retrieved July, 04, 2011 from http://www.tehnologyreview.com/energy/12784/

Johnson, B. & Christensen, L. (2004). *Educational research: Quantitative, qualitative, and mixed approaches*. Boston, MA: Pearson Education Inc.

Jonassen, D. H., Peck, K. L. & Wilson B. G. (1999). *Learning with technology: A constructivist perspective.* Prentice Hall, Inc., NJ.

Jordan, B. & Henderson, A. (1995). Interation analysis: Foundations and practice. *The Journal of the Learning Sciences, 4(1),* 39-103.

Kang, S. (2004). Instructional design and development: A brief historical overview. *Educational Technology, 44(6),* 39-45.

Kalyuga, S. (2007). Enhancing instructional efficiency of interactive e-learning environments: A cognitive load perspective. *Educational Psychology Review, 19,* 387-399

Kaplan-Akilli, G. (2007). Games and simulations: A new approach to in education? Ch-1 In D. Gibson, C. Aldrich, & M. Prensky (Eds.). *Games and simulations in online learning: Research and development frameworks.* Hershey, USA: Information Science Publishing. 1-20.

Ketelhut, D. J. (2007). The impact of student self-efficacy on scientific inquiry skills: An exploratory investigation in River City, a multi-user virtual environment. *Journal of Science Education and Technology, 16(1),* 99-111.

Ketelhut, D. J., Dede, C., Clarke, J., & Nelson, B. (2006). *A multi-user virtual environment for building higher order inquiry skills in science.* Paper presented at the American Educational Research Association, San Francisco, CA.

Ketelhut, D. J., Clarke, J., Dede, C., Nelson, B., & Bowman, C. (2005). *Inquiry teaching for depth and coverage via multi-user virtual environments.* Paper presented at the National Association for Research in Science Teaching, Dallas, TX.

Kirriemuir, J. (2002). Video gaming, education and digital learning technologies. *D-Lib Magazine, 8(2),* Retrieved July, 04, 2001 from http://www.dlib.org/dlib/february02/kirriemuir/02kirriemuir.html

Kirriemuir, J. & McFarlane, A. (2004). *Literature review in games and learning*. NESTA Future Lab Series – Report 8. Retrieved from http://archive.futurelab.org.uk/resources/documents/lit_reviews/Games_Review.pdf

Koç, Y., Işıksal, M., & Bulut, S. (2007). Elementary school curriculum reform in Turkey. *International Education Journal, 8(1)*, 30-39.

Krendl, K. A. & Broihier, M. (1991). *Student responses to computers: A longitudinal study.* Paper presented at the Annual Meeting of the International Communication Association. Chicago, IL – May 23 – 27, 1991.

Larochelle, M. & Bednarz, N. (1998). Constructivism and education: beyond epistemological correctness. Ch1 In Marie Larochelle, Nadine Bednarz and Jim Garrison (Ed.) *Constructivism and education*. Cambridge University Press. 3-20.

Lim, C. P., Nonis, D. & Hedberg, J. (2006). Gaming in a 3D multiuser virtual environment: Engaging students in Science lessons. *British Journal of Educational Technology, 37(2),* 211-231.

Liu, C. (2006). *Second Life Learning Community: A peer-based approach to involving more faculty members in Second Life.* In proceedings of Second Life education workshop at the Second Life community convention, D. Livingston & J. Kemp (Eds.), San Francisco, 6-10.

Lowther, D. L., Inan, F. A., Strahl, J. D., & Ross, S. M. (2008). Does technology integration "work" when key barriers are removed? *Educational Media International, 45(3),* 195-213.

Ludgate, H. C. (2008). *Inside curriculum-embedded virtual worlds: Collaborative dialogue in Quest Atlantis.* Unpublished doctoral dissertation, Pepperdine University, Malibu.

Malone, T. W. (1980). *What makes things fun to learn? Heuristics for designing instructional computer games.* Paper presented at the Joint Symposium: Association for Computing Machinery Special Interest Group on Small Computers and Special Interest Group on Personal Computers, Palo Alto, CA.

Malone, T. W. & Lepper, M. R. (1987). Making learning fun: A taxonomy of intrinsic motivations for learning. In R. E. Snow & M. J. Farr (Eds.), *Aptitude, learning, and instruction, III Cognitive and affective process analysis.* Hillsdale, NJ: Lawrence Erlbaum Associates. 223-253.

Marshall, C. & Rosmann, G. B. (1999). *Designing qualitative research (3rd ed.).* Thousand Oaks, CA: SAGE Publications Inc.

Mason, H. & Moutahir, J. (2006). *Multidisciplinary experiential education in Second Life: A global approach.* In proceedings of Second Life education workshop at the Second Life community convention, D. Livingston & J. Kemp (Eds.), San Francisco, 30-34.

Maxwell, J. A. (1996). *Qualitative research design: An iterative approach.* Thousand Oaks, CA: SAGE Publications Inc.

McFarlane, A., Sparrowhawk, A. & Heald, Y. (2002). Report on the educational use of games: An exploration by TEEM of the contribution which games can make to the education process. TEEM, St Ives, Cambridgeshire, UK.

Merriam, S. B. (1998). *Qualitative research and case study applications in education.* San Francisco: Jossey-Bass.

National Research Council. (1996). *National science education standards: Observe, interact, change, learn*. National Academy Press: Washington, DC.

Nelson, B. C. & Ketelhut, D. J. (2007). Scientific inquiry in educational multi-user virtual environments. *Educational Psychology Review, 19(3),* 265-283.

Nelson, B., Ketelhut, D., Clarke, J., Bowman, C., & Dede, C. (2005). Design-based research strategies for developing a scientific inquiry curriculum in a multi-user virtual environment. *Educational Technology, 45(1),* 21–28.

Newman, J. (2004). *Videogames*. London: Routledge.

Omale, N., Hung, W.C., Luetkehans, L. & Cooke-Plagwitz, J. (2009). Learning in 3-D multiuser virtual environments: Exploring the use of unique 3-D attributes for online problem-based learning. *British Journal of Educational Technology, 40(3),* 480-495.

Osborne, J. F. (1996). Beyond constructivism. *Science Education, 80(1),* 53-82.

Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Thousand Oaks, CA: SAGE Publications Inc.

Pence, H. E. (2007). The homeless professor in second life. *Journal of Educational Technology Systems, 36(2),* 171-177.

Piaget, J. (1951). *Play, dreams and imitation in childhood.* USA: Norton & Company, Inc.

Provenzo Jr., E. F. (1992). The video generation. *The American School Board Journal, 179(3),* 29-32.

Prensky, M. (2001). *Digital game-based learning.* New York: McGraw Hill.

Rappa, N. A., Yip, D. K. H., & Baey, S. C. (2009). The role of teacher, student and ICT in enhancing student engagement in multiuser virtual environments. *British Journal of Educational Technology, 40(1),* 61-69.

Reigeluth, C. M. (1994). The imperative for systemic change. *In* C. M. Reigeluth & R. J. Garfinkle (Eds.) *Systemic change in education* (pp. 3-11). Englewood Cliffs, NJ: Educational Technology Publications.

Reiser, B. J. (2004). Scaffolding complex learning: The mechanisms of structuring and problematizing student work. *The Journal of the Learning Sciences, 13(3),* 273-304.

Rieber, L. P. (1996). Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations and games. *Educational Technology Research & Development, ETR&D, 44(2),* 43-58.

Roberts, T. S. (2005). Computer-supported collaborative learning in higher education: An introduction. Ch 1 In T. S. Roberts (Ed.), *Computer-supported learning in higher education.* Hershey, PA: Idea Group Publishing, 1-18.

Rossman, G. B. & Fallis, S. F. (1998). *Learning in the field: An introduction to qualitative research.* Thousand Oaks, CA: SAGE Publications Inc.

Rouse, R. (2001). Game design: Theory and practice. Texas, USA: Wordware Publishing, Inc.

Rutherford, F. J. (2005). The 2005 Paul F-Brandwein lecture: Is our past our future? Thoughts on the next 50 years of science education reform in the light of judgments on the past 50 years. *Journal of science education and technology, 14(4),* 367-386.

Savenye, W. C. & Robinson, R. S. (2004). Qualitative research issues and methods: An introduction for educational technologists. In David H. Jonassen (Eds.), *Handbook of Educational Communications and Technology* (2nd ed., pp. 1045–1071.). NewYork: Macmillan.

Sellers, M. (2006). Designing the experience of interactive play. Ch 2 In P. Vorderer & J. Bryant. (Eds.). *Playing video games: motives, responses, and consequences*. Mahwah - NJ: Lawrence Erlbaum Associates, Inc. 9-22.

Shaffer, D. W., Squire, K. R., Halverson, R. & Gee, J. P. (2005). Video games and the future of learning. *Phi Delta Kappan, 87(2,* 104-111.

Sherry, J. L., Lucas, K., Greenberg, B. S., & Lachlan, K. (2006). Video game uses and gratifications as predictors of use and game preference. Ch 15 In P. Vorderer & J. Bryant. (Eds.). *Playing video games: motives, responses, and consequences*. Mahwah - NJ: Lawrence Erlbaum Associates, Inc. 213-224.

Schrader, P., Zheng, D. & Young, M. (2006). Teachers' perceptions of video games: MMOGs and the future of preservice teacher education. *Innovate* 2 (3). Accessed online in April, 2008.

http://www.innovateonline.info/index.php?view=article&id=125.

Squire, K. (2006). From content to context: Videogames as designed experience. *Educational Researcher, 25(8),* 19-29.

Squire, K. D. (2005). Changing the game: What happens when videogames enter the classroom? *Innovate 1(6).*

Squire, K. (2003). Video games in education. *International Journal of Intelligent Simulations and Gaming, 2(1).*

Squire, K. (2002). Cultural framing of computer video games. *The International Journal of Computer Game Research, 2(1).* Retrieved in June, 2001 online from http://www.gamestudies.org/0102/squire/

Squire, K. & Jenkins, H. (2003). Harnessing the power of games in education. *Insight, 3(1),* 5-33.

Smith, L. M. (1994). Biographical method.  In N. Denzin & Y. Lincoln (Eds.) *Handbook of qualitative methods (pp. 286-305).* Thousand Oaks – CA: SAGE Publications Inc.

Smith, B. P. (2006). The (computer) games people play: An overview of popular game content. Ch 5 In P. Vorderer & J. Bryant. (Eds.) *Playing video games: motives, responses, and consequences*. Mahwah - NJ: Lawrence Erlbaum Associates, Inc. 57-75.

