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163

Ahmer Iqbal

Facilitating the Use of Virtual Worlds in Schools

JYVÄSKYLÄN YLIOPISTO

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ABSTRACT

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Virtual worlds have grown in popularity recently and thus have been able to gain attention of many researchers and educationists as well. Despite that many educationists believe that virtual worlds could be a beneficial educational technology, it has not been widely implemented in schools. This dissertation seeks to explore the issues related to facilitating the use of virtual worlds in schools. There are two main goals in this dissertation. First goal is to identify the participatory practices of the participants in virtual worlds which can be informed to the educationists so that they can use appropriate participatory practices according to their needs. Secondly, the issues that teachers and administrators need to consider in facilitating the use of virtual worlds in schools including the choice of different instructional delivery methods.

The dissertation consists on an introduction or summary and a collection of six articles. First four articles help in identifying the participatory practices. Fourth article also contributes to the second goal as well as the fifth and sixth articles. Sixth article compares different instructional delivery methods. During this research, participants from five Finnish and a Pakistani school participated during different phases. In this research mostly mixed-methods were used.

The dissertation builds upon a thorough literature review and results obtained from the research to identify the participatory practices and generate recommendations that educationists need to consider in facilitating the use of virtual worlds in schools. A framework of educational facilitation in virtual worlds is suggested. The dissertation also includes a discussion on the process of facilitation of virtual worlds in schools.

Finally, this dissertation recommends some future research areas and directions to further the cause of facilitating the use of virtual worlds in schools.

Keywords: virtual worlds, multi-user virtual environments, educational technology, e-learning

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No wonder, writing the acknowledgment is the most difficult part of writing a thesis as the emotions are so high. Anyway, in the end I hope this sets me on a new journey of new discoveries and may help me in working to get rid of illiteracy in my country, Pakistan. The script in Urdu at the end is from the national poet of Pakistan, Allama Muhammad Iqbal, which can be roughly translated as follows:

In this age, education is the cure for nations' maladies,
education is like a lancet for the diseased blood"
-Allama Muhammad Iqbal

اس دور میں تعلیم ہے امراضِ ملت کی دوا ہے خونِ فاسد کے لیے تعلیم مثلِ نیشتر

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Ahmer Iqbal

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PII Tuukkanen, T., Iqbal, A. & Kankaanranta, M. (2010). A framework for children's participatory practices in virtual worlds. Journal of Virtual Worlds Research, 3 (2).

PIII Tuukkanen, T., Wilska, T. A., Iqbal, A. & Kankaanranta, M. Virtual worlds as children's participatory media: children's participatory practices in virtual worlds. Submitted to New Media & Society journal.

PIV Iqbal, A., Kankaanranta, M. & Neittaanmäki, P. (2010). Engaging learners through virtual worlds. Procedia Social and Behavioral Sciences, 2 (2), 3198-3205.

PV Iqbal, A. 2012. Facilitating exploratory learning in schools through virtual worlds: experiences from a course run at a school. In Proceedings of Cognition and Exploratory Learning in Digital Age (CELDA-2012), Madrid, Spain, 221-228.

PVI Iqbal, A., Kankaanranta, M. & Neittaanmäki, P. Accepted. Facilitating exploratory learning in schools through virtual worlds: a look at instructional delivery methods and facilitation process. Accepted for 2nd International Conference on Education and Management Innovation (ICEMI 2013), Rome, Italy.

1 INTRODUCTION

"If we examine our history deeply, it will reveal that we have given foremost praise to knowledge and the knowledgeable in every era. One of our greatest historians, Ibn Khaldun, writes that if a society appreciates knowledge and the knowledgeable then its greatness and magnitude cannot be doubted. On the contrary, the societies which ignore their knowledgeable and do not appreciate knowledge have never been crowned as mighty ones."

-Hakim Muhammad Said (1920-1998)
An approximate translation from Urdu to English by Ahmer Iqbal

Humans have achieved remarkable progress over the centuries and the engine of this progress has been the curiosity to gain and accumulate knowledge. Today no society or nation can proceed and get developed without engaging in the pursuit of knowledge, so much so that most of the economies of the developed nations are considered to be knowledge economies. Due to this high impact of learning, every nation, especially developed ones, have tried to create institutions of knowledge acquisition that are known to us as schools, colleges and universities. However, even as humans made groundbreaking discoveries in a variety of disciplines at these institutions, the schools and their approach to learning changed very little. Even the advent of recent technological advancements, especially computers and internet, were not embraced at schools as it should have. Their usage at school level has improved considerably especially in developed nations but the progress is still far from satisfactory.

With computers came computer and video games which engaged the young ones and adults alike for hours. Educationists saw in these games a potential tool for learning, but society was not ready to bring play and learning together in this manner in the school environment. It took a long time, but all of the research done on the topic of game-based learning indicates an upswing in interest.

Due to the increase in processing power of computers and improvements in graphics technology, virtual worlds have emerged on the computer scene.

They started as text-based worlds and have become realistic environments over the years. Graphic virtual worlds are not very old, but their potential for education is immense.

1.1 Significance of the research

Virtual worlds are becoming very popular, especially for those who are younger than 25 years as they constitute 97% of the registered accounts (KZero Q1 Universe Chart, 2012). Total commutative registered accounts in virtual worlds have exceeded 1921 million accounts by the end of 1st quarter in 2012 according to the latest 'Universe chart' by KZero (KZero Q1 Universe Chart, 2012). Approximately 60% of these accounts belong to users younger than 15 years old that are school-aged children. Top four virtual worlds are Habbo (265 million registered accounts as of Q1 2012), Poptropica (225), Stardoll (200) and Club Penguin (170) (KZero Q1 Universe Chart, 2012) as is shown in Table 1. These all are two-dimensional virtual worlds and the user's average age is between 11 and 16 years. This means a large number of school-going children use and engage in these virtual worlds and if we can use them for education they may yield engaged and entertained learners.

TABLE 1 Top four virtual worlds.

Rank	Name of virtual world	Average age group	Population at the end of first quarter of 2012 in millions
1	Habbo	15–16 years	265
2	Poptropica	9-10 years	225
3	Stardoll	14–15 years	200
4	Club Penguin	11–12 years	170

Most of the research that has been carried out on the educational use of virtual worlds has been targeted at students older than school age or the research has been limited to mainly three-dimensional virtual worlds – for example, Second Life, Quest Atlantis and River City. Most of the knowledge about the use of virtual worlds in education has so far been reported either in informal publications, including online blogs and websites, or is carried out in non-academic settings (de Freitas, 2008).

A technical report produced for the guidance of European Commission which was released after a workshop and provided a vision of future learning by 2020, predicted that immersive environments and simulated worlds could be an important part of future 'Information and Communications Technology'(ICT)-based learning environments (Punie & Cabrera, 2006). After seven years the vision is not realized and it seems much needs to be done to realize that vision. There is a need to enquire about the features students would like to see, and the activities they would like to engage in, while immersed in these

virtual worlds. It is also necessary to investigate how schools could in them and activities they would like to indulge and engage in and how schools could integrate these environments into their conventional system.

Thus, there is a gap of research which needs to be bridged to bring virtual worlds to schools. The research should not only focus on learning gains and engaging techniques but shall also investigate the facilitation problems in schools.

More detailed account of the research goals, questions and methods used are laid down in detail in chapter three of the thesis. However, I briefly present the goals of the research in the following section.

1.2 Research goals in brief

The overall main goal of this thesis is to inquire how to facilitate the use of virtual worlds in schools. In order to achieve this goal, it was important to answer two main research questions, which are as follows:

1) "What makes a virtual world engaging, and entertaining? What are the participatory practices in virtual worlds?"

2) "What are the issues that teachers and administrators need to consider in facilitating the use of virtual worlds in schools?"

A sub-goal of the abovementioned goal was to look at the instructional delivery methods that can be used to achieve the above mentioned goal.

"Which instructional delivery methods, teaching methods, can be used to implement virtual worlds into classrooms? Which one is best in terms of learning gain and student satisfaction?"

In order to research the abovementioned questions, an approach to research the topic was needed, which is briefly presented next.

1.3 Approach

It was realized at the beginning of the research that there are mainly two approaches that can be taken to research the topic. One way was to look at educational theories and then adopt virtual worlds according to that. This approach has generally been used for educational games and has resulted in less engaging games. Most of the educational games have failed because they are considered as boring (Bellotti et al., 2009). Another thought was to take the route that

is championed by Gee (2003, 2007) and agreed by Prensky (2005) and De Maria (2007). That is first try to explain what players learn from existing video games. Many researchers may argue that much has changed recently and educational games are becoming more engaging.

I realized that there is a need to address the problem from both strategies. As a result, children's experiences and motivations in using virtual worlds shall be looked at. Their participatory practices in virtual worlds should be investigated. These participatory practices can inform the teachers about the preferences of their students in virtual worlds and the teachers could use them to engage students where ever suitably possible.

To research the participatory practices and experiences of school-aged participants in virtual worlds, three studies were conducted at schools. The first study resulted in article PI and this study was conducted with lower secondary students at a Finnish school. In this study data was collected through questionnaires, interviews and observation of user sessions. In another study at two Finnish schools which resulted in PII, 126 students answered an online survey. The survey had three main parts: one about their general background; second one about virtual world usage; and third about their participation in virtual worlds. In the third study which resulted in PIII, students of two Finnish schools participated in group interviews. A study was conducted at a Pakistani school where children learned with three different instructional delivery methods involving virtual world. This study resulted in two articles, PV and PVI. All these studies that were conducted at schools are explained in section 3.4 in more detail.

On the other hand, a comprehensive literature review about the use of virtual worlds in education shall be accompanied to understand the field better. This literature review is part of each of the research papers attached with this thesis, and additional background literature and review is presented in chapter 2.

Over the course of this research, many virtual worlds and games were used, or played, by me to attain a better understanding of them. Finally, the instructional delivery methods and problems of integrating virtual worlds in schools were researched.