Stake, R. E. (1995). *The art of case study research.* Thousand Oaks – CA: SAGE Publications Inc.

Stake, R. (2005). Qualitative case studies. In N. Denzin & Y. Lincoln (Eds.), *The Sage handbook of qualitative research* (3rd ed., pp. 443-466). Thousand Oaks, CA: Sage.

Stake, R. E. (2006). *Multiple case study analysis*. New York: Guilford Press.

Steinkuehler, C., King, E., Simkins, D., Alagöz, E., Chu, S., Oh, Y, Bakar-Çörez, A., & Zhang, B. (2009, June). *After-school online gaming lab for guys.* Poster session presented at the annual meeting of the Games+Learning+Society Conference - GLS Madison, WI – USA.

Steinkuehler, C. & Squire, K. (2009). Virtual worlds and learning. *On the Horizon, 17(1),* 8-11.

Steinkuehler, C. & Johnson, B. Z. (2009). Computational literacy in online games: The social life of mods. *International Journal of Gaming and Computer-Mediated Simulations, 1(1),* 53-65.

Steinkuehler, C. & King, E. (2009). Digital literacies for the disengaged: Creating after school contexts to support boy's game-based literacy skills. *On the Horizon, 17(1),* 47-59.

Steinkuehler, C. & Duncan, S. (2008). Scientific habits of mind in virtual worlds. *Journal of Science Education & Technology, 17(6),* 530-543.

Steinkuehler, C. (2008). Massively multiplayer online games as an educational technology: An outline for research. *Educational Technology, 48(1),* 10-21.

Steinkuehler, C. (2007). Massively multiplayer online gaming as a constellation of literacy practices. *E-Learning, 4(3),* 297-318.

Steinkuehler, C. (2005). *Cognition and learning in massively multiplayer online games: A critical approach.* Unpublished doctoral dissertation, University of Wisconsin-Madison.

Subrahmanyam, K., Greenfield, P., Kraut, R., & Gross, E. (2001). The impact of computer use on children's and adolescents' development. *Applied Developmental Psychology, 22,* 7-30.

Thomas, M. K. (2004). *The quest of Quest Atlantis: Developing a nuanced implementation of a technology rich educational innovation.* Unpublished doctoral dissertation, Indiana University, Bloomington.

Turkle, S. (1984). Video games and computer holding power. Ch 2 In S. Turkle, *The second self: Computers and the human spirit.* New York: Simon & Schuster. 64-92.

Tuzun, H. (2004). *Motivating learners in educational computer games.* Unpublished doctoral dissertation, Indiana University, Bloomington.

Tüzün, H. (2006). Eğitsel bilgisayar oyunları ve bir örnek: Quest atlantis. *H.Ü. Eğitim Fakültesi Dergisi, 30,* 220-229

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

Tüzün, H., Arkun, S., Bayırtepe-Yağız, E., Kurt, F., & Yermeydan-Uğur, B. (2008). Evaluation of computer games for learning about mathematical functions. *I manager's Journal of Educational Technology, 5(2),* 64-72.

Tüzün, H., Yılmaz-Soylu, M. Karakuş, T., İnal, Y. & Kızılkaya, Y. (2009). The effects of computer games on primary school students' achievement and motivation in geography learning. *Computers & Education, 52,* 68-77.

U.S. Department of Education, Office of Educational Technology. (2010). National education technology plan 2010: Transforming American education learning powered by technology. ED Pubs: Alexandria, VA.

Van den Akker, J. (1994). Designing innovations from an implementation perspective. In Husen, Tosten & Postlethwaite, T. Neville. (Eds.). *The international encyclopedia of education, 2nd ed.* Oxford, U. K.: Elsevier Science.

Van Eck, R. & Dempsey, J. (2002). The effect of competition and contextualized advisement on the transfer of mathematics skills in a computer-based instructional simulation game. *Educational Technology Research & Development, ETR&D, 50(3),* 23-41.

Veerman, A. & Veldhuis-Diermanse, E. (2001). *Collaborative learning through computer-mediated communication in academic education.* In proceedings of the first European conference on CSCL, P. Dillenbourg, A. Eurelings, & K. Hakkarainen (Eds.), European perspectives on computer-supported collaborative learning., McLuhan Institute, University of Maastricht, Maastricht (2001), 625-632.

Von Glasersfeld, E. (1993). Questions and answers about radical constructivism. Ch 2 in K. Tobin (Ed.), *The practice of constructivism in science education*, Lawrence Erlbaum Associates. 23-38

Vygotsky, L .S. (1978). *Mind in society: The development of higher psychological process.* Cambridge-Massachusetts: Harvard University Press.

Warburton, S. (2009). Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching. *British Journal of Educational Technology, 40(3),* 414-426.

Warren, S. J., Dondlinger, M. J. & Barab, S. A. (2008). A MUVE towards PBL writing: Effects of a digital learning environment designed to improve elementary student writing. *Journal of Research on Technology in Education, 41(1),* 113-140.

Wentworth, D. R. & Lewis, D. R. (1973). A review of research on instructional games and simulations in social studies education. *Social Education,* 432-440.

Whitehead, A. N. (1929). *The aims of education and other essays*. New York: MacMillan.

Wilson, B. G. (1996). What is a constructivist learning environment? Ch1 In B. G. Wilson, *Constructivist Learning Environments: Case Studies in Instructional Design*. Educational Technology Publications, Inc., Englewood Cliffs, New Jersey. 3- 8.

Yıldırım, A. & Şimşek, H. (2005). *Sosyal bilimlerde nitel araştırma yöntemleri*. Ankara: Seçkin Yayıncılık.

Yin, R. K. (2003) *Case study research: Design and methods*. Thousand Oaks – CA: SAGE Publications Inc.

Yong, T. L. & Ping, L. C. (2008). Engaging academically at risk primary school students in an ICT mediated after school program. *Australian Journal of Educational Technology*, *24(5),* 521-539.

Zheng, D. (2006). *Affordances of 3D virtual environments for English language learning: An ecological psychological analysis.* Unpublished doctoral dissertation, University of Connecticut, Storrs.

Zhu, Q., Wang, T. & Jia, Y., (2007). *Second Life: A New Platform for Education*. In proceedings of 1st IEEE International Symposium on Information Technologies and Applications in Education, 201-204.

# APPENDIX A

# AN EXAMPLE QUEST

| Dünyamızı Tanıyalım | | |
|---|---|---|
| **Köy:** Sosyal Bilgiler Köyü | | |
| **Lumins:** 7<br>**Cols:** 7 | **Kim tarafından inceleneceği:**<br>Konsey | **Toplumsal Sorumluluk İlkesi:**<br>Sosyal Sorumluluk |

Dünya üzerinde bir çok ülke olduğunu öğrendik. Ülkeler her ne kadar kendilerine has özellikler taşıyor olsalar da, bazen ortak konularla karşı karşıya gelebiliyorlar. Dünya üzerindeki bu ülkelerin ne gibi benzer problemler yaşadığını merak ediyoruz. Bu faaliyette sizden istediğimiz benzer problemlerin üstesinden gelmeye çalışan iki veya daha fazla ülke belirlemeniz. Örneğin, çarpık kentleşme, ormanların tahrip edilmesi, artan suç oranları, politik sorunlar veya sizin belirlediğiniz bir başka problemle yüzleşen ülkeleri seçebilirsiniz.

Bazen bu durumlara (veya sorunlara) yaklaşım çok farklı şekillerde olabilir. Bir grup soruna bir yönden bakarken, diğer grup çok farklı bir yaklaşımda bulunabilir. Dünyanızdaki ciddi problemlerin üstesinden nasıl geldiğinizi merak ediyoruz. Bir durum veya sorun belirleyerek, bu durumun seçtiğiniz iki (veya daha fazla) ülkeyi nasıl etkilediğini anlatan bir yazı hazırlayabilir misiniz?

İlk olarak, birçok ülkede ortak olan bir problem seçin. Daha sonra, bu probleme farklı bakış açısından yaklaşan iki (veya daha fazla) ülke belirleyin. Sonraki adımda, olayın her iki yönüyle ilgili olan kaynakları araştırarak, her ikisini de ikna edici bir şekilde sunun. Son olarak, bu durum için bir uzlaşma yolu belirleyin.

Yapacağınız bu çalışma ile karşılaştığımız sorunlara sürekli olarak tek taraftan yaklaşmamak, bunun yerine farklı görüşlere de açık olmamız konusunda bize yardımcı olacaksınız. Buna ek olarak, dünya üzerindeki bazı konular üzerine uzlaşma yöntemleri hakkında da bilgi edinmiş olacağız.

**Amaçlarınız:**

- Öğretmeninizin rehberliğinde sınıfta tartışarak dünya üzerindeki birçok ülkede karşılaşılan durumları (problemleri) belirleyin.
- Grup arkadaşınızla birlikte seçtiğiniz duruma (probleme) iki farklı açıdan yaklaşımı anlatan bir rapor hazırlayın.
- Her bir görüş için kısa ama ikna edici bir paragraf yazmanız yeterli olacaktır.
- Peki ya seçtiğiniz ülkeler bu duruma (probleme) nasıl yaklaşıyor? Yazınıza bununla ilgili bir paragraf eklemeniz daha da açıklayıcı olacaktır.
- Son paragrafınızda uzlaşma yolu olarak ne yapılabileceğinden söz edin.
- Hazırladığınız raporu OTAK aracılığıyla bize gönderin.

**Kaynaklar**

Belirlediğiniz konu ile ilgili olarak İnternet'ten, gazetelerden veya kütüphanelerden araştırma yapabilirsiniz.

# APPENDIX B

## STUDENT INTERVIEW QUESTIONS FOR PILOT STUDY

Merhaba... Biliyorsun bu dönem boyunca bazı haftalar ben buraya geldim ve sizinle Quest Atlantis ortamında bazı uygulamalar yaptık. Şimdi senin bu uygulama ile ilgili görüş ve önerilerini öğrenmek için sana bazı sorular yönelteceğim. Senin görüşlerin bu ortamda daha iyi uygulamalar yapabilmek için gerekli düzenlemeleri yapmam için oldukça önemli. O yüzden doğru ve açık yanıtlar vermeni bekliyorum.

Bu sorulara vereceğin yanıtların ders notlarına etkisi olmayacak. Öğretmenin de bu görüşmeden haberdar olmayacak. Dolayısıyla cevap verirken rahat olabilirsin.