1.4 Structure of the thesis

This thesis consists of six chapters and the six papers that are included at the end of the document. In the first chapter, an introduction to the research is laid through establishing the significance of the research and briefly introducing the goals of the research and the research approach. The second chapter presents a literature review to establish the background of the research using literature from virtual worlds as an educational technology medium. The research approach is explained in the third chapter where the research goals and questions are presented, as well as the research methods that have been used to examine

them. The overviews of the papers included in this thesis are presented in chapter four. In chapter five, the findings of the research are discussed and a framework of educational facilitation in virtual worlds is presented. Last chapter concludes the thesis by establishing the contribution of this research and suggesting future research directions.

2 BACKGROUND OF THE RESEARCH / LITERATURE REVIEW

In this chapter a background review is presented through relevant literature. The focus will be on virtual worlds and their use in school level education. There is a considerable amount of literature available on the use of virtual worlds in general, but not all of it is relevant to the context of this dissertation.

The chapter starts with a definition of virtual world for this dissertation. Then, a brief overview of research on virtual worlds is presented. Following that, different aspects of virtual worlds in education are discussed through looking at: their affordances for learning; learning gains achieved through them; engagement of learner; teacher's perspective about them; and the obstacles of using them in education.

2.1 Definitions of virtual worlds for this dissertation

The term 'virtual' is used in many ways these days in research and academic settings as well as in the media, and most of the time this results in confusion. Moreover, there is no universally agreed upon definition of virtual worlds (Bell, 2008) which results in misunderstanding. Here a definition of 'virtual worlds' and multi-user virtual environments (MUVEs) is presented to avoid any misunderstanding in this thesis and perhaps this definition could be a small step towards clarrification and standardization in terms of defining virtual worlds.

Initially, the term 'virtual environment' was mostly defined using sensory aspects. For example, Schroeder (1996) defined the term 'virtual environment' or 'virtual reality' as follows:

> "a computer-generated display that allows or compels the user (or users) to have a sense of being present in an environment other than the one they are actually in, and to interact with that environment".

This definition is quite broad and could be used to refer to many technologies. Mostly, this sort of definition was used to refer to immersive virtual reality technologies such as immersive Head-Mounted Displays (HMDs) or cave-like environments where the whole user is in a room in which all walls are projected with a display resulting in a feeling of immersion. Later, Shroeder (2006) redefined the term as 'shared virtual environment (SVE)' in which 'shared' meant sharing of, or co-presence in, the same environment by many users. This can also be termed as 'Multi-User Virtual Environments (MUVEs)'.

Before establishing a definition of MUVEs it is very important to make a distinction to the term 'virtual environment' in the field of educational sciences. In educational sciences, the term 'virtual environment' largely refers to online, internet or intranet-based, tools and resources, and when these tools and resources are used for learning then they are called 'virtual learning environment' (VLE) as is defined by Hiltunen (2010, page 21) in her doctoral thesis:

> "Virtual learning environment (VLE) is defined as a set of online tools and resources that facilitate various aspects of the online education experience, including communication, assessments, and content sharing."

These environments can have many synchronously connected users as well which can make one confuse these environments with MUVEs. In this thesis, the MUVEs will always be referred as three-dimensional or two-dimensional graphical environments where: users are represented as avatars; users can be present simultaneously; users can interact with each other and with the environment; and the environment is persistent which means it exists even after a user has logged-out of it. River City (RC) team calls it a MUVE while a similar environment known as Quest Atlantis (QA) avoids the term MUVE and refers to it as a virtual world or just an educational game. In this thesis, online, internet or intranet-based, educational environments such as websites, databases and communication technology will be referred to as virtual learning environments (VLEs) as per the definition provided by Hiltunen (2010) and as is used in the educational sciences field, to avoid any confusion.

Bell (2008) has defined virtual worlds inferring from previous definitions provided by Bartle (2003), Koster (2004) and Castronova (2005). He, Bell (2008), defines as follows:

> "A synchronous, persistent network of people, represented as avatars, facilitated by networked computers"

According to this definition, NeverWinter Nights, Second Life, World of Warcraft, Habbo and other similar environments are virtual worlds. However, this definition includes many of the game-worlds as well. There are researchers (e.g. Spence, 2008; Steinkuehler & Williams, 2006), who state that virtual worlds are essentially non-game spaces where games can be part of them but are not the defining characteristic of a virtual world (Iqbal et al., 2010). KZero maintains

the same views as it publishes two different charts: 'Universe Chart' for virtual worlds (KZero Q1 Universe Chart, 2012); and 'RPG Galaxy Chart' for role-playing games (RPGs) and it includes game-based virtual worlds like World of Warcraft (KZero RPG Galaxy Chart, 2012). De Freitas (2006, 2008) uses the term 'immersive worlds' as well and has divided these immersive worlds into five categories which are: role play worlds; social worlds; working worlds; training worlds; and mirror worlds. These categories seem to be derived from how a virtual world is used and such categorization could be controversial.

I agree with the distinction between RPGs and virtual worlds and for the purpose of this thesis exclude gameworlds as virtual worlds. Thus, the definition provided by Bell (2008) excluding game-worlds is used to define virtual worlds. In this thesis, virtual worlds (VWs) and multi-user virtual environments (MUVEs) refer to the same technology. Whenever one of the terms, virtual worlds (VWs) or multi-user virtual environments (MUVEs), appear it will also mean the other as well.

2.2 Brief overview of overall research on virtual worlds

Virtual worlds have received significant attention in the last decade and many famous writers, game designers and researchers have investigated them. The work of Richard Bartle on 'multi-user dungeons' (MUDs) was instrumentally significant in bringing us to virtual worlds. 'MUD1' was the first role-playing game to be played by several users on the internet in 1981. Since then he has continued his work on MUDs and on virtual worlds. Bartle's book 'Designing virtual worlds', was launched in 2003, became one of the most initial comprehensive books on the subject. Since then, the bulk of the research on virtual worlds has focused on: technical and design issues; applying virtual worlds to different domains; and investigating the effect of virtual worlds.

Current virtual worlds were made possible due to technological and design related research, as well as advancements in computers and graphical processing. Much of the technological advancement in video games and virtual reality were directly applicable in implementing virtual worlds. Technological aspects were mostly related to: the graphical processing (e.g. Sreng et al., 2007; Cheng et al., 2007); avatar rendering (e.g. Jung & Knöpfle, 2006); building communication capabilities (e.g. Verhulsdonck, 2007; Zimmermann & Liang, 2008); defining interaction possibilities in the virtual space (Hendriks et al., 2003); navigation (e.g. Deusdado et al., 2008); and integration of other web technologies (e.g. Giannopoulos et al., 2007; Menchaca et al., 2005). The rise of 'Adobe Flash', formerly named as 'Macromedia Flash', made it possible to create browser based virtual worlds easily and quickly.

Virtual worlds have been used in many fields and researchers have studied aspects of them. For example, Castronova (2001, 2002 & 2003) started enquiring about virtual economies quite early. Bloomfield (2009) and Bloomfield & Rennekamp (2009) have recently looked into the business and finance side of

virtual worlds. On the other hand, Kafai et al. (2008), Fields & Kafai (2009) and Kafai & Fields (2009) has explored learning and knowledge creation and gender related divide in virtual worlds.

Hew and Cheung (2010) reviewed the research conducted on the use of virtual worlds in education. They found that 69% of the studies were conducted at university or polytechnic level, 19 % at secondary schools and only 12% on primary level.

Second Life is the most researched virtual world despite being not the one with most users. The reason could be that it is a three-dimensional virtual world with better graphics and user-driven in-world building process which means most of the virtual world creations in Second Life are created by its users. This provides flexibility to the users and to the researchers to test and research different ideas.

2.3 Virtual worlds in education

A review of literature is presented below which looks at different aspects of using virtual worlds in education especially at school level. A look at learning gains, student engagement and teacher's perspective are presented. In the end, the hindrances and obstacles of using them at schools are presented. This section starts with the affordances of virtual worlds for education.

2.3.1 Affordances of virtual worlds for education

Affordances of a technology are defined as intrinsic features of that technology (Gibson, 1986). Although the affordances of a technology could be perceived in advance as the ones for which the technology is developed and on the other hand there could be some hidden affordances that were not perceived at the time of the inception of technology. Some of these affordances become apparent during the use of technology. For example, refrigerators were designed to keep the food fresh for longer times by keeping it cool. Later, people found out a hidden affordance of it and that was that it can also be used as a notice board by using magnets. Similarly, virtual worlds may not have been designed primarily as educational spaces, but more and more educationists are pointing out their affordances for learning. However, there is a need that the features or properties of the technology should efficiently support the actions taken by the users of virtual worlds (Nardi & O'Day, 1999). In the case of virtual worlds, the educationists may have to tailor the technology to make it suitable to be used in educational contexts. 'The Assessment and Teaching of 21st-Century Skills' (ATC21S) research project divides the 21st century skills into four broad categories which are: (1) 'ways of thinking' which includes creativity, critical thinking, problem-solving, decision-making and learning; (2) 'ways of working' which focuses on communication and collaboration; (3) 'tools for working' which means information and communications technology (ICT) and information lit-

eracy; and 'skills for living in this world' which focuses on citizenship, life and career, and personal and social responsibility (ATC21S, online). The perceived affordances of virtual worlds can be categorized according to these four categories as is shown in Table 2. Experiential learning, exploratory learning, simulation and visualization based learning, distance learning and storytelling-based learning can be termed as different ways of learning which are part of the 'ways of thinking' category in ATC21S and could foster creativity, critical thinking and problem-solving. Collaboration and communication are very essential 'ways of working'. Virtual worlds could be, at least partly, a 'tool of working' as they can blend virtual and real situations and it could be a tool to teach about information and game literacies. Identity development, and social, cultural and community related skills are very important for living in this world.