Anlamadığın bir soru olursa tekrar sorabilirsin. Başlamadan önce sormak istediğin herhangi bir şey var mı? O zaman ilk soruyla başlayabiliriz.

1. Bilgisayar oyunları oynuyor musun?
    a. Hangi oyunları oynuyorsun?
    b. Daha önce QA'ye benzer bir oyun oynamış mıydın?
2. Biliyorsun burada bir süredir sizinle Quest Atlantis ile bir uygulama yapıyoruz. Bana bu uygulamadaki deneyimlerinden söz eder misin?
3. Quest Atlantis'te en çok beğendiğin özellikler nelerdir?
4. Peki beğenmediğin yönleri nelerdir?
5. Biliyorsun seçtiğiniz bir avatar sizi ortamda temsil ediyor.
    a. Avatarının özelliklerini hiç değiştirdin mi? Neler yaptın?
    b. QA'de seni temsil eden bir avatarının olması ile ilgili neler düşünüyorsun?
6. Ortamdaki araçlardan hangilerini kullandın mı? (Uçak, araba vs.)
    a. Bunu yaparken neler hissettin?
7. Arkadaşlarına e-mail gönderdin mi?
    a. Evet: İçeriği neydi? Cevap aldın mı? (İşine yaradı mı?)
    b. Hayır: Neden? Normalde e-mail adresin var mı? E-mail gönderiyor musun?

8. Son iki haftadır tartışma listesini kullanıyorsunuz. Böyle bir listenin kullanılması ile ilgili görüşlerin neler?
    a. Bu listede kendi görüşlerini yazmak ve arkadaşlarının görüşlerini okumak sana neler hissettiriyor?
9. Chat özelliğini kullanarak arkadaşlarınla mesajlaştın mı? (Okul - Ev)
    a. Evet: İçeriği neydi? Sana faydası oldu mu?
    b. Hayır: Neden?
    c. Uygulama esnasında arkadaşlarınla çoğunlukla aynı ortamdaydın. Buna rağmen chat yapabiliyor olmak senin için önemli miydi?
10. Sınıfta ders işlemekle QA'de ders işlemeyi karşılaştırır mısın?
    a. Sence yaptığımız uygulamalar derslerin gibi miydi? Ne gibi farklar ve/veya benzerlikler vardı?
        i. Arkadaşlarınla iletişimin
        ii. Kendi başarın
        iii. Duygu ve düşüncelerini açıkça belirtebilmen
        iv. Konuya ilgi/merak (Böyle bir oyun ortamını derslerde kullanmak senin Sosyal bilgiler dersine olan ilgini isteğini değiştirdi mi?)
11. Bu uygulamada Sosyal Bilgiler dersi ile ilgili bir şeyler öğrendiğini düşünüyor musun?
    a. Evet: Neler öğrendin?
    b. Hayır: Neden böyle düşünüyorsunuz?
12. Bu uygulama sırasında keşke şu da böyle olsaydı o zaman daha güzel olurdu dediğin bir şey oldu mu? Anlatır mısın?

    (alternatif:)Bu öğrenme ortamını daha cazip kılmak için ne gibi değişiklikler yapılabilir?
13. Diğer derslerini de böyle bir ortamda işlenmesini ister miydin? Neden?

Bireysel çalışmanın yanı sıra grup çalışması da yaptınız. Şimdi bununla ilgili birkaç soru yöneltmek istiyorum.

14. Genelde derslerine çalışırken bireysel (kendi başına) çalışmayı mı yoksa grup arkadaşlarınla birlikte çalışmayı mı tercih edersin?
15. Questleri bireysel olarak yapmaktan mı grup olarak mı yapmaktan hoşlandın? Neden?
16. Grup arkadaşlarınla birlikte questi nasıl tamamladığınızı anlatır mısın?

Benim sorularım bu kadar. Son olarak senin eklemek istediğin herhangi bir şey var mı? Bana zaman ayırdığın ve görüşlerini benimle paylaştığın için teşekkür ederim.

# APPENDIX C

# TEACHER INTERVIEW QUESTIONS

Merhaba ... Öncelikle bu görüşme için bana zaman ayırdığınız için size çok teşekkür ederim. Sizin de bildiginiz gibi, öğretmenliğini yaptığınız 7. sınıf Fen ve Teknoloji dersinde bir uygulama yaptık. Uygulamada öğrenciler Quest Atlantis ortamında hazırlanan bir sanal dünyada gezinerek, parkta yaşanan su kirliliği problemini araştırdılar ve sorunu çözmeye çalıştılar. Bu görüşmenin amacı da sizin bu uygulama ile ilgili görüşlerinizi öğrenmek. Bu sebeple size birkaç soru yönelteceğim. Başlamadan önce sizin sormak istediğiniz herhangi bir soru var mı? Eğer sizin için bir sakıncası yoksa görüşmemizi kaydetmek istiyorum. Bu kayıt sadece bu çalışmanın analizi için kullanılacak ve çalışma tamamlandıktan sonra imha edilecektir.

**Sorular**

Üniversiteden mezun olduğunuz bölüm: ..............................................

Mezuniyet dereceniz: [ ] Lisans [ ] Master [ ] Doktora

Varsa tez konunuz:

Mesleki Deneyiminiz: .............. yıl

Çalıştığınız okul türü: ... Devlet ... Özel

1. Öncelikle öğrencilik yıllarınıza kısa bir dönüş yapmak istiyorum. Öğretmenlik eğitimini aldığınız sırada teknolojinin eğitimde kullanılmasına yönelik bir ders almış mıydınız?
    a. (Cevap Evet ise) Bu dersin/derslerin içeriğinden bahsedebilir misiniz?
    b. (Cevap Hayır ise) Bunun eksikliğini hissettiniz mi?
        i. Ne tür sıkıntılar yaşadınız? Biraz açıklar mısınız?
2. Peki hizmet-içi eğitim veya seminerler kapsamında teknolojinin eğitimde kullanılmasına yönelik bir ders aldınız mı?
    a. (Cevap Evet ise) İçeriğinden bahsedebilir misiniz?

3. Teknolojinin eğitimde kullanılması konusunda ne düşünüyorsunuz?
4. Şu anda görev yapmakta olduğunuz okul sizce teknolojik yeniliklere ne ölçüde açık?
    a. Okul yönetimi teknolojinin derslerde kullanımını destekleyici bir politika izliyor mu?
    b. Bu yönde neler yapıldığını biraz açıklayabilir misiniz?
5. Okulunuzda teknolojinin eğitimde kullanımına yönelik genel tutum nasıl?
    a. Öğretmenler açısından
    b. Öğrenciler açısından (Veliler)
    c. Okulun fen bilgisi öğretmeni olarak sizden derslerinize teknoloji entegrasyonuyla ilgili beklentiler/talepler neler?
    d. Zümre olarak bu konuda neler yapıyorsunuz?
6. Derslerinizde teknoloji tabanlı uygulamalar yapıyor musunuz?
    a. (Cevap Evet ise) Bu uygulamalara örnek verir misiniz?
    b. Bu uygulamaları siz mi hazırlayıp yürütüyorsunuz? Uygulama sürecinde neler yaşanıyor, biraz bahsedebilir misiniz?
    c. (prompt) Konuların seçiminde nelere dikkat ediliyor?
    d. (Cevap Hayır ise) Nedenlerini açıklayabilir misiniz?
7. (Uygulama ile ilgili hatırlatma yapılacak) Peki yaptığımız bu çalışmayı teknolojinin derslere entegre edilmesi açısından düşündüğünüzde nasıl değerlendirirsiniz?
8. Sizce bu uygulama ne kadar etkili oldu? Ya da olmadı? Nedenleri neler?
9. Yapılan uygulamanın dersinize bir katkı sağladığını düşünüyor musunuz?
    a. Ne ölçüde olduğunu açıklayabilir misiniz?
    b. Öğrencilerinizin bu uygulamadan kazanımları ne ölçüde oldu?
    c. (Olumsuz cevap verirse) Sizce bunun nedenleri ne olabilir?
10. Böyle bir etkinlik sırasında öğretmenlik yapmak sizce ne anlam ifade ediyor?
    a. Ne kadar kolay/zor?
    b. Sınıfta yapılan etkinliklerle ne tür farklılıklar/benzerlikler gösteriyor?
11. Bu tür teknolojik ortamların kullanılmasının avantajları/dezavantajları nelerdir?
12. Bu tür bir uygulamanın dersin bir parçası olarak ele alınması için neler yapılmalı?
    a. Öğretmenin ve öğrencilerin bunu benimsemeleri ve dersin bir parçası olarak görmeleri için hangi koşulların olması gerekiyor?
    b. Müfredat buna ne kadar müsait?

c. Okul yönetimi bu konuda ne kadar destekleyici?

d. Öğretmenler bu konuda ne kadar yeterli? Ne tür desteğe ihtiyaç duyuyorlar?

13. Uygulama sırasında katılmak istemeyen ya da ortamın sadece oyun özellikleriyle ilgilenen öğrenciler vardı. Sizce bunun sebepleri nelerdir?

14. Hatırlayacağınız gibi yaptığımız çalışmada uygulamaları araştırmacı olarak ben yürüttüm. Uygulamayı o dersin öğretmeninin yürütmesi için nasıl bir yöntem izlenmesini tavsiye edersiniz?

a. Böyle bir uygulama öncesinde veya sırasında yapılması gerekenler neler?

15. Sizce bu tür uygulamaların sürekliliğinin sağlanması ne ölçüde mümkün?

a. Bunun için neler yapılması gerekiyor?

b. Türk Milli Eğitim sistemi bu tür uygulamalar için ne kadar uygun?