TABLE 2 Affordances of virtual worlds according to 21st century skills.

ATC21S Category	**Virtual World Affordance**	**Description of Affordance**
Ways of thinking: Creativity, critical thinking, problem-solving, decision-making and learning	Experiential learning	Hew & Cheung, 2010 think that virtual worlds can be used for experiential learning. The users can learn by experiencing the information as compared to just reading text (Chow, Andrews & Trueman, 2007).
	Exploratory learning	Since virtual worlds are exploratory in nature, one could implement exploratory methods of learning in them as Quest Atlantis does.
	Simulation and visualization based learning	Virtual worlds can be used as a simulation space. It could be too costly to produce or reproduce content and context as compared to virtual worlds or MUVEs (Warburton, 2009). The users can get the feeling of being immersed in the simulative space (Hew & Cheung, 2010).
	Distance learning	Many universities are already running some courses in Second Life and at the moment there are some positive results about it. Virtual worlds do have the potential to be a one of the platform in distance learning.

	Learning through narration and story telling	Barab et al. (2007a) believe that virtual worlds can be used to engage learners in narration. Storytelling is an engaging way to engage learners and virtual worlds could be an effective way of storytelling (Robertson et al., 2008).
Ways of working: Communication and collaboration	Collaborative participation	Virtual worlds can be used for collaboration in which the learners can help each other in learning the skills to use it (Barab et al., 2007a) or engage in collaborative learning.
	Communication affordances	In order for the collaboration to succeed in a virtual world there shall be strong communication and it is seen as an affordance by Hew & Cheung (2010), Stoerger (2010). Embedded chat is mostly used in virtual worlds to communicate. However, some virtual worlds like Second Life and Active Worlds do support voice chat as well which may result in richer communication. Another aspect is to look virtual worlds as a platform to teach about communication disciplines.
Tools for working: information and communications technology (ICT) and information literacy	Virtual worlds as gamepads	It is rather easy and cost effective to make games using virtual worlds and it could be a means of information literacy. This is has resulted in Quest Atlantis and River City. They used the virtual world of Active World and created their own game-based learning virtual world.
	Blending between virtual and real worlds	The virtual worlds can bridge the gap between physical and virtual spatial metaphors (Stoerger, 2010; de Freitas, 2008). The working places of

		the future could require users to work both in a virtual space and a real space.
Skills for living in the world: Citizenship, life and career, and personal and social responsibility	Identity-development	Learners can take on different identities in virtual worlds through their avatar (Barab et al., 2007a; Warburton, 2009) (Hollins & Robbins, 2008). This identity play can be individual and collective (Warburton, 2009) and could lead to helping a learner in making career choices.
	Social and community related skills	Virtual worlds can provide a sense of community (Hollins & Robbins, 2008), togetherness or belonging to a learning group (Warburton, 2009; de Freitas, 2008). It can also result in rich social interaction among the group or individuals (Stoerger, 2010).
	Learning about different cultures	Experiencing the cultural diversity of human beings is very costly and impossible but with the use of virtual worlds different cultures can be learnt about comparatively cheaply. In virtual worlds or MUVEs, there are already people from around the world and all these people connect to make it a rich cultural learning environment (de Freitas, 2008). In the global world the understanding of different cultures could be very important.

Most of the above mentioned perceived affordances of virtual worlds have already been explored by many researchers. A brief account of each affordance and some exemplary research is presented in Table 3. Some of the affordances from Table 2 are missing as those affordances are not researched significantly. For example, learning based on storytelling in virtual worlds is not researched significantly and further research needs to be done to realize virtual world's potential for this affordance. Similarly, there is a need to do more research how

virtual worlds can blend between virtual and real worlds. One example could be of SLACTIONS (Slactions, online) conference which was held in 2009, 2010, 2011 and 2012. This research conference takes place simultaneously in several physical real world locations and in Second Life.

TABLE 3 Affordances of virtual worlds which have been researched.

Affordances of virtual worlds which are researched	**Exemplars (Name of the paper and reference)**
Experiential learning	Teaching ethical theories through virtual experiences (Houser et al., 2011); Virtual world teaching, experiential learning, and assessment: an interdisciplinary communication course in Second Life (Jarmon et al., 2009);
Exploratory learning	The whole learning process in Quest Atlantis and River City was exploratory in nature.
Simulation and visualization based learning	Simulating geriatric home safety assessments in a three-dimensional virtual world (Andrade et al., 2012); Policy game, online game-simulated: applying the ecology of policy game to virtual world (Park, 2012); Millikan's Oil-Drop Experiment: a centennial setup revisited in virtual world (Gagnon, 2012); Preparing graduate students for virtual world simulations: exploring the potential of an emerging technology (Hewitt et al., 2009);
Distance learning	Real learning in a virtual world: A case study of the school of Information Studies Learning Centre in Second Life (Hay & Pymm, 2011); Virtual worlds and course dialogue (Tapsis et al. 2012); Virtual worlds in distance education: a content analysis study (Wang & Lockee, 2010); Development and evaluation of a virtual campus on Second Life: the case of SecondDMI (De Lucia et al. 2009); Professor avatar: in the digital universe of Second Life, classroom instruction also takes on a new personality (Foster, 2007);
Collaboration	Virtual worlds for language learning: from theory to practice. (Sadler, 2012); Towards a research agenda for the use of three-dimensional virtual worlds in language learning (Peterson, 2011); Supporting distributed team working in 3D virtual worlds: a case study in Second Life (Minocha & Morse, 2010); Pre-service teachers in Second Life: are digital natives

	prepared for a Web 2.0 experience? (Inman, 2010); A statewide university system (16 campuses) creates collaborative learning communities in Second Life (Eaton et al. 2011); Identifying an appropriate pedagogy for virtual worlds: a communal constructivism case study (Girvan & Savage, 2010)
Communication affordances	Design and implementation of a 3D multi-user virtual world for language learning (Ibanez et al., 2011); Virtually endless possibilities for business communication (Jennings, 2010); Interacting through avatars: virtual worlds as a context for online education (Petrakou, 2010);
Virtual worlds as gamepads	Quest Atlantis; River City; There are about 46 gaming destinations in Second Life (Second Life Destination Guide, online); Using the virtual world of Second Life to create educational games for real world middle school science classrooms (Cooper et al., 2009);
Identity-development	Presenting identity in a virtual world through avatar appearances (Neustaedter & Fedorovskaya, 2009); Identity formation, learning styles and trust in virtual worlds (Junglas et al., 2007);
Social and community related skills	The virtual campus of the future: stimulating and simulating civic actions in a virtual world (Bers & Chau, 2010); A statewide university system (16 campuses) creates collaborative learning communities in Second Life (Eaton et al. 2011);
Learning about different cultures	From the virtual world to the real world: a model of pragmatics instruction for study abroad (Shively, 2010); Cultural competency instruction in a 3D virtual world (Steed, 2009).

However, one must keep in consideration that all of these learning affordances may or may not come into practice at once. Thus, it depends on the learner's and teacher's goals and the needs of the situation in which learning takes place. It must also be noted that some of these affordances will be more valid in three-dimensional virtual worlds than in two-dimensional virtual worlds and even than it depends on the functionalities of the virtual world that is used for education.

The effect of learning can be measured in many ways but the educationists specifically emphasize on the learning gains that can be measured statistically especially in United States of America standardized tests are big business. It

may not be most effective way but given the importance that is given to these learning gains, it is important to convince that learning through virtual worlds could result in significant learning gains. That is the next topic in this chapter.

2.3.2 Learning gains

Learning gains in virtual worlds at school level is not a very widely researched topic. Most of the research carried out on learning gains using virtual worlds revolves around Quest Atlantis, River City and Second Life. River City is not online anymore and Second Life is only for 16 years and older which makes it only suitable for higher secondary school level and leaves only Quest Atlantis available for schools at secondary and primary level. A large number of virtual worlds, especially the most populated ones, have not been researched much at all. They could have enormous potential for learning.

The team of Quest Atlantis has shown more learning gains through Quest Atlantis than traditional teaching methods as is summarized by Iqbal et al. (2010) (PIV). An overview of these classroom comparison studies is also available online (Quest Atlantis learning gains, online). The learning gains have been reported across many subjects such as language arts, science, mathematics/statistics and social studies. The students showed significant learning gains from pretest to posttest in a persuasive writing study through Quest Atlantis (Barab et al., 2010, 2008) and in essay writing class (Barab et al., 2007b) or in using narratives (Barab et al., 2005a). Similarly, higher learning gains on a standardized post-test than in the pre-test in a 4th grade elementary science study with Quest Atlantis was reported (Barab et al., 2007d). On standard item tests as well the Quest Atlantis students performed better than the direct instruction group (Barab et al., 2007c). Higher learning gains were also shown by the two classes that learned through Quest Atlantis than the traditional classes in the research carried out by Hickey et al. (2009) with 6th grade students in science learning. However, the gains were not very significant. In a study conducted by Iqbal et al. (Accepted) (PVI) using the same unit in Quest Atlantis, 'Taiga: water quality unit', the gains were significant in the instructional delivery method where students indulged in group-discussions in class and used Quest Atlantis in computer labs. The learning gains were also almost statistically significant when the students were taught by teacher in class and used Quest Atlantis in computer labs. Arici (2008) not only showed higher learning gains but also better content retention in the Quest Atlantis group. Warren and Dondlinger (2008) reported better standardized scores in writing tasks as well and they also found that teachers had to spend less time in answering directional questions using Quest Atlantis and students completed more voluntary writing tasks than a comparison group.