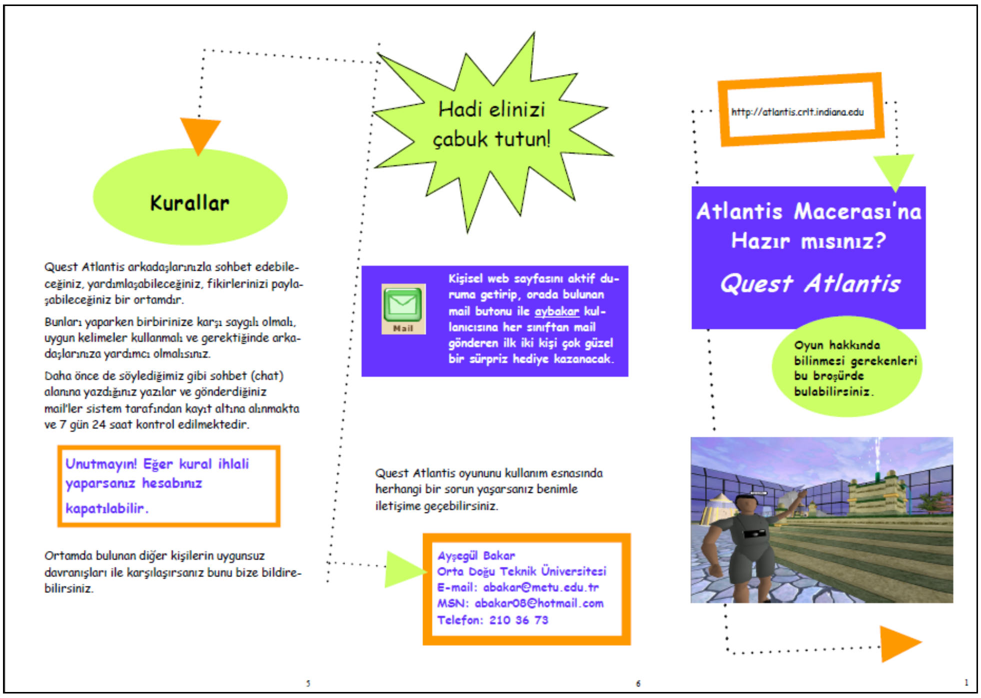
c. Öğretmenleri bu konuda özendirmek için neler yapılmalı? Nasıl bir süreç izlenmeli?

d. Siz bu tür uygulamaları devam ettirmek ister misiniz? Nasıl?

Benim sorularım bu kadar. Sizin eklemek istediğinin herhangi bir şey var mı? Bana zaman ayırdığınız ve görüşlerinizi benimle paylaştığınız için teşekkür ederim.

# APPENDIX D

# FLYER



Kurallar

Quest Atlantis arkadaşlarınızla sohbet edebileceğiniz, yardımlaşabileceğiniz, fikirlerinizi paylaşabileceğiniz bir ortamdır.

Bunları yaparken birbirinize karşı saygılı olmalı, uygun kelimeler kullanmalı ve gerektiğinde arkadaşlarınıza yardımcı olmalısınız.

Daha önce de söylediğimiz gibi sohbet (chat) alanına yazdığınız yazılar ve gönderdiğiniz mail'ler sistem tarafından kayıt altına alınmakta ve 7 gün 24 saat kontrol edilmektedir.

Unutmayın! Eğer kural ihlali yaparsanız hesabınız kapatılabilir.

Ortamda bulunan diğer kişilerin uygunsuz davranışları ile karşılaşırsanız bunu bize bildirebilirsiniz.

5

Hadi elinizi çabuk tutun!

Mail

Kişisel web sayfasını aktif duruma getirip, orada bulunan mail butonu ile aybakar kullanıcısına her sınıftan mail gönderen ilk iki kişi çok güzel bir sürpriz hediye kazanacak.

Quest Atlantis oyununu kullanım esnasında herhangi bir sorun yaşarsanız benimle iletişime geçebilirsiniz.

Ayşegül Bakar
Orta Doğu Teknik Üniversitesi
E-mail: abakar@metu.edu.tr
MSN: abakar08@hotmail.com
Telefon: 210 36 73

6

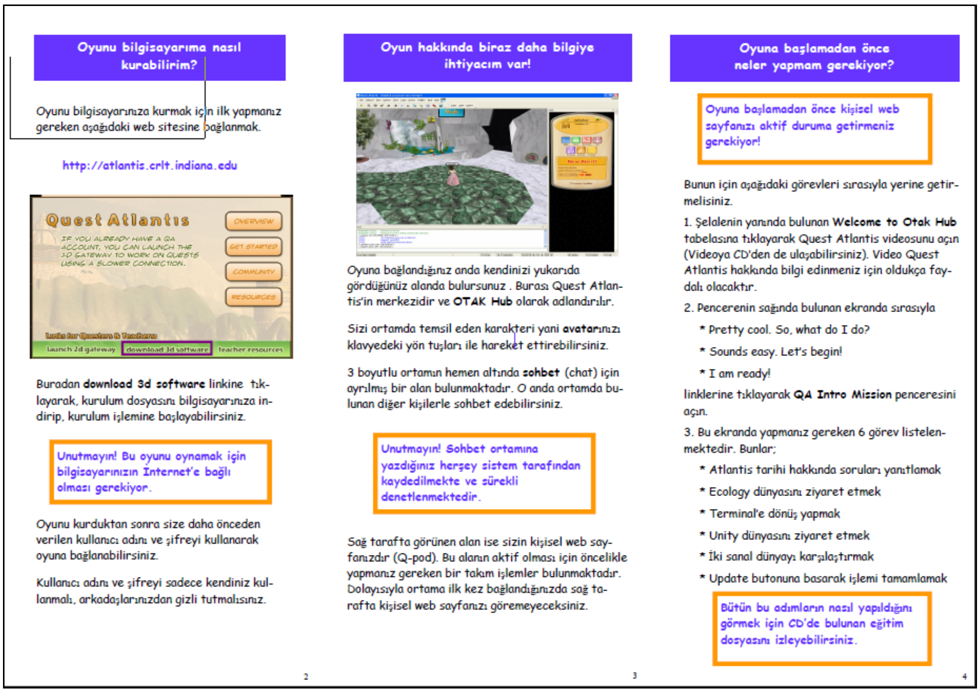
http://atlantis.crlt.indiana.edu

Atlantis Macerası'na Hazır mısınız?

Quest Atlantis

Oyun hakkında bilinmesi gerekenleri bu broşürde bulabilirsiniz.

1



Oyunu bilgisayarıma nasıl kurabilirim?

Oyunu bilgisayarınıza kurmak için ilk yapmanız gereken aşağıdaki web sitesine bağlanmak.

http://atlantis.crlt.indiana.edu

Quest Atlantis
IF YOU ALREADY HAVE A QA ACCOUNT, YOU CAN LAUNCH THE 2D GATEWAY TO WORK ON QUESTS USING A SLOWER CONNECTION.
OVERVIEW
GET STARTED
COMMUNITY
RESOURCES
Links for Questers & Teachers
launch 2d gateway
download 3d software
teacher resources

Buradan **download 3d software** linkine tıklayarak, kurulum dosyasını bilgisayarınıza indirip, kurulum işlemine başlayabilirsiniz.

Unutmayın! Bu oyunu oynamak için bilgisayarınızın İnternet'e bağlı olması gerekiyor.

Oyunu kurduktan sonra size daha önceden verilen kullanıcı adını ve şifreyi kullanarak oyuna bağlanabilirsiniz.

Kullanıcı adını ve şifreyi sadece kendiniz kullanmalı, arkadaşlarınızdan gizli tutmalısınız.

2

Oyun hakkında biraz daha bilgiye ihtiyacım var!

Oyuna bağlandığınız anda kendinizi yukarıda gördüğünüz alanda bulursunuz . Burası Quest Atlantis'in merkezidir ve **OTAK Hub** olarak adlandırılır.

Sizi ortamda temsil eden karakteri yani **avatar**ınızı klavyedeki yön tuşları ile hareket ettirebilirsiniz.

3 boyutlu ortamın hemen altında **sohbet** (chat) için ayrılmış bir alan bulunmaktadır. O anda ortamda bulunan diğer kişilerle sohbet edebilirsiniz.

Unutmayın! Sohbet ortamına yazdığınız herşey sistem tarafından kaydedilmekte ve sürekli denetlenmektedir.

Sağ tarafta görünen alan ise sizin kişisel web sayfanızdır (Q-pod). Bu alanın aktif olması için öncelikle yapmanız gereken bir takım işlemler bulunmaktadır. Dolayısıyla ortama ilk kez bağlandığınızda sağ tarafta kişisel web sayfanızı göremeyeceksiniz.

3

Oyuna başlamadan önce neler yapmam gerekiyor?

Oyuna başlamadan önce kişisel web sayfanızı aktif duruma getirmeniz gerekiyor!

Bunun için aşağıdaki görevleri sırasıyla yerine getirmelisiniz.

1. Şelalenin yanında bulunan **Welcome to Otak Hub** tabelasına tıklayarak Quest Atlantis videosunu açın (Videoya CD'den de ulaşabilirsiniz). Video Quest Atlantis hakkında bilgi edinmeniz için oldukça faydalı olacaktır.

2. Pencerenin sağında bulunan ekranda sırasıyla

* Pretty cool. So, what do I do?
* Sounds easy. Let's begin!
* I am ready!

linklerine tıklayarak **QA Intro Mission** penceresini açın.

3. Bu ekranda yapmanız gereken 6 görev listelenmektedir. Bunlar;

* Atlantis tarihi hakkında soruları yanıtlamak
* Ecology dünyasını ziyaret etmek
* Terminal'e dönüş yapmak
* Unity dünyasını ziyaret etmek
* İki sanal dünyayı karşılaştırmak
* Update butonuna basarak işlemi tamamlamak

Bütün bu adımların nasıl yapıldığını görmek için CD'de bulunan eğitim dosyasını izleyebilirsiniz.

4

## APPENDIX E

## STUDENT NOTEBOOK

# *KIZILIRMAK MİLLİ PARKI BALIK ÖLÜMLERİNİ ARAŞTIRMA PROJESİ*

# *Alan Notları*

**Araştırmacı**: ______________________________________

# Korucu Ahmet'in Mektubu

| |
|---|
| **Problem:** |
| **Ahmet'in sana verdiği görev:** |

| | |
|---|---|
| Problem hakkında ne biliyorsun? | Bu sorunu çözmek için başka hangi bilgilere ihtiyacın var? |

# Kızılırmak Milli Parkı Balık Ölümlerini Araştırma Projesi

Kızılırmak Milli Parkı'ndaki karakterler problemle ilgili olarak sana ne söyledi? Aşağıdaki tabloya hatırlatıcı notlar al.

| Kişi | Problemle ilgili olarak sana ne söyledi? |
|---|---|
| **KORUCU AHMET** | |
| **Hangi grubun üyesi?** | |
| **CEM VE AYLİN** | |
| **Hangi grubun üyesi?** | |
| **MELİSA** | |
| **Hangi grubun üyesi?** | |
| **MİNE** | |
| **Hangi grubun üyesi?** | |

# Kızılırmak Milli Parkı Balık Ölümlerini Araştırma Projesi

| Kişi | Problemle ilgili olarak sana ne söyledi? |
|---|---|
| **DENİZ** | |
| **Hangi grubun üyesi?** | |
| **ELA** | |
| **Hangi grubun üyesi?** | |
| **HALİL** | |
| **Hangi grubun üyesi?** | |
| **BURAK** | |
| **Hangi grubun üyesi?** | |

# Kızılırmak Milli Parkı Balık Ölümlerini Araştırma Projesi

| Kişi | Problemle ilgili olarak sana ne söyledi? |
|---|---|
| **DUYGU** | |
| **Hangi grubun üyesi?** | |
| **UFUK** | |
| **Hangi grubun üyesi?** | |
| **SARP** | |
| **Hangi grubun üyesi?** | |
| **YASEMİN** | |
| **Hangi grubun üyesi?** | |

**Kızılırmak Milli Parkı Balık Ölümlerini Araştırma Projesi**

**Soru-1.** Ahmet parktaki grupların kimlerden oluştuğunu tam olarak anlayıp anlamadığınızdan emin olmak istiyor.
Her cümlenin başındaki rakamı, ilgili olduğunu düşündüğünüz kutunun içine yazın.

| | |
|---|---|
| [ ] Ziyaretçiler | 1. Bu grup parkı yönetiyor ve parkta bulunan herkesin ihtiyaçlarını karşılamaya çalışıyor (Ahmet, Burak). |
| [ ] Korucular | 2. Bu grup parka ziyaretçiler getiriyor. Ayrıca her yıl balık tutma yarışması düzenliyor (Melisa). |
| [ ] Pınarlı halkı | 3. Bu grup hayvan ve mısır yetiştiriyor ve kendilerine yetecek kadar balık avlıyor (Halil, Ela). |
| [ ] Keresteciler | 4. Bu grup parktaki ağaçları kesiyor ve yerine yenilerini dikiyor (Duygu, Ufuk). |
| [ ] Balık Avı Tur Şirketi | 5. Bu grup kesilen ağaçları işleyip, kazanç elde etmek için satıyor (Sarp). |
| [ ] Kereste Fabrikası | 6. Bu grup parka eğlenmek ve dinlenmek amacıyla geliyor (Yasemin, Deniz, Mine). |

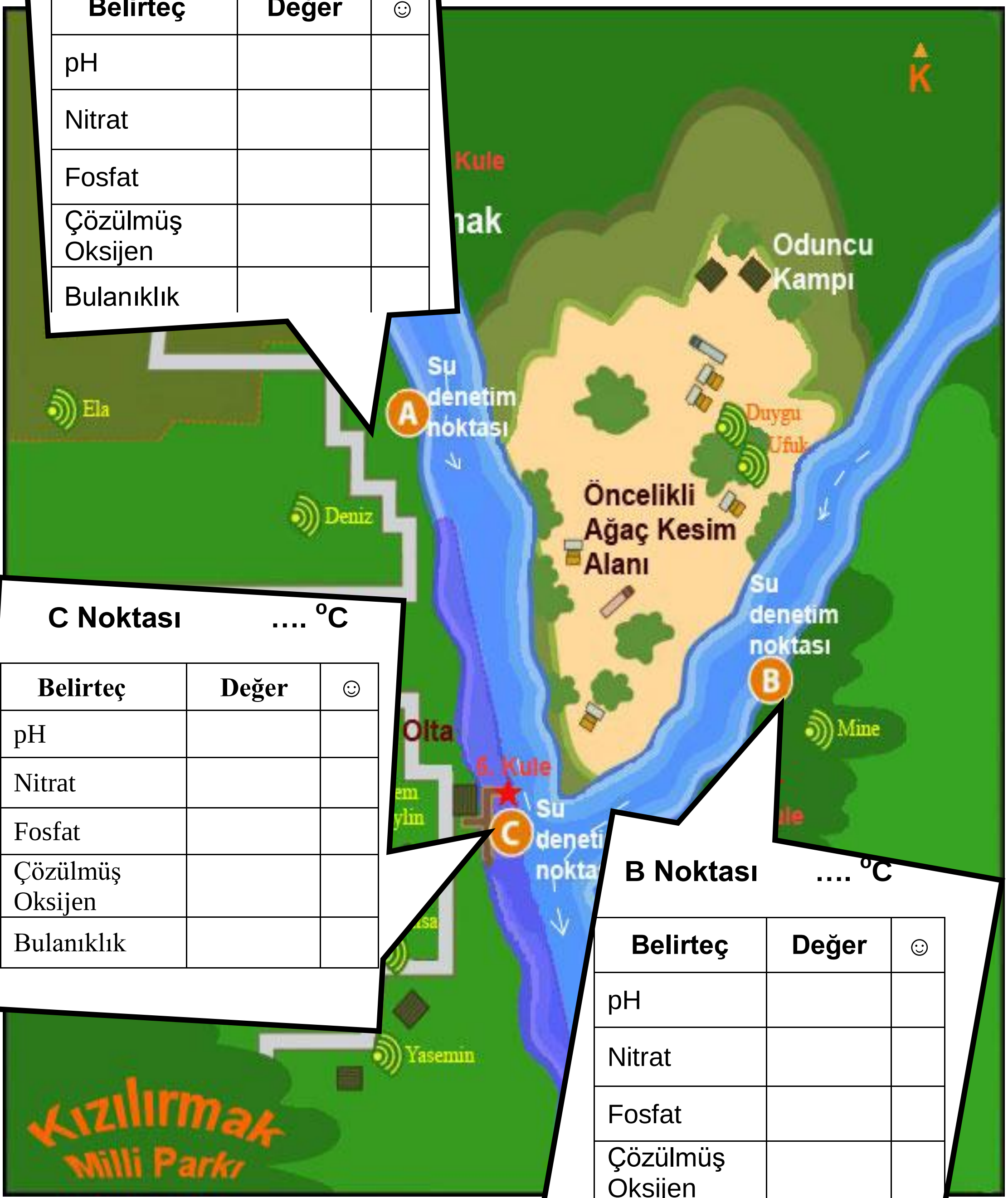
**Soru-2.**Ahmet farklı kişilerin düşüncelerini anlayıp anlamadığınızdan emin olmak istiyor. Her cümlenin başındaki rakamı, ilgili olduğunu düşündüğünüz kutunun içine yazın.

| | |
|---|---|
| [ ] Sarp | 1. Balık sayısındaki azalma çok karışık bir sorun. Benim görevim parkın ayakta kalmasını sağlamak için bu problemi çözmek. |
| [ ] Duygu, Ufuk | 2. Düzenlediğimiz balık tutma yarışmasının herhangi bir soruna neden olduğuna inanmıyorum. Ancak, Pınarlı halkı açıkça aşırı balık avlıyorlar, belki de balık ağı kullanıyorlardır. |
| [ ] Melisa | 3. Bence yakın çevredeki fabrikalardan kaynaklanan asit yağmurları nehrin pH seviyesini düşürüyorlar ve bu da balıkların ölümüne sebep oluyor. |
| [ ] Mine | 4. Buralı bir kadın olarak, buradaki insanların nehri koruyacağını ve hiçbir şekilde zarar vermeyeceğini biliyorum. |
| [ ] K. Ahmet | 5. Pınarlı kasabasının muhtarı olarak, kerestecilerin önceki yıllara göre daha fazla ağaç kestiğini fark ettim. |
| [ ] Halil | 6. Bu parkın bir ziyaretçisi olarak, balıkçıların aşırı balık avladığına, nehrin eskisinden daha mutsuz olduğuna inanıyorum |
| [ ] Deniz | 7. Bu sorunun dışında kalan biri olarak (erkek arkadaşım kereste fabrikasında çalışıyor), kerestecilerin sorumluluk sahibi olduklarına inanıyorum. Hatta yeni iş alanı yaratıyorlar. |
| [ ] Ela | 8. Parkta veri topluyorum. Geçen yıllara göre bu yılki ormanlık alan daha az. |
| [ ] Yasemin | 9. Pınarlı civarındaki suya muhtemelen kullandıkları gübre karışıyor ve bu da balıklara zarar veriyor. |

# Kızılırmak Milli Parkı Balık Ölümlerini Araştırma Projesi

## *Bilimsel Veriler*

Analiz sonuçlarınızı aşağıdaki kutulara yazın ve her bir değerin balıklar için iyi ya da kötü olduğunu belirtin (☺ sütununa **iyi** ya da **kötü** yazın).




**A Noktası** …. °C

| Belirteç | Değer | ☺ |
|---|---|---|
| pH | | |
| Nitrat | | |
| Fosfat | | |
| Çözülmüş Oksijen | | |
| Bulanıklık | | |

**C Noktası** …. °C

| Belirteç | Değer | ☺ |
|---|---|---|
| pH | | |
| Nitrat | | |
| Fosfat | | |
| Çözülmüş Oksijen | | |
| Bulanıklık | | |

**B Noktası** …. °C

| Belirteç | Değer | ☺ |
|---|---|---|
| pH | | |
| Nitrat | | |
| Fosfat | | |
| Çözülmüş Oksijen | | |
| Bulanıklık | | |

# Kızılırmak Milli Parkı Balık Ölümlerini Araştırma Projesi

**Bilimsel Verilerin Işığında**

Bu tabloda su analizi sonuçlarını özetleyin.

| |
|---|
| **Yaptığınız su analizlerinin nehrin farklı noktalarında nasıl bir değişiklik gösterdiğini özetleyin.** |
| **Su analizleri sonucu elde ettiğiniz veriler balık ölümlerinin sebebini açıklamanıza yardım ediyor mu? Nasıl bir katkı sağladığını açıklayın.** |
| **Nehrin farklı noktalarında böyle farklı sonuçlar ortaya çıkmasına sebep olan olaylar ne olabilir?** |

# Kızılırmak Milli Parkı Balık Ölümlerini Araştırma Projesi

Elde ettiğiniz diğer bilgilerle ilgili not almak için bu sayfayı kullanabilirsiniz.

| **Bilgi Kaynağı** | **Açıklama** |
|---|---|
| | |
| | |
| | |

# Kızılırmak Milli Parkı Balık Ölümlerini Araştırma Projesi

**Problemin Sebebinin ve Çözüm Yolunun Bulunması**

| |
|---|
| **Sizce parktaki balık ölümlerinin sebebi hangi grup?**<br>**(Sadece bir grup seçebilirsiniz)**<br>**Çayönü kasabası – Altın Olta Balık Avı Tur Şirketi – Mavi Çam Kerestecilik** |
| **Problemin ortadan kalkması için bu grupla ilgili nasıl bir değişiklik yapılması gerekiyor?** |
| **Neden diğerlerini değil de o grubu bu problemin sebebi olarak görüyorsunuz? Bu kararı vermenizin nedenlerini açıklayınız.** |
| **Hipotezinizi yazınız. (Hipotez yazmak ile ilgili ayrıntılı bilgi almak için 14. sayfaya bakabilirsiniz.)** |

# Kızılırmak Milli Parkı Balık Ölümlerini Araştırma Projesi

Bir grupla ilgili karar verdiniz. Peki bu karar uygulandıktan sonra parkta neler olacak? 2 yıl sonrasını hayal edin ve parkta neler olup bittiğini açıklayın.