It is not encouraging that River City is not available anymore as it could have been a very valuable MUVE for education at the school level. Ketelhut et al. (2005) reported a significant learning gain in students learning biology through River City which was higher than those students who studied with traditional methods. Similarly, significant gains were achieved in post-tests of

another biology study when students learned through guided inquiry and in-class interpretation (Ketelhut et al., 2007). This method of teaching, that is learning through a mix of guided inquiry and teacher led in-class interpretive sessions, has also occurred in another study (Ketelhut et al., 2006a).The other two implementations, one with expert agents embedded in River City and the other based on community of practice, showed no significant gains (Ketelhut et al., 2006a). A significant gain in post-tests was also found in lower ability students (Dede et al., 2004). However, the results were inconclusive in a museum-based study of River City (Dede & Ketelhut, 2003). Girls generally performed better than boys in River City and the difference was insignificant as compared to the traditional class (Ketelhut et al., 2006b). One interesting finding has been that students who increase their self-efficacy also show higher gains in science learning (Clarke et al., 2006).

Significant learning gains have also been reported in geography learning in a MUVE and the learning gain was significantly greater than with the students of a traditional class (Tuzun et al., 2009). Tentative learning gains were also shown by 8th grade science students using a game made in Second Life (Bilyeu, 2007, Cooper et al., 2009).

Thus it can be inferred that significant learning gains can be achieved through virtual worlds if they are implemented and integrated into curriculum properly and right instructional delivery methods are used. It shall be emphasized that more research is needed about learning gains in two-dimensional virtual worlds, such as Habbo, Stardoll, Club Penguin and Poptropica, as they are more popular among school age learners.

2.3.3 Engagement

A combined definition of engaged learning was developed during this research through relevant literature review (e.g. Kearsley & Shneiderman, 1998; Newmann et al., 1992; Jones et al., 1994; Willms et al., 2009; Hudly et al., 2003; Ott & Tavella, 2009; Barab et al., 2005a). According to this definition engaged learning is one in which: the learner himself/herself is very active in the learning process; requires cognitive investment; involves socio-collaborative learning; improves behavior of the learner towards learning; and makes learner emotional about the learning process (Iqbal et al., 2010). These aspects of engagement have been described appropriately by (Iqbal et al., 2010) in following way:

> "Jones et al. (1994) and (Kearsley & Shneiderman, 1998) are referring to similar aspects, learner activeness aspect, when they mention that learners are active and are responsible and energized by their learning. Cognitive aspect includes active cognitive processes (Kearsley & Shneiderman, 1998), psychological investments (Newmann et al., 1992), and intellectual engagement (Willms et al., 2009) and is fostered with inquiry-based learning (Barab et al., 2005a) and with cognitive apprentice (Jones et al., 1994). Socio-collaborative aspect emphasizes that learning takes place in collaboration with peer learners (Kearsley & Shneiderman, 1998) (Jones et al., 1994) and by interacting with the society (Shneider-

man, 1993) (Willms et al., 2009) and should result in helping the society (Barab et al., 2005a) (Kearsley & Shneiderman, 1998). High attendance, less disciplinary problems and high rate of task-completion (Hudley et al. 2003) is represented by the behavioral aspect. Engaged learners are motivated and have positive attitude towards their learning process which is represented by emotional aspect."

Researchers have explored engagement in games (e.g. Malone 1980) but the literature on engagement in virtual worlds is very limited. Csikszentmihalyi's (1992) 'flow theory' is widely accepted in the gaming community to generate and study engagement in games. This theory will be discussed in detail in Chapter 5.

This above definition of engaged learning can be applied to virtual world or MUVE-based education as well. However, it may be that most of the virtual worlds could struggle to involve all the above mentioned aspects of engaged learning. If they can make sure that at least the learner gets active and engages cognitively which results in improved behavior and motivation then that virtual world has successfully resulted in engaged learning. Additionally, it could be very difficult to prove whether all aspects of engaged learning were involved or not.

Many researchers have reported about the engagement capability of virtual worlds but instead of providing a whole picture these studies mostly provide a glimpse into the possibility to use these environments for engagement. However, the amount of research conducted on this aspect of virtual worlds is also very little, especially the one that were conducted at school level.

Improved attendance and a fall in disruptive behavior have been reported in some classes that utilized River City (Nelson et al., 2005). Similarly, Dede et al. (2005) also reported improved attendance and a fall in disruptive behavior in students in River City. In their study they used three types of evidence as a proof of engagement. Firstly, the students and the teachers wanted to use the virtual world of River City again and students liked using it. Secondly, the number of absentees dropped and, thirdly, the use of inappropriate language vanished from the chat logs. In the study conducted by Iqbal (2012), most of the students enjoyed learning through Quest Atlantis and expressed that they wished to continue using it at their school. The students also perceived that they could not have learned in a better way through traditional teaching methods. Some researchers reported voluntary use of virtual worlds as an indication of engagement in virtual worlds or MUVEs-based education (e.g. Dodge et al., 2008; Warren & Dondlinger, 2008; Arici 2008). For example, Dodge et al. (2008) reported voluntary usage of Quest Atlantis for hours and also engaging in voluntary quests as well. In Arici's (2008) research 75% of the learners indulged in additional activities in Quest Atlantis without any extra credits. Barab et al. (2005a, 2005b) have also reported that Quest Atlantis could be more appealing to girls than boys, or at least they were more active than boys in sending emails and in chats. The results only provide a hint or an indication and cannot be termed as conclusive. Similarly, Iqbal et al. (Accepted) (PVI) also found that the

class with more girls showed significant gains, however in that research the comparison was between different instructional delivery methods. It can be inferred that the instructional delivery method that was employed in that particular class resulted in learning gains. Ketelhut et al. (2010) reported high level of engagement when students learned through River City. Wrzesien & Raya (2010) reported that the students at the primary school level using the augmented virtual world of 'E-Junior' were more engaged and enjoyed more than the traditional class. In Marshall's et al. (2004) study also the primary students were engaged in a virtual world, not a virtual world according to the definition for this thesis, called 'Puppet'.

Since the closure of the teen grid of Second Life, it has become very difficult for schools to use Second Life in their teaching as the minimum age limit is sixteen. However, it can be used in higher secondary schools. In Calongne's et al. (2007) research the students were engaged when they were learning about criminal prosecution in the court through Teen Second Life. Similarly, Global Kids, Inc's 'science through Second Life curriculum' also showed preliminary evidence of engagement in using virtual worlds (Turkay, 2008).

Thus it can be concluded that virtual worlds can be engaging learning environments for both genders and can result in better attendance and fall in disruptive or inappropriate behavior and the students engage in learning activities voluntarily. The research involving two-dimensional virtual worlds is scarce.

2.3.4 Teacher's perspective

In order to make sure that a technology gets adopted into the classroom it is important to take the perspective of the teacher into account before even designing the technology. Teachers encompass a vast experience about the structure and culture of school working and, besides, they are the ones who will have to adopt the technology in their classroom. With this goal in mind, it was decided to include this section in the background literature review which shall be based on the experiences and perspectives of teachers about using virtual worlds in class. The search for relevant literature was quite disappointing as it was found out that there is not much research literature available where the point-of-view of teachers about the use of virtual worlds is recorded. This view is also shared by (Wood, 2010). Even when some relevant literature was found, it focused on using Second Life (e.g. Stone, 2009; Kramer, 2010; Dutton, 2009) which can only be used at higher secondary level in schools due to age restrictions and it gets mostly used in universities and colleges. In some cases the subjects have been not in-service teachers but pre-service teacher training students (e.g. Kennedy-Clark, 2011; Inman, 2010). In one case it was interesting to note that in the literature review the author wrote about the adaptation of technology in classrooms on a general level rather than the adaptation of virtual worlds in classrooms (e.g. Wood, 2010) and one author did not even cite any studies on this topic (e.g. Kluge & Riley, 2008). The above mentioned factors point out the lack of research available about the perception and experiences of teachers using virtual worlds in classroom especially at school level.

Koh et al. (2009) reported that most of the teachers in his research had a positive attitude towards using games in schools in Singapore and they perceived that students enjoy games and thus games can be used to engage them. They believed that games can result in better learning gains in terms of cognition, psychomotor skill and affective learning. The barriers according to them were insufficient time, limited resources, high cost, irrelevance of game content to curriculum, parental reaction and unsupportive school. Klopfer et al. (2009) suggest that the concerns of teachers that shall be addressed about games are: content; healthy skeptics of technology; and unfamiliarity of games. The entire above mentioned teacher perspectives could be valid about virtual worlds as well.

Merchant (2009) found that gameplay for learning using virtual worlds is an 'alien' idea for teachers. Teachers do not know how to teach in virtual worlds and after some time their teaching in virtual worlds starts resembling the traditional methods. In that study, teachers perceived virtual worlds as only a pre-activity that can be followed by the real work in classroom. Teachers also expressed the need for control, as pointed out also in the research of Kennedy-Clark (2011), as chaotic situations are not really acceptable in classrooms. Teachers need a safe and orderly place. Teachers expressed the need for a 'common net' for teachers to share experiences, perspectives and choices (Desiderio et al. 2009).

Five doctoral dissertations were found during the search for literature. They were all based on either perceptions of instructors or pre-service student teachers. Second Life was used in all of these studies and the study focused on university level education mainly. Although the findings are not based on school level teachers, the results could be relevant and therefore the main findings are briefly discussed here. In all of the studies the teachers, pre-service or in-service, believed that virtual worlds can be very valuable for education (Wood, 2010; Kharif, 2007; Kramer, 2010; Dutton, 2009; Inman, 2010). However, technical problems (Wood, 2010; Kramer, 2010; Dutton, 2009; Inman, 2010), both related to hardware and software, were an obstacle and the support from administration was not good (Dutton, 2009; Wood, 2010). In one study, after going through training, pre-service teachers were still not confident enough about virtual worlds to use them in their teaching (Inman, 2010). The teachers at the undergraduate and above levels are quite free in choosing teaching methodology that they adopt and in fine tuning the curriculum thus curriculum related problems were not mentioned in much detail in these studies. However, this could be very important at school level as the content and curriculum is strictly followed.

2.3.5 Instructional delivery methods for virtual worlds

Virtual learning environments (VLE) are a set of online tools and resources that facilitate the online education experience (Hiltunen, 2010). In that sense, virtual worlds could be a VLE in itself and, on the other hand, they could be just a part of a complex VLE. Thus, learning methods and approaches that are normally

found to be appropriate for VLEs shall also be befitting to virtual worlds. However, one can agree with Hiltunen (2007) that different pedagogical approaches are needed for different learning situations.

Many researchers suggest that learning activities in virtual worlds could be grounded in the constructivist learning theory (Ibanez et al., 2011; Stoerger, 2010; Jestice, 2010; Mallan et al., 2010; Neely et al., 2010; Bronack et al., 2008; Bronack et al., 2006; Girvan & Savage, 2010). However, the research has to identify which instructional delivery method suits each kind of learning situation in virtual worlds.

Generally, three kinds of, or a mix of the three kind of, instructional delivery methods have been implied by teachers when using virtual worlds. Firstly, they have tried to use virtual worlds for direct instruction by delivering lessons in virtual world as it happens in distance learning. The second way has been to teach through peers in groups or in a community of learners where the teacher guides the groups or communities. The third method has been through self-exploration and teacher guides when needed. However, I was not able to find any study which compares these instructional delivery methods except one.

Ketelhut et al. (2006a) carried out a study in River City with three instructional delivery methods as is mentioned before: (1) learning through a mix of guided inquiry and teacher led in-class interpretive sessions; (2) learning through expert agents embedded in River City; (3) and based on community of practice. I carried out studies in Pakistan in which three instructional delivery methods were used which were: (1) explanatory instruction with exploratory inquiry-based learning in Quest Atlantis; (2) group discussion with exploratory inquiry-based learning in Quest Atlantis; (3) and self-exploration through guided inquiry instruction in Quest Atlantis. Instructional delivery methods 1 and 2 had almost statistically significant learning gains in pre to posttest.

2.3.6 Obstacles in using virtual worlds in education

The obstacles or hindrances that need to be tackled in order to use virtual worlds in education are generally similar to those of using games in education or actually using any ICT in education. Avoiding the debate on whether virtual words are games or not, Whitton (2011) presents four factors that affect engagement in games: (1) difficulties in getting started; (2) being stuck during the activity; (3) lack of trust in the environment; (4) and intrinsic boredom with the subject matter or activity itself. All of these factors could affect engagement in virtual worlds as well. Moreover, these factors affect both teachers and students.

Many researchers have reported that there is a steep learning curve to fully learn to use virtual worlds (e.g. Loureiro & Bettencourt, 2011; Woods, 2010), especially in 3D virtual worlds such as Second Life (Sanchez, 2009; Inman, 2010; Kharif, 2007; Stone, 2009; Kramer, 2010), and as a result there is a strong possibility of being stuck in an activity for a long time, which could add to frustration. Moreover, teachers do not have enough time to get acquainted with games and other technologies like virtual worlds (Kirriemuir & McFarlane, 2004; Klopfer et al., 2009). To overcome the steep learning curve in games and virtual

worlds and to get well acquainted one needs support (Klopfer et al., 2009) (de Freitas, 2008) (Kirriemuir & McFarlane, 2004), training (de Freitas, 2008) (Kirriemuir & McFarlane, 2004), guidance (de Freitas, 2008) (Kirriemuir & McFarlane, 2004), documentation and infrastructure (Van Eck, 2006; Koh et al., 2012; Desiderio et al., 2009).

Another issue is lack of trust in the environment (Whitton, 2011). This lack of trust can be lack of trust in games and virtual worlds on a general level as being valid educational environments or lack of trust in a particular game, virtual world for its effectiveness for education. There is a negative culture or attitude to perceive that these environments are not suitable for education (Kirriemuir & McFarlane, 2004; Klopfer et al., 2009; Virvou et al., 2005, p.54; Koh et al., 2012) which results in this lack of trust. Koh et al. (2012) write that there are three types of educators with regard to games: "those who understand the potential of games in teaching"; "those who prefer only a specific type of game and are reluctant to try other types of games"; and "those who have not used games at all and who are not interested in them (Dondi & Moretti, 2007)".

Apart from the factors mentioned above, one of the problems is that of the structure of school day which is divided into 40-45 minute classes which is quite insufficient for games, virtual world or MUVEs related activities (Klopfer et al., 2009; Koh et al., 2012; Turkay, 2008; Iqbal et al., accepted (PVI)). Leaving an activity in between and logging-off causes frustration and students do not like it (Iqbal et al., accepted (PVI)).

The biggest issue that serves as a barrier is that of curriculum and it is not a simple one. If a game or virtual world does not meet the curriculum standards in a way that is very explicit to the teachers and administrators, or if it is not relevant to the curriculum, they tend to avoid it (Klopfer et al., 2009; Koh et al., 2012). Integration of games or virtual worlds into the curriculum is a challenge (Kirriemuir & McFarlane, 2004; Prensky, 2001). Moreover, there is not enough academic research about the classroom perspectives (Merchant, 2009) which includes comparison of different instructional delivery methods for virtual worlds as is done by Iqbal et al. (2012) (PVI).

Technical issues also affect the experience of using a technology and can cause a lot of frustration in teachers and students. Virtual worlds are graphical environments which generally require very good computers with strong computer graphics processing capability, specifically in the case of 3D virtual worlds (Iqbal et al., accepted (PVI)). Many researchers have reported computer related problems as a valid reason why these environments are not used in education (e.g. Woods, 2010; Levin, 2008; Kirriemuir & McFarlane, 2004; Desiderio et al., 2009; Stoerger, 2010; Koh et al., 2012). As these virtual worlds are internet-based, they may also cause network and bandwidth problems (Oliveira et al., 2004; Stoerger, 2010; Woods, 2010).

There is a high cost involved in improving the technological infrastructure by providing better computers and internet connectivity. The development and deployment costs of games, virtual worlds can also be a hurdle. Moreover, there is also cost associated with training the teachers and researching different

aspects of using these environments at schools. All the costs involved in the factors mentioned above are a major reason why these environments are not used (Teoh, 2007; Neas, 2005; Koh et al., 2012; Loureiro & Bettencourt, 2011; Klopfer et al., 2009; Desiderio et al., 2009).

There can be many other challenges which could affect the integration of games in education, such as gender (Neas, 2005). Lowrie and Jorgensen (2011) found that girls prefer to play games which have problem solving, quantitative computations and graphs while boys prefer games with visual or spatial requirements. Resistance to change from teachers could be an important factor as well (Desiderio et al., 2009).

Boredom with the subject matter is one thing and getting bored with an activity is another thing. Games made for educational purposes have been generally boring with very simple, repetitive and poorly designed activities which were limited in range as well (Kirriemuir & McFarlane, 2004). Such games fail to further the cause of bringing the engagement of games and virtual worlds in education despite the proof of their effectiveness in education as has been already discussed in prior text in this thesis. Thus, when a virtual world is designed, it is important to design activities which are engaging as well as educational.

Thus the main obstacles or barriers that have to be addressed to bring virtual worlds can be listed as follows:

- Steep learning curve
- Lack of time and support for teachers to learn about them
- Lack of trust in them as a tool with educational value
- Structure of the school day
- Problems related to integration into the curriculum
- Technical problems in implementing and using them
- High costs
- Avoiding boring activities

However, things will improve as more research proves the importance of virtual worlds in education and as research, like this one, tries to take into account the needs of different stakeholders in education. However this change can be quite slow as the educational system is very rigid and adapts slowly due to structures like curriculum, standard requirements, teaching equipment, resource allocation, and physical appearance of classrooms (Egenfeldt-Nielsen, 2006).

3 RESEARCH APPROACH

In this section, the research approach is presented in detail by laying down research questions and the research methods used to investigate the answers to the questions.

3.1 Research questions

The main research questions that were the focus of this research are discussed in the following texts.

3.1.1 Participatory practices in virtual worlds

The children may be motivated to use virtual worlds in formal and non-formal settings as they are engaging and entertaining and virtual worlds are very similar to video games. But it is important to know what users of these virtual worlds engage in voluntarily and what activities they like. Thus leading to my research goal which is:

> Goal 1 "What makes a virtual world engaging, and entertaining? What are the participatory practices in virtual worlds?"

Once these participatory practices are identified, the teachers may use them to engage their students in the learning process. Of course, all participatory practices may not be relevant to all learning situations and the teacher may have to decide which activity could best suit in the context of the subject and the context of the situation.

3.1.2 Considerations for teachers and administrators to facilitate the use of virtual worlds in education

Teachers or school administrators shall not be blamed solely for not using video games or virtual worlds. Teachers cannot be expected to take the burden of developing and researching virtual worlds for education. The research has to be conducted in this field by researchers and it shall also consider the context of schools and the various aspects of technological intervention at school level. On the other hand, teachers will need to ditch technophobia as a factor of not using educational technology in their teaching (Juutinen, 2011, page 27).

It is assumed that teachers may be more enthusiastic in implementing virtual worlds in their classes if they are aware of the considerations that one has to take while facilitating education in virtual worlds and implementation and maintenance is not a burden on them.

In order to bring virtual worlds to schools there is a need to answer the following research question:

> Goal 2 "What are the issues that teachers and administrators need to consider in facilitating the use of virtual worlds in schools?"

A sub-goal or part of these considerations could be the classroom implementation strategies or instructional delivery methods. The next research question is about the teaching context and the instructional delivery methods. The class normally has more than ten students in Finland and a traditional class could have about 20 to 25 students in the more populated areas. Some schools do not have enough computers in each class to fulfill the need of each students, thus they have computer labs where the students gather to use computers. Besides, normally the school day is equally divided into time periods for different subjects. These time periods may not be enough to get students to the computer lab and let them use virtual worlds substantially. If virtual worlds based learning environments have teaching units which can be sub divided into tasks that are achievable in the duration of a class then it could be easy for teachers to implement virtual worlds in their teaching.