<table>
<tr><td colspan="2">Seçtiğiniz grup parktan ayrıldıktan sonra parkta neler değişti? Lütfen parkın 2 yıl sonraki halini tasvir ediniz.</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2">Sizin önerdiğiniz çözüm gerçekten işe yaramış mı? Neden?</td></tr>
<tr><td colspan="2">2 yıl sonra önerdiğiniz çözümün olumlu – olumsuz etkileri neler olmuş?</td></tr>
<tr><td>Olumlu Etkiler</td><td>Olumsuz Etkiler</td></tr>
<tr><td></td><td></td></tr>
</table>

# Kızılırmak Milli Parkı Balık Ölümlerini Araştırma Projesi

Korucu Ahmet'ten 2 yıl sonra bir mektup daha aldınız (Bu mektup size daha sonra verilecek). 2 yıl sonrası için sizin düşündüğünüz park ile korucunun anlattığı park arasında ne gibi farklılıklar - benzerlikler bulunuyor?

<table>
<tr><th colspan="2">Sizin düşündüğünüz park ile korucunun anlattığı arasında ne gibi farklar ve benzerlikler var?</th></tr>
<tr><th>Farklılıklar</th><th>Benzerlikler</th></tr>
<tr><td></td><td></td></tr>
<tr><th colspan="2">Bu durumdan çıkardığınız sonuçlar nelerdir? Lütfen açıklayınız.</th></tr>
<tr><td colspan="2"></td></tr>
</table>

# Araştırmacı Kılavuzu

| Belirteçler | Kaynaklar ve Tanımlar |
|---|---|
| **pH** | pH suyun asit-baz değerinin ölçüsüdür. Farklı pH değerleri sudaki farklı yaşam alanlarını destekler. 6.5 – 7.5 arasındaki değerler genellikle çok iyidir. 5.5'tan küçük ve 8.5'tan büyük değerler sudaki yaşamı olumsuz yönde etkiler. pH değeri madensel atıklar ya da asit yağmurları nedeniyle düşebilir; kireç taşının eriyip suya karışmasıyla da yükselebilir. |
| **Çözülmüş Oksijen** | Çözülmüş oksijen sudaki oksijen gazı miktarıdır. Oksijen karasal alanda olduğu gibi, sudaki yaşam için de oldukça önemlidir. 3 mg/l'den düşük değerler sudaki yaşamı olumsuz etkiler. 5 – 6 mg/l arasındaki değerler balıkların büyük çoğunluğu için gereken değerdir. Çözülmüş oksijen değerinin düşük olmasının sebepleri bitki örtüsünün bozulması, yüksek sıcaklık veya suya karışan oksijen miktarının az olmasıdır. |
| **Bulanıklık** | Bulanıklık suyun berraklığının ölçüsüdür. Bulanıklık büyük oranda suda yüzen yabancı maddelerden kaynaklanır. 5 NTU ve daha az değerler sudaki yaşam için gereklidir. 25 NTU'dan büyük değerler birçok balık için oldukça kötüdür. Bulanıklık değeri yüksek olduğunda su altındaki alglere ve bitkilere daha az güneş ışını ulaşır. Bulanıklığın sebepleri erozyon, alglerin büyümesi ve suyun akış hızının çok hızlı olması olabilir. |
| **Nitrat** | Nitrat bitkilerin büyümesi için çok önemlidir. Sudaki yaşam için 03 mg/l'den küçük değerler iyi, 2.0'dan büyük değerler ise kötüdür. Nitrat değerinin yüksek olması bitkilerin aşırı miktarda büyümesine neden olur. Bu kadar çok bitkinin ölmesi veya çürümesi durumunda sudaki çözülmüş oksijen değerini azaltır. Nitrat suya ekili alanlar ve hayvan dışkıları nedeniyle karışabilir. |
| **Fosfat** | Fosfat bitkilerin büyümesi için çok önemlidir. Sudaki yaşam için 0.1 mg/l'den küçük değerler iyi, 3.0'dan büyük değerler ise kötüdür. Fosfat değerinin yüksek olması bitkilerin aşırı miktarda büyümesine neden olur. Bu kadar çok bitkinin ölmesi veya çürümesi durumunda sudaki çözülmüş oksiyen değerini azaltır. Fosfat suya erozyon, hayvan dışkıları veya ekili alanlar nedeniyle karışabilir. |
| **Sıcaklık** | Suyun sıcaklığının yüksek ya da düşük olması, sudaki sıcaklık değişimi kadar önemli bir faktör değildir. Eğer suyun sıcaklığı bir noktadan br noktaya 5C'den daha fazla değişim gösterirse, sudaki hayat olumsuz yönde etkilenebilir. Suyun sıcaklığının yüksek olması çözülmüş oksijen değerinin düşmesine neden olur. Suda yüzen toprak tanecikleri, suyun üstünde gölgenin yetersiz olması veya endüstriyel atıklar yüksek su sıcaklığının sebepleri olabilir. Öte yandan, su sıcaklığının düşük olmasının sebebi barajlardan gelen sular veya soğuk su kaynakları olabilir. |

# Araştırmacı Kılavuzu

## HİPOTEZ YAZMAK

Hipotez, bilimsel yöntemde olaylar arasında ilişkiler kurmak ve olayları bir nedene bağlamak üzere tasarlanan ve geçerli sayılan bir önermedir.

Bir hipotez mantıklı yapılmış bir tahmindir. Çünkü hipotez belli bilgilere dayanarak oluşturulur. Bir hipotezde varolan bir sorunun olası nedeni ile ilgili tahminde bulunulur. Genellikle 1 cümleden oluşan hipotezler test edilebilir ve değişikliğe açıktır.

Örneğin birisi size Aslı'nın favori renginin ne olduğunu sorduğunda bir tahminde bulunabilirsiniz. Ama eğer Aslı'nın çoğunlukla kırmızı kıyafetler giydiğini görür ve odasını kırmızı boyadığını bilirseniz o zaman yaptığınız tahmin mantıklı bir tahmin olur çünkü elinizde bununla ilgili bilgi bulunmaktadır ve siz bu bilgilere dayanarak bir tahmin yapıyorsunuzdur.

Örnek hipotezler

1. Çikolata sivilceye neden olabilir.
2. Topraktaki tuz bitkilerin gelişimini olumsuz etkileyebilir.
3. Bitkilerin gelişimi ışığın renginden etkilenebilir.
4. Bakteri gelişimi sıcaklıktan etkilenebilir.
5. Ultraviyole (morötesi) ışık cilt kanserine neden olabilir.
6. Sıcaklık yaprakların renk değiştirmesine neden olabilir.

# Kızılırmak Milli Park Haritası

# APPENDIX F

# EXAMPLE INTERACTION MAP – HALIL

Ben Halil, Çayönü Kasabası'nın muhtarıyım. Burada işin ne? Kimi temsilen buradasın?

**Benim işim beni ilgilendirir. Neden bu nehirde aşırı balık avlıyorsunuz?**

**Ben korucunun namına buradayım. Sizinle konuşmamı önermişti.**

**Buraya sizinle güneydeki balıkçılar arasındaki problemi çözmek için gönderildim.**

Interaction goes on according to students' selections

Student Selects-1

**HALİL**
Tavırların gerçekten çok kaba. Sanki nehirdeki balıkların kökünü biz kuruttuk. Eğer birilerinin işini yok etmek isteseydik, bu keresteciler olurdu balıkçılar değil.

**Balık ağı kullanan herhangi biri nehirdeki balıkların tükenmesine neden olabilir. Aşırı balık avlamadığınızı kanıtlayabilir misiniz? Kerestecilerle ne probleminiz var?**

**Kabalığım için özür dilerim. Balıkların neden yok olduğunu açıklayabilir misiniz? Belki bana kerestecilerle aranızda olan problemi de anlatırsınız.**

Student Selects-1

**HALİL**
Senin gibi birine hiçbir şey kanıtlamak zorunda değilim. Aradığın cevapları kendin bulmak zorundasın.
Belki davranışların gerçekten düzeldiğinde yeniden gelirsin.

Student Selects-2

**HALİL**
Hepimiz zor zamanlar geçiriyoruz, bu yüzden çok gerginiz. Özrünü kabul ediyorum. Balıklar keresteciler yüzünden kayboluyor. Buna inanmamın iki sebebi var:
Birincisi, nehrin kerestecilerin çalıştığı bölgenin yukarısında kalan kısmında balıkçılık gayet iyi durumda.
İkincisi, nehrin kerestecilerin çalışma alanlarından aşağıda kalan kısmının çamurlu olduğunu fark ettim. Nehir tortu ile dolmuş. Keresteciler nehrin kıyısına çok yakın alanlarda bile ağaç kesiyorlar.

**Sence kerestecilerin nehre zarar verdiğini nasıl kanıtlayabilirim?**

**Bana başka tavsiyen var mı?**

Student Selects-2

**HALİL**
Korucu Ahmet iyi bir insan. Ama bu aralar çok endişeli. Ona yardım edebileceğine eminim.
Sana şunu söyleyebilirim: Yaşadığım bu yerde hep çok sayıda balık olurdu. Balığı sadece kendimiz yemek için ve bir miktar da marketimizde satmak için avlıyoruz. Yıllardır hep aynı miktarda balık avlarız; yani aşırı sayıda balık avlıyor olamayız.
Kızılırmak Parkı'nda olan bu değişimin sebebi kerestecilerin kestikleri ağaç miktarında ve bu işi nasıl yaptıklarında gizli. Bu alanları seyrek toprakla dolduruyorlar, o da kolaylıkla nehre karışıyor.
Problemin asıl sebebi bu olmalı.