The teachers also need to be provided with right strategies and instructional delivery methods. Thus, one needs to examine instructional delivery methods and different aspects of implementing them in a class. This means that the following research questions shall also be answered:

> Sub-goal 2.1 "Which instructional delivery methods, teaching methods, can be used to implement virtual worlds into classrooms? Which one is best in terms of learning gain and student satisfaction?"

3.2 Research approach

The approach that was taken in this research has already been explained in chapter 1 (section 1.2). Therefore, a re-account of the research approach is presented in more detail here.

As already mentioned, at the beginning of the research there had to be some decisions taken to decide upon the two prevailing approaches in the research community over this topic. The first approach is to give overwhelming importance to the educational theories and practices and then create a video game. The majority of the video games that are made for education are perceived to be boring (Bellotti et al., 2009) and overly simple (Kirriemuir & McFarlane, 2004) as the gaming rules that make a video game engaging are largely ignored. They do not seem to take into account that the learners of today have changed profoundly due to digital revolution (Prensky, 2005). On the other hand, there have been many boring video games made by professional game designers which have failed commercially. Thus, it may not be a very simple process that can be easily harnessed by educationists.

Another approach that is very popular at the moment is to use commercially available video games for learning. This could be very difficult to implement in the context of schools due to the irrelevance of video games to the curriculum and working practices at schools and the structure of a school day.

Gee (2003, 2007), Prensky (2005) and De Maria (2007) suggest that one should first look at what gamers already learn from playing video games and take that as a basis for future research.

All these approaches could be very valid but may or may not apply to the use of virtual worlds in schools. One important factor is that virtual worlds are quite different from conventional video games as has been discussed in chapter 2, and the participatory practices in them may differ in them. That is why in this research, the focus was on finding and explaining the participatory practices in virtual worlds for which considerable effort was made.

Secondly, I focused my attention on bringing the virtual worlds to the classroom. In order to find that out, I concentrated on instructional delivery methods and implementation problems.

3.3 Research methods

Mainly in this research, both qualitative and quantitative methods were used according to the needs of the research in focus. Feldon & Kafai (2008) suggest that mixed methods should be used when researching in or about virtual worlds. Most of the research in this thesis can be termed as using 'mixed methods' which can be defined as:

"...a mixed methods approach is one in which the researcher tends to base knowledge claims on pragmatic grounds..."
- Creswell (2003)

Table 4 presents a summarized account of the papers and the research methods used. Following that, the research methods are explained in detail. As most of the research was carried out using mixed methods, any single article did not rely on a single research method except the article 4 in which only theoretical argumentation was used.

TABLE 4 Research methods.

Paper number	Theme of the paper	Research methods
PI	Experiences and motivations	Mixed methods which consisted on questionnaires, interviews and usage sessions.
PII	Framework of participation	Mixed methods based on a survey which was mainly quantitative and theoretical argumentation.
PIII	Participatory practices and framework of participation	Mixed methods but mainly qualitative, consisting on semi-structured group interviews, and theoretical argumentation.
PIV	Educational engagement through virtual worlds	Theoretical argumentation
PV	Experiences from a virtual world based course	Mixed methods but mainly quantitative, which was conducted as a field study and the data was based on observations and survey
PVI	Instructional delivery methods and facilitation in a virtual world based course	Mixed methods but mainly quantitative. It was a field study and the data was based on observations, discussions, pre and post-tests, teaching sessions, online participation in Quest Atlantis and responses given to queries which were embedded into the Quest Atlantis.

3.3.1 Questionnaires and surveys

Questionnaires and surveys were used in PI, PII and PV. Each questionnaire or survey included both open-ended and close-ended questions. Most of the questions in all the papers were close-ended and in that sense they can be termed as more quantitative in nature.

The design and the nature of questions in each questionnaire or survey depended largely on the motifs of research. Important questions about motivation of using games and virtual worlds or about participatory practices were developed using literature review (e.g. Schuurman et al., 2008; Tychsen et al., 2008; and Yee, 2005) in order to maintain the validity of the research with the previous research done in this field. However, some terms needed to be simplified for the understanding of the children and in most cases they were translated into Finnish for a better understanding of the question. The researcher took a

lot of care to maintain the research coherence while simplifying or translating the terms.

3.3.2 Interviews and discussions

Interviews were an important means of data collection in PI and PIII. The interviews that were conducted for both the papers were semi-structured and largely open-ended. The questions of the interviews were formulated using applicable research literature. Apart from the papers PI and PII some interviews were also conducted in the research explained in chapter 5.4. In all interviews the audio was recorded and in some cases video was also made.

PV and PVI were outcomes of the research done in a school in Pakistan. During that research the researcher had numerous formal and informal discussions with the school teachers, administrators and owners of the school. In the research explained in chapter 5.4, the researcher had discussions with the teachers, principal and educational consultant. These discussions may not have followed the strict guidelines of qualitative research but were instrumental in understanding the context of school for implementation of educational software especially games and virtual worlds. These discussions helped in understanding the rationale behind the decisions that a school normally take regarding technology and the hindrances that are generally faced by the schools.

3.3.3 Participatory research

In the study that resulted in PV and PVI, the researcher participated in the whole study, initially as the trainer of the teachers and the volunteers and later as online teacher and mentor. The participants in that research had to solve some missions in Quest Atlantis and answer questions to the quests. The researcher provided feedback about the quests and guided the participants if they needed any help.

In the study explained in chapter 5.4, the participants wrote the script of the machinima short movie by themselves in the class with the teacher. The researcher got involved in the production phase when the movie was acted by the participants in Second life. The researcher took the role of virtual cameraman during the production process. All the post-production work was carried out by the research staff.

These studies had elements of action research but they did not follow a cycle. This research had some similarity with 'participatory action research' or 'classroom action research' as is defined by Kemmis & McTaggart (2000) (Norman K. and Yvonna S. eds 2000) but the next steps of improving the course design were not carried out hence a cycle or second iteration was missing.

3.3.4 Theoretical argumentation

Theory is used in much variety in qualitative research (Creswell, 2003, page 131). In papers PII and PIII, survey answers and interviews provided the basis

of the resulting framework. However, the framework and its categories were developed through rigorous theoretical argumentation and research literature. Thus it can be inferred that the theories itself served as data to an extent.

In PIV, the aim was to present an overview of research conducted using virtual worlds and on engagement. Thorough theoretical argumentation was used to develop a framework of engagement for virtual worlds.

3.3.5 Observations

In those research studies where participatory research or field studies were done, observations were used an effective tool of gathering data. The researcher took notes as the task was carried out and in some cases wrote down his observations right after the completion of the task. Observations were also made while analyzing the recordings of the procedures and while the tasks were being carried out.

3.4 Studies conducted with schools

Four studies were conducted with schools. Three of these were to find out the participatory practices in virtual worlds and one was about the instructional delivery methods and the process of facilitation. In the following text I explain these studies. More detailed explanation of these studies can be found in their respective articles which are part of this thesis.

3.4.1 Study 1 which resulted in PI

This study was carried out at a Finnish school in spring of 2010 and it involved 15 participants, eight girls and seven boys, who were aged between 13 and 15 and were in eighth and ninth grades.

In this study the data was collected through questionnaires, interviews and observation of user sessions. There were two different questionnaires. First, information about initial background was acquired through a questionnaire which was focused on information about user experiences and was used to group the participants according to the virtual worlds they have been using. In this questionnaire, a list of 26 virtual worlds was presented with an additional space for a virtual world that was not in the list but the participants were using. For each virtual world listed the participants had to answer: (1) how long they had been using a particular virtual world; (2) the frequency of use; and (3) how long ago they had stopped using a particular virtual world if they were not using it any more.

In the second questionnaire the students were asked to answer an online survey, which contained 25 questions concerning background information about the use of computers, games and virtual worlds. It also asked about their experiences, expectations, motivations and perceptions about using games and

virtual worlds in education. The basis of the survey questions was earlier studies focusing on motivations and experiences (e.g. Schuurman et al., 2008; Tychsen et al., 2008; and Yee, 2005).

Then usage sessions were conducted at the computer lab of the school and the aim was to understand the activities that users usually perform in virtual worlds. Five groups were created, one for each virtual world, according to the answers given in first questionnaire. The groups were: Club Penguin (4 participants) Neopets (3), Habbo Hotel (3), Barbie Girls/Barbie.com/Stardoll/pollypocket.com (3) and IMVU (2). Each group used the virtual worlds for about 20 to 30 minutes in front of the researcher and explained the activities that they performed in the virtual worlds as well as the features that they liked and disliked. The session of use was followed by an open-ended 30 to 45 minutes group interview to dig deeper about the answers in the survey and to find views to use these environments in education. The usage sessions and interviews were video recorded. The interviewer and the observer also took notes.

3.4.2 Study 2 which resulted in PII

This study was conducted as a survey in February 2010. Thus, 126 students of two Finnish schools answered an online survey which was distributed through email and most of the participants filled it in their computer labs with a teacher available for assistance. The survey consisted on three main parts: the first part asked the children about their background; the second part about their virtual world usage; and the third part about their participation in virtual worlds.

The first part included questions about general background such as name, gender, age, municipality, parents' education and leisure activities. Next question asked whether participants knew what virtual worlds were; whether they had used virtual worlds or not; and if they were currently using virtual worlds. The participants who were still using virtual worlds were directed to those questions which asked to identify the virtual worlds they were using and answer different questions related to participation in those virtual worlds. While, those who had stopped using virtual worlds were asked to identify the virtual worlds that they were using in the past and give reasons for abandoning virtual worlds. We asked these questions in order to understand what contributes to the lack of participation in virtual worlds.

The third part of the survey asked students to: identify the features, among 13 features presented in a question that they were interested in; indicate how often they perform the 15 activities, presented in a question, in virtual worlds; tell about perceived benefits of virtual worlds; and to express what kind of virtual worlds they would like to use.

3.4.3 Study 3 which resulted in PIII

Semi-structured group interviews were conducted in two Finnish schools spring 2010 in this study. The participants were asked to tell about the virtual

worlds they use and the activities they perform there. There were 21 participants in this study out of which 13 were boys and 8 were girls and they were aged between 11 and 15 years. Before the interviews all the children reported based on their perception that they were users of virtual worlds. However, it turned out that two boys had actually not used virtual worlds at all, but perceived online games as virtual worlds. Thus, the analysis focused only on those 19 participants, who were users of virtual worlds. The interviews were conducted in Finnish and the translations are provided by the researcher.

The interview contained themes that can be transformed into the following questions.

1. What kind of participatory practices children have in virtual worlds? What kind of activities children perform? Which activities and special features children find interesting?
2. What opportunities and risks there are in children's participation in virtual worlds? What are the benefits and harms of using virtual worlds? How do virtual worlds differ from the 'real' world?

3.4.4 Study 4 which resulted in PV and PVI

This study was conducted at a school in Pakistan in spring 2012. The research had mainly two parts: (1) to compare different teaching methods based on student out comes; and (2) to get an insight into student's experiences through a survey. The participants (n=48; 27 male, 21 female) were divided into three classes which were organized according to three different instructional delivery methods which were: (1) explanatory instruction with exploratory inquiry-based learning in Quest Atlantis (16 participants); (2) group discussion with exploratory inquiry-based learning in Quest Atlantis (15); (3) and self-exploration through guided inquiry instruction in Quest Atlantis (17). The results of the comparison between instructional delivery methods are discussed in section 5.2.1 in detail.

The survey was taken at the end of the comparison study, thus the survey contained questions about the experience of learning through a virtual world, Quest Atlantis in this case. It included questions which asked the students: whether they liked learning through QA or not; Would they like the school to continue using QA; and whether they would be using QA at home or not?

In a question were asked how much they perceive that they have learned in this study. They were also asked whether they would prefer learning through traditional class, through QA or through a combination of traditional class and QA. The students had to give their views about the features of Quest Atlantis as well in a question. The last main part of the survey was about the difficulties that the students faced during the study.

One more main theme of this study was to study the process of facilitation of virtual worlds in schools and that is discussed in detail in section 5.4.1, 'Overview of the facilitation process'.

3.5 Research ethics

I will finish this chapter by discussing the ethical considerations as this research involved many children and minors younger than 18 years.

The main aims and goals of the research were such that it was unavoidable to involve children in it. Ethical issues are of importance to every study but the questions get even more vital and complex when the research involves children (e.g. Morrow & Richards 1996; Thomas & O'Kane 1998). This research did not involve any such issues which could expose children to any vulnerability. Despite that, the researcher followed the ethical rules that generally prevail in the scientific community and especially followed the guidelines set by the University of Jyväskylä.

When conducting research, it is generally required to obtain informed consent before the research begins but in the case of children the consents can be obtained from the parents or guardians who are referred to by Sieber (1992) as 'gatekeepers'. This is because the children might not be able to understand the context of research or the implications of the research. I took these considerations into account and obtained consent from the children as well as the parents. In places where research was carried out as normal school work, the school served as the 'gatekeeper'.

4 OVERVIEW OF THE PAPERS

"Do not train a child to learn by force or harshness but direct them to it by what amuses their minds, so that you may be better able to discover with accuracy the peculiar bent of the genius of each."

- Plato

In this chapter, a short review of each paper for this research is presented. For each paper, publication details and authors are mentioned. The order of the papers is logical rather than chronological to make it easy to understand the logical interrelationship between the distinct papers irrespective of the date of publication. In the overview of each paper, the research objectives and methods are presented first and then the results are presented and discussed briefly. The limitations of each paper are also discussed briefly. At the end of the chapter, the contribution of me as an author is mentioned for each of the jointly authored publication.

But before all that, Figure 1 shows how the papers relate to the research goals and which paper contributed in getting answers to which goal. PI, PII and PIII helped in answering the goal related to engagement and participatory practices. PIV was about engagement and it contained guidelines for teachers as well thus it contributed to both goal 1 and 2. PV and PVI contributed towards goal 2 and its sub goal about the instructional delivery methods.

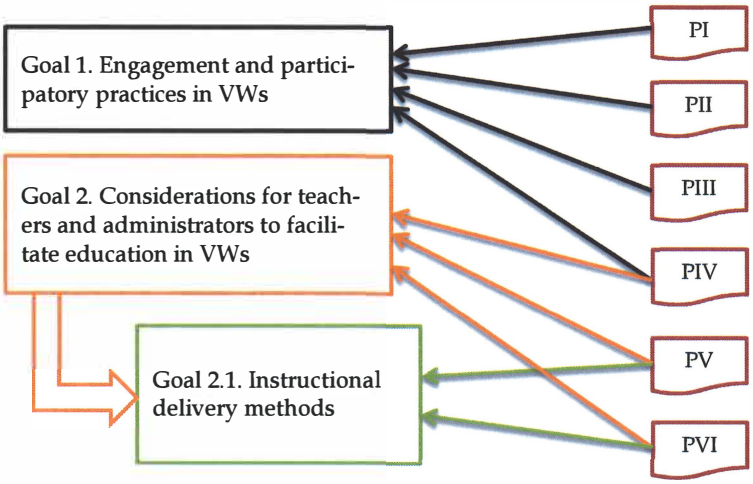

FIGURE 1 Connection of included articles with the goals.

4.1 PI: "Participation of the young ones in virtual worlds: a look at experiences and motivations"

Iqbal, A., Kankaanranta, M. & Neittaanmäki, P. (2011). Participation of the young ones in virtual worlds: a look at experiences and motivations. World Journal on Educational Technology, 3 (1), 16-27.

4.1.1 Research objectives and methods

The main aim of this research article was to identify the motivations and enquire about the experiences of young people in using virtual worlds. The focus was on the activities they perform, features they use and reasons to abandon virtual worlds if they do so. The research was conducted using mixed methods which included two questionnaires, interviews and usage sessions of the virtual worlds.

The initial questionnaire was focused on gathering background information about user experiences and also to group the participants according to the virtual worlds they have been using. The second questionnaire was used to find out about the use of computers, games and virtual worlds. It also included queries about their experiences, expectations, motivations and perceptions about using games and virtual worlds in education.

Open-ended group interviews and usage sessions were carried out to find the nature of activities that participants indulge in in virtual worlds.

4.1.2 Results and brief discussion

The results suggested that the features liked in virtual worlds are very similar to those liked in commercial video games. The most liked features for virtual worlds were developing characters and doing things in groups. The activities that were mostly performed in virtual worlds were: chatting or doing different things with friends; playing games; and exploring new places.

Most of the participants abandoned a certain virtual world at a certain age due to increasing needs of socializing online with friends and also moving on to platforms that provide a better gaming experience.

Most of the participants were skeptic whether games and virtual worlds can be used in education. Although interested, they thought of these two things as extremes and wondered if they can be brought together for an engaging learning experience.

4.2 PII: "A framework for children's participatory practices in virtual worlds"

Tuukkanen, T., Iqbal, A. & Kankaanranta, M. (2010). A framework for children's participatory practices in virtual worlds. Journal of Virtual worlds Research, 3(2).

4.2.1 Research objectives and methods

The main motivation for this paper was to find out the participatory practices of children in virtual worlds and to develop a framework of participation in virtual worlds which adheres to civic participation.

A survey was conducted to find out children's participatory practices in virtual worlds which included questions about children's background, their virtual world usage and participation in virtual worlds.

The framework was mainly created using literature review and then it, and the results of the survey, was used to chart out the affordances of virtual worlds for children's participation.

4.2.2 Results and brief discussion

The results of the survey indicated that the participants were highly interested in socializing with friends and in indulging in avatar related activities. The participants frequently participated in chatting and doing things with friends; playing games individually or with friends; and changing appearance of avatar and accessorizing them. Traditional forms of civic participation were not very common in virtual worlds.

The developed framework viewed children in virtual worlds as social actors, learners of civic participation and citizens. On the bases of this framework

and the survey results, affordances of virtual worlds for participation were developed.

4.3 PIII: "Virtual worlds as children's participatory media: children's participatory practices in virtual worlds"

Tuukkanen, T., Wilska, T. A., Iqbal, A. & Kankaanranta, M. Virtual worlds as children's participatory media: children's participatory practices in virtual worlds. Submitted.

4.3.1 Research objectives and methods

The main aim of this paper was to identify the affordances for children's participation in virtual worlds. The research had two parts. In one part, we analyzed and further developed the framework of children's participatory practices that was presented in PII. The tilt of the framework was social sciences, and in this article the concept of participation was also defined according to the field of social sciences which defines participation as having social interaction and a process of influence. This further development of framework partially depended on research review and partially on the empirical data collected in this research which forms the second part. The empirical data consisted on the interviews which were conducted to identify the participatory practices of children in virtual worlds.

4.3.2 Results and brief discussion

Through the interviews, seven participatory practices were identified: playing; creating virtual persona; indulging in social communication; engaging in commercial activities; expressing oneself; engaging in community activities; and organizing events.

The identification of these participatory practices and research literature helped us in defining the roles of virtual worlds in children's participation. Virtual worlds can be used as playground, social community, and arena for learning civic skills as well as public sphere or media.

A framework of educational facilitation in virtual worlds is created in which the core is based on the framework presented in PII and PIII in section 5.4 as the current frameworks do help us in understanding participatory practices in virtual worlds but they do not indicate how this can be incorporated in education.

4.4 PIV: "Engaging learners through virtual worlds"

Iqbal, A., Kankaanranta, M. & Neittaanmäki, P. (2010). Engaging learners through virtual worlds. Procedia Social and Behavioral Sciences, 2, 3198-3205.