**Toprak neden balık populasyonuna zarar versin ki?**

**Keresteciler çok fazla miktarda toprağın nehre karışmasına nasıl sebep oluyorlar?**

Student Selects-1

**HALİL**
Ben olsam kerestecilerle ve balıkçılarla konuşurdum. Sana faydalı olacak bilgi verebilirler. Ama ne yazık ki hiçbiri de bizi çok fazla sevmez.
Bizim erişkin balıkları öldürdüğümüzü ve bu sebeple de balık sayısının azalmasından sorumlu olduğumuzu düşünüyorlar. Ama biz yıllardır aynı avlanma yöntemlerini kullanıyoruz ve balık sayısında meydana gelen bu azalma yeni bir olay.
Bence Altın Olta'ya gelen balıkçılar da bu işten sorumlu. Düzenledikleri yarışma balıkların yumurtlama zamanına denk geliyor ve onlar da anne balıkların ölümüne neden oluyorlar. Balıkları tutup tekrar nehre bıraktıklarını iddia ediyorlar ama yumurtalarını taşıyan bir balığın bu sarsıntıyı atlatabileceğini sanmıyorum. Sana bol şanslar.

# APPENDIX G

## STUDENT PERCEPTION QUESTIONNAIRE

Aşağıdaki sorular sizin Quest Atlantis ile yapılan uygulamaya yönelik görüşlerinizi almak için hazırlanmıştır. Sorulara verdiğiniz yanıtların ders notlarınıza olumlu/olumsuz etkisi olmayacaktır ve gizli tutulacaktır. Lütfen soruları dikkatli bir şekilde okuyarak cevaplayınız. (Ayşegül Bakar Çörez - Doç. Dr. Kürşat Çağıltay)

Adınız Soyadınız: …………………………………………

1. Sence Quest Atlantis'in olumlu ve olumsuz özellikleri nelerdir? (Lütfen üçer tane yazınız)

| <u>Olumlu</u> | <u>Olumsuz</u> |
|---|---|
| a. ................................................ | d. ........................................... |
| b. ............................................... | e. ........................................... |
| c. .............................................. | f. ............................................ |

2. Quest Atlantis ortamındaki **Kızılırmak Milli Parkı Araştırma Projesi**ni kolaylık/zorluk bakımından değerlendirir misin? Sence neden;

   kolaydı
   ...............................................................................................................................
   ...............................................................................................................................
   .........................................................................................................

   zordu.......................................................................................................................
   ...............................................................................................................................
   .........................................................................................................

3. Bu **proje** senin Fen ve Teknoloji dersine olan ilgini artırdı mı? Lütfen açıklayınız.

   ...............................................................................................................................
   ..................................................................................................................

4. Okul dışında da Quest Atlantis ortamına bağlanıp projeye devam ettin mi? Sebeplerini belirtir misin?

   ...............................................................................................................................
   ..................................................................................................................

5. Bu projede konuyla ilgili bilgi edindiğini düşünüyor musun? (Lütfen kendinize uygun olan bölümü yanıtlayın)

| Evet. Şunları öğrendim: | Hayır. Çünkü, |
|---|---|
| 1................................... | 1..................................... |
| 2................................... | 2...................................... |
| 3.................................... | 3....................................... |

6. Quest Atlantis oyunu size ilk tanıtıldığında, bu oyuna karşı düşüncelerin nasıldı? Yapılan proje sonrası bu düşüncelerin değişti mi? Lütfen açıklayınız.

.............................................................................................................................
.............................................................................................................................
.........................................................................................................

7. Bu projenin daha etkili olması için ne gibi değişiklikler yapılmasını istersin?

1.....................................................................................................................
2.....................................................................................................................
3.....................................................................................................................

8. Quest Atlantis'in diğer konularda/derslerde de kullanılmasını ister misin? Nasıl?

.......................................................................................................................
.......................................................................................................................
.......................................................

# APPENDIX H

## STUDENT INTERVIEW QUESTIONS FOR CASES 3 AND 4

Merhaba ................ Öncelikle bu görüşmeye zaman ayırdığın için teşekkür ederim. Biliyorsun TEGV'deki yaz etkinlikleri döneminde sizinle bir proje yürüttük. Bu görüşmede senin bu proje ile ilgili görüş ve deneyimlerini öğrenmek için sana çeşitli sorular yönelteceğim. Soruların doğru ya da yanlış cevapları yok. Benim için önemli olan senin görüşlerini ve düşüncelerini öğrenmek. Bu yüzden doğru ve açık yanıtlar verirsen çok sevinirim.

Başlamadan önce bana sormak istediğin herhangi bir şey var mı? Hazırsan başlayabilir miyiz?

**TEGV**

1. TEGV'e ne zamandır geliyorsun?
2. Buraya geliş amacın nedir?
3. Burada en çok neler yapmaktan hoşlanıyorsun?
4. Biliyorsun QA seçmeli bir etkinlikti. Senin bu projeye katılmayı tercih etmenin nedenleri neydi?
    a. QA'ye karşı ilk izlenimin nasıldı?
5. Hayat Bilgisi/Fen ve Teknoloji dersini sever misin?
6. Okulunuzda Hayat Bilgisi / Fen ve Teknoloji dersini genelde nasıl işliyorsunuz? Ders sırasında neler yapıyorsunuz? Bana biraz anlatabilir misin?
7. Bilgisayar oyunları oynuyor musun?

    [Evet]

    a. Nerede?
    b. Haftada kaç saat?
    c. Hangi oyunları oynuyorsun?
    d. Özellikle bu oyunları seçmenin sebepleri neler?
    e. Daha önce QA'ye benzer bir oyun oynamış mıydın?

    [Hayır]

f. Neden oynamıyorsun?

8. Quest Atlantis'in en çok beğendiğin özellikleri neler? (En az 3 tane)
    a. Peki beğenmediğin özellikleri neler? (En az 3 tane)
    b. Sence QA'de değişmesi gereken özellikler neler?
9. Bildiğin gibi TEGV'de yaz dönemi etkinlikleri kapsamında sizinle birlikte bir proje tamamladık. Bana burada yaşadığın deneyimi anlatırsın mısın?
    a. Yaptığımız proje okulda işlediğiniz derslerin gibi miydi? (veya) Proje sırasında kendini ders işliyor gibi hissettin mi?
        i. Sınıfta ders işlemekle QA'de ders işlemeyi karşılaştırır mısın?
        ii. Ne gibi farklılıklar/benzerlikler vardı?
            1. Görüşlerini sunmak, arkadaşlarınla iletişim kurmak, kendi başarın, konuya ilgi/merak (böyle bir oyun ortamını kullanmak senin Hayat Bilgisi/Fen ve Teknoloji dersine olan ilgini değiştirdi mi?)
10. Bu proje sırasında Hayat Bilgisi/Fen ve Teknoloji dersi ile ilgili bir şeyler öğrendiğini düşünüyor musun?
    a. (Evet) Neler öğrendin?
        i. Nasıl öğrendin? (prompts: benden, kendisi araştırma yaparken veya arkadaşlarından)
    b. (Hayır) Neden bu şekilde düşünüyorsun?
11. Sence bu projenin sana en büyük katkısı ne oldu?
12. Proje esnasında keşke bu da böyle olsaydı, o zaman daha güzel olurdu dediğin oldu mu?
    a. Sence bir değişiklik yapılması gerekir mi?
13. Projeyi tamamlarken ne tür bilgiler topladın?
        i. Karakterlerle görüşme, gözlem notları, su analizi, grafik, fotoğraf, kitap
    a. Balık ölümlerinin sebebiyle ilgili karar verme aşamasında hangi bilgileri kullandın?
    b. Neden o bilgileri kullanmayı tercih ettin?
    b. Okulda işlediğiniz Hayat Bilgisi/Fen ve Teknoloji derslerinde hiç bu tarz bir araştırma projesi yapmış mıydınız?
        i. [Evet] Detayları?
14. Bilgisayar oyunlarını kolay öğrenir misin? (Bir bilgisayar oyununu öğrenirken neler yaşarsın/hissedersin?)

15. Bilgisayarda neler yapmayı biliyorsun?
    a. Bilgisayarı açıp kapama, Internet, Office (sunu hazırlama, yazı yazma)
    b. Ödevlerini yapmak için İnternetten yararlanıyor musun?
        i. Araştırma yaparken neler yaşıyorsun?
        ii. Aradığını kolay bulabiliyor musun?
    c. Ödev yaparken kağıt kalem kullanarak yapmayı mı tercih edersin yoksa bilgisayar kullanarak yapmayı mı? Neden?
16. Bilgisayarda yeni bir şey öğrenirken neler hissediyorsun?
17. Bilimsel bir problemi çözerken (ve/veya) araştırma yaparken hangi adımları takip edersin?
    a. Not alır mısın?
    b. Veri toplar mısın?
    c. Toplanan verilerden kolay sonuç çıkarır mısın?
    d. Verileri grafik kullanarak ifade eder misin?
18. Burada size proje başlarken not almanız için kitapçıklar dağıttım. Çok sayfa olduğu için şikayet ettiniz. Neden?
    a. Okunması gereken yerler vardı. Okurken neler hissettin?
19. Proje esnasında zorlandığın oldu mu?
    a. Bu seni nasıl etkiledi?
20. Bu proje esnasında seni en çok heyecanlandıran ne oldu? (en çok zevk aldığın an/olay)
    a. Peki ya en az heyecanlandıran neydi?
        i. Proje esnasında sıkıldığın oldu mu?

Benim sorularım bu kadar. Son olarak senin eklemek istediğin herhangi bir şey var mı? Bana zaman ayırdığın ve görüşlerini benimle paylaştığın için teşekkür ederim.

# APPENDIX I

## STUDENT DEMOGRAPHIC QUESTIONNAIRE

Sevgili çocuklar, bu anket bilgisayar ve Internet kullanımına yönelik deneyimleriniz hakkında bilgi edinmek amacıyla geliştirilmiştir. Bu ankete vereceğiniz cevapların ders notunuza olumlu veya olumsuz bir etkisi **olmayacaktır**. Her maddeyi **dikkatlice** okuyarak, sizin için en **doğru** ifadenin bulunduğu kutuya **X** işareti koyunuz (örnek [ X ]).

**Ad:** ..........................................  **Soyad:**................................................

**Okulu:** ..............................................................................................................

**Kaçıncı Sınıfa Geçtiniz?** .........................................................................................

**Anket Soruları**

| | | |
|---|---|---|
| 1. Evinizde bilgisayar var mı? | [ ] Evet | [ ] Hayır |
| 2. Evinizde İnternet bağlantısı var mı? | [ ] Evet | [ ] Hayır |
| 3. Evinizde oyun konsolu var mı? (Örneğin Play Station, Nintendo, Atari) | [ ] Evet | [ ] Hayır |
| 4. Evde bilgisayar kullanıyor musunuz? | [ ] Evet | [ ] Hayır |
| 5. Okulda bilgisayar kullanıyor musunuz? | [ ] Evet | [ ] Hayır |

6. Kaç yıldır bilgisayar kullanıyorsunuz? (Lütfen belirtin) …………………………

7. Kaç yıldır İnternet kullanıyorsunuz? (Lütfen belirtin) ……………………………

8. Okul dışında İnternet'i ortalama hangi sıklıkta kullanıyorsunuz? (Sadece bir seçenek işaretleyin)

[ ] Hiç kullanmıyorum  [ ] Ayda birkaç kere

[ ] Haftada birkaç kere  [ ] Her gün

9. İnternet'e nereden bağlanıyorsunuz? (Birden fazla seçenek işaretleyebilirsiniz)

[ ] Bağlanmıyorum [ ] Evden

[ ] Okuldan [ ] Arkadaşımın bilgisayarından

[ ] İnternet Cafe'den

[ ] Diğer (Lütfen belirtiniz)..............................................................

10. Aşağıdaki bilgisayar yazılımlarından hangilerini kullanıyorsunuz? (Birden fazla seçenek işaretleyebilirsiniz)

[ ] Kelime işlemci (örnek Word) [ ] Hesap Tablosu (örnek Excel)

[ ] Sunum (örnek PowerPoint) [ ] Çizim programları (örnek Photoshop)

[ ] Bilgisayar Oyunları [ ] Diğer (Lütfen Belirtiniz)...................

11. Aşağıdakilerden hangilerini Internet'te kullanıyorsunuz? (Birden fazla seçenek işaretleyebilirsiniz)

[ ] E-posta (e-mail) [ ] Web (WWW)

[ ] Sohbet (Chat/MSN) [ ] Dosya indirmek (download)

[ ] Dosya yüklemek (upload) [ ] Tartışma grupları (Forum)

[ ] Tek başıma oyun oynamak [ ] Başkalarıyla birlikte oyun oynamak

[ ] Arama yapmak [ ] Müzik (MP3) indirmek

[ ] Video izlemek [ ] Film indirmek

[ ] Sosyal gruplar (örnek Facebook) [ ] Öğretmenlerimle görüşmek

[ ] Ev ödevlerimi yapmak

[ ] Diğer (Lütfen belirtiniz)...................................................................................

12. En çok oynadığınız 3 bilgisayar oyununun adını yazınız.

..........................................................................................................................................
..........................................................................................................................................
..........................................................................................................................................

13. Haftada ortalama kaç saat bilgisayar oyunu oynuyorsunuz?
...........................................................................

14. Neden bilgisayar oyunu oynuyorsunuz? Lütfen açıklayınız (Eğer oynamıyorsanız, oynamadığınızı belirterek bunun nedenlerini açıklayınız)

..........................................................................................................................................
..........................................................................................................................................
..........................................................................

15. Sizce iyi bir bilgisayar oyunun özellikleri nelerdir?

.........................................................................................................................
.........................................................................................................................
.........................................................................................................................

16. Eğitim amaçlı tasarlanmış bilgisayar oyunlarını da oynuyor musunuz? Oynuyorsanız hangi oyunlar olduğunu yazınız.

.........................................................................................................................
.........................................................................................................................
.........................................................................................................................

17. Tek kullanıcılı oyunları mı yoksa çok kullanıcılı olanları mı daha çok seviyorsunuz? Lütfen nedenini açıklayınız.

.........................................................................................................................
.........................................................................................................................
.........................................................................................................................
.......................................

*Anketi doldurduğunuz için teşekkürler*

# APPENDIX J

## TEACHER PERCEPTION QUESTIONNAIRE

Aşağıdaki sorular sizin Quest Atlantis ile yapılan uygulamaya yönelik görüşlerinizi almak için hazırlanmıştır. Ankete vereceğiniz cevaplar doktora tezi ve yapılacak akademik yayınlarda kullanılacaktır. Kişisel bilgileriniz saklı tutulacaktır.

Ayşegül Bakar Çörez - Doç. Dr. Kürşat Çağıltay

Adınız Soyadınız: ……………………………………………

1. Quest Atlantis oyun ortamını eğitsel materyal olarak değerlendiriniz. Sizce bu oyunun olumlu ve olumsuz özellikleri nelerdir?

   ..........................................................................................................................
   ..........................................................................................................................
   ..........................................................................................................................
   ..........................................................................................................................
   ...............................................................................................

2. Öğrencilerin Kızılırmak Milli Park projesi sayesinde Fen ve Teknoloji dersine yönelik kazanımları olduğunu düşünüyor musunuz? Lütfen açıklayınız.

   ..........................................................................................................................
   ..........................................................................................................................
   ..........................................................................................................................
   ..........................................................................................................................
   ...............................................................................................

3. Uygulamalar esnasında bazı öğrencilerin projeye karşı ilgisiz oldukları ve kendilerine verilen görevleri tamamlamadıkları görüldü. Bunun sebepleri sizce ne olabilir?

.......................................................................................................................
.......................................................................................................................
.......................................................................................................................
...................................................................................................

4. Daha sonraki yıllarda da bu ortamı derslerinizde kullanmak ister misiniz? Lütfen açıklayınız.

.......................................................................................................................
.......................................................................................................................
.......................................................................................................................
...................................................................................................

5. Bu tür uygulamalarda branş öğretmeni olarak nasıl bir rol almak istersiniz?

.......................................................................................................................
.......................................................................................................................
.......................................................................................................................
......................................................................................................

6. Branş öğretmeni olarak bu uygulamanın derslere entegrasyonu ve iyileştirilmesine yönelik önerileriniz nelerdir?

.......................................................................................................................
.......................................................................................................................
.......................................................................................................................
......................................................................................................

# CURRICULUM VITAE

## PERSONAL INFORMATION

Surname, Name: Bakar Çörez, Ayşegül

Nationality: Turkish (T.C.)

Date of Place and Birth: 30 June 1980, Ankara

Marital Status: Married

Phone: +90 533 3914221 (GSM)

email: aysegul.bakar@gmail.com

## EDUCATION

| **Degree** | **Institution** | **Year of Graduation** |
|---|---|---|
| Ph.D. | METU – Comp. Edu. & Ins. Tech. | 2011 |
| BS | Ankara U. – Comp. Edu. & Ins. Tech. | 2002 |
| High School | Kurtuluş High School | 1997 |

## FOREIGN LANGUAGES

Advanced English

**PUBLICATIONS**

## Journal Papers

Baran, B., Kilic, E., **Bakar-Corez, A.**, Cagiltay, K. (2010). Turkish University Students' Technology Use Profiles and Their Thoughts about Distance Education. The Turkish Online Journal of Educational Technology, 9(1), January, 2010.

Steinkuehler, C., King, E., Chu, S., Alagoz, E., **Bakar-Corez, A.**, Simkins, D., Oh, Y & Zhang, B. Identifying Protoform Practices: Leadership. International Journal of Learning and Media, 1(2), June, 2009

**Bakar, A.**, Tüzün, H., & Çağıltay, K. Öğrencilerin eğitsel bilgisayar oyunu kullanımına ilişkin algıları: Sosyal bilgiler dersi örneği. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 35, pp. 27-37, 2008

Kılıç, E., Baran, B., **Bakar, A.** & Çağıltay, K. "Üniversite öğretim üyelerinin Internet Üzerinden Eğitim konusundaki görüşleri". Eğitim araştırmaları. 6(22), pp.159-165, 2006

## Conference Papers

**Bakar-Corez, A.,** Tuzun, H. & Cagiltay, K. Use of Educational Games in Classroom: Challenges and Barriers. Accepted paper to be presented in IODL & ICEM-2010 to be held in Eskisehir, Turkey, October 6-8, 2010.

Steinkuehler, C., King, E., Alagoz, E., Oh, Y., Chu, S., Zhang, B., **Bakar, A.**, & Martin, C. (2010). Using a designed online games based affinity space as a quasi-natural ethnographic context and experiment lab. In K. Gomez, L. Lyons, J. Radinsky (Eds.) Learning in the Disciplines: Proceedings of the 9th International Conference of the Learning Sciences (ICLS 2010) Volume 2, Short Papers, Symposia, and Selected Abstracts (pp. 330-331). International Society of the Learning Sciences: Chicago IL.

Steinkuehler, C., King, E., Simkins, D., Alagoz, E., Chu, S., Oh, Y**, Bakar-Corez, A.**, & Zhang, B. After-School Online Gaming Lab for Guys. Games+Learning+Society Conference - GLS 2009, June 10-12, Madison, WI - USA

**Bakar, A.** & Kocaman-Karoglu, A. "İlköğretim Branş Öğretmenlerinin Derslerinde BDE Uygulamalarından Yararlanma Durumlarının İncelenmesi" 2nd ICITS International Computer & Instructional Technologies Symposium, 16-18 April 2008, Kusadasi, Turkey

Kursun, E., **Bakar, A.**, Gurer, M. D. "Modeling technology use in teacher training programs: A case of a faulty of education". 2nd International Open and Distance Learning (IODL) Symposium, Anadolu University, Eskisehir, Turkey, September 2006

**Bakar, A.** & Cagiltay, K. "Evaluation of Children's Web Sites: What Do They Prefer?" ED-Media, 2006, Orlando

**Bakar, A.**, Inal. Y. & Cagiltay, K. "Use of Commercial Games for Educational Purposes: Will Today's Teacher Candidates Use them in the Future?" ED-Media, 2006, Orlando

**Bakar, A.**, Inal. Y. & Cagiltay, K. "Interaction Patterns of Children while Playing Computer Games". ED-Media, 2006, Orlando

Baran, B., Kilic, E., **Bakar, A.** & Cagiltay, K. "Turkish University Students: How Do They Use Technology And What Do They Think About Distance Education?", AECT convention in october, Orlando, Florida, USA, 2005

Cagiltay, K., **Bakar, A.**, Baran, B., Kilic, E. "Üniversite Öğretim Üyelerinin İnternet Üzerinden Uzaktan Eğitim Konusunda Görüşleri", New Information Technologies in Education 2nd International Workshop, Dokuz Eylül University, Izmir, Turkey, NITE'2004