4.4.1 Research objectives and methods

This was a theoretical paper in which the focus of the researchers was to summarize the literature about engaged learning in the context of virtual worlds. Research literature was reviewed to: enquire about learning gains in different virtual worlds; define engaged learning in the context of virtual worlds; identify design principles for virtual worlds; and provide a guideline for engaged learning in the context of virtual worlds. The researchers tried to focus on research literature which focused on learning at school level specially when examining learning gains and providing guidelines for engaged learning.

4.4.2 Results and brief discussion

The results about learning gains suggested, as is revealed by literature review, that students generally showed learning gains when they learned through virtual worlds. However, most of this learning gain was heavily dependent on the instructional delivery methods used. In some instructional delivery methods that learning gain was significant while in some negligible. Most well researched virtual worlds at school level are Quest Atlantis and River City. Some researchers used custom made 3D environments as well and showed their affordance for engaged learning. Researchers had also indicated better behavior and attitude in students that was also reflective of increased motivation and a proof of engaged learning.

A definition of engaged learning was also presented in this paper which was based on literature review. An engaged learning has 5 aspects: (1) learner activeness aspect; (2) cognitive aspect; (3) socio-collaborative aspect; (4) behavioral aspect; and (5) emotional aspect.

As is summarized in the paper a virtual world designed for engaged learning shall be based on experiential, inquiry-based and project-based learning. It shall have features to facilitate socio-collaborative interaction in activities that are authentic and challenging and has tools to carry out those activities. Such a virtual world shall have game-based rules to make learning fun.

Some brief guidelines for teachers and administrators were also provided in this paper to facilitate hassle-free incorporation of virtual worlds in the learning process. These guidelines were about the change in the role of the teachers; tailoring the content to make it suitable to be used in virtual worlds; and how to assess the learning process.

4.5 PV: "Facilitating exploratory learning in schools through virtual worlds: experiences from a course run at a school"

Iqbal, A. Facilitating exploratory learning in schools through virtual worlds: experiences from a course run at a school. In Proceedings of Cognition and Exploratory Learning in Digital Age (CELDA-2012), Madrid, Spain, 221-228.

4.5.1 Research objectives and methods

The main objective in this research was to find out the experiences of students about introducing a virtual world, Quest Atlantis in this case, into their learning process. The students learned about water quality issues through Quest Atlantis's water quality unit called 'Taiga'. The students were divided into three different instructional delivery methods which were: explanatory instruction with exploratory inquiry-based learning in Quest Atlantis (teaching method 1 or TM1); group discussion with exploratory inquiry-based learning in Quest Atlantis (teaching method 2 or TM2); and self-exploration through guided inquiry instruction in Quest Atlantis (teaching method 3 or TM3). TM1, TM2 and TM3 are the same as instructional delivery methods 1, 2 and 3, or IDM1, IDM2 and IDM3, as they appear in PVI. They answered pre and posttests and they answered a survey at the end of the research. The learning gains and gender differences in this study were presented in PVI. The results of the survey and the observations of the researcher, author in this case, were presented in this paper.

The survey included questions about the learning environment, perceptions about the learning process and problems that the students might have encountered during the study.

4.5.2 Results and brief discussion

The results in this paper were presented and discussed in four categories which dealt with: learning process in Quest Atlantis; likeness of Quest Atlantis; features liked in Quest Atlantis; and problems and hindrances faced by students. Across all these categories, the results were also discussed based on the instructional delivery methods.

An overwhelming majority of students believed that either they learned a lot or learned something about water quality in Quest Atlantis. The students of TM2 were surer that they learned a lot in comparison to other instructional delivery methods. Most of the students were also sure that they could not have learned more about water quality in a traditional class. The majority of the students also expressed that they could not have enjoyed more in a traditional class while learning about water quality. However, on the contrary, the majority of the students of TM3 thought that they could have enjoyed more in a traditional class.

Most of the students, about two-thirds, thought that Quest Atlantis was a very good virtual world or educational software, and a majority of them suggested that their school shall continue to use it.

Most of the students liked the missions/quests and graphics of Quest Atlantis while about half of them liked the teacher guidance system, gaming elements, topic and the story in Quest Atlantis.

The biggest hindrances or problems mentioned by the students, and also expressed by teachers, administrators and parents in discussions with the researcher, were: working in pairs; wrong time to conduct this research; short session times; and technical problems related to computers and the internet.

These results were very valuable both in terms of facilitating learning in a virtual world at school level and in terms of the preference for instructional delivery methods. It is evident that TM3, that is self-exploration through guided inquiry instruction, shall be mostly avoided. While implementing a virtual world, a school should make sure to solve the problems and hurdles that affected the learning process in this study.

4.6 PVI: "Facilitating exploratory learning in schools through virtual worlds: a look at instructional delivery methods and facilitation process"

Iqbal, A., Kankaanranta, M. & Neittaanmäki, P. Accepted. Facilitating exploratory learning in schools through virtual worlds: a look at instructional delivery methods and facilitation process. Accepted for 2nd International Conference on Education and Management Innovation (ICEMI 2013), Rome, Italy.

4.6.1 Research objectives and methods

The research was carried out to find out the best instructional delivery methods to introduce virtual worlds into schools and reflect on the facilitation process. The students learned about water quality through 'Taiga: water quality unit' in Quest Atlantis.

The students were requested to complete three missions due to lack of time. Initially, five instructional delivery methods were supposed to be used but due to lack of resources and participants, three of these instructional delivery methods were implemented. The instructional delivery methods are already mentioned in the overview of PV. The students learned through their respective instructional delivery methods and appeared in pre and posttests which were provided by Quest Atlantis team. The students also answered a survey at the end of this research but the findings of the survey were presented in PV.

4.6.2 Results and brief discussion

The results were presented in two parts. First, instructional delivery methods were compared on the basis of learning gains which were acquired through the results of pre and posttests. Secondly, the process of facilitation of virtual worlds was reflected upon.

The students of the second instructional delivery methods, which was group discussion with exploratory inquiry-based learning in Quest Atlantis, showed most and significant learning gain in posttests as compared to pretest across all three instructional delivery methods. The first instructional delivery methods also showed learning gain, though lower than IDM2 and almost significant. However, the students in third instructional delivery methods, which was self-exploration through guided inquiry instruction in Quest Atlantis, showed a slight decline.

The results quite convincingly prove, also in PV, that self-exploration without in-class discussion or explanation is not a good way to use virtual worlds, especially in Quest Atlantis, and this method is not the one that Quest Atlantis team proposes as well. The teaching method that Quest Atlantis team proposes is a combination of first and second instructional delivery methods.

4.7 Author's contribution to joint research papers

I researched and wrote PV by myself.

In paper I, IV and VI, I was the main author and the research was also mainly conducted by me. Co-authors provided their expertise in the research design, analysis, and in the writing of the paper. Several discussions took place among all the authors during the refinement of the research methodology, data collection, analysis and writing process.

I was second author in PII and third author in PIII. Terhi Tuukkanen was the first and main author in both papers. In PII, I took an active part in developing the framework of virtual participation which was the outcome of that paper. I participated in theoretical underpinning which formed the basis of the framework. I also participated actively in designing the survey which was used to identify the participatory practices in virtual worlds and was also used to draw affordances of virtual worlds for children's participation. I also took part in the writing process of that paper.

The data in PIII was based on interviews. I took part in data collection along with Terhi Tuukkanen who was the main author of the paper. I also provided his expertise during the analysis of the data and in writing the paper. Based on the empirical data the framework of participation in virtual worlds presented in PII was further developed and I and Terhi Tuukkanen mainly developed the framework together.

5 RESULTS AND DISCUSSION

In this chapter, the main results of the research are presented and discussed. Afterward, a framework of educational participation in virtual worlds is presented, which is followed by a suggested facilitation process for using virtual worlds in education, especially at school level.

5.1 Participatory practices in virtual worlds

One of the main goals of this research was to identify the factors and activities that can help students in getting engaged in the learning process in virtual worlds. This goal was translated into a research question which was as follows:

"What makes a virtual world engaging, and entertaining? What are the participatory practices in virtual worlds?"

The approach taken to answer this question was to ask the users of virtual worlds to reveal what they do and engage in when using virtual worlds. In other words, the idea was to look at the participatory practices in virtual worlds.

Paper I, II and III were instrumental in finding these participatory practices. It can be deduced from the results of these papers that users of virtual worlds engage in following activities in virtual worlds:

- Creating virtual persona or indulging in avatar related activities for example trying different looks, wearing different clothes and buying and wearing accessories on their avatars.
- Socializing with friends, mostly with real life friends through chatting, decorating their personal places, exploring new places and arranging events like virtual hangouts or parties.
- Playing embedded mini games or playing role playing games (RPGs) individually, with real life friends and with strangers.

- Taking part in different communities. These communities could be theme based or ones without any set agenda or themes.
- Indulging in commercial activities for example buying accessories and cloths for their avatars or for friend's avatars or buying furniture or other virtual items.
- Expressing themselves in virtual worlds.

All these participatory practices can be used by teachers, educationists and designers to make and use virtual worlds that are engaging for the learners. However there are two important findings that shall be mentioned and emphasized upon to draw the attention of both teachers and researchers. Firstly, most of these users at the school age were using two-dimensional virtual worlds like Habbo and Stardoll while most of the research focuses on three-dimensional MUVEs. Special and immediate attention shall be given to investigate the use of those virtual worlds which are popular among these users for education.

Secondly, it was revealed in PI that most of the users abandon virtual worlds at a certain age, between 13 to 15 years of age approximately, because of increasing needs of complex playing experience and social needs. Even on the KZero Q1 Universe Chart (2012) there is no big virtual world between ages 16 and 21. IMVU has an average age of 23 and Second Life users have an average age above 30 years.

Learners do not just care about fun. They can be serious about learning and education as well. In the study that resulted in PV and PVI6, the topic that was chosen was one that is not taught in Pakistan. That caused lack of motivation in some students. Thus it is necessary that the learners should know how their activities in virtual worlds directly relate to the curricular needs.

5.2 Considerations for teachers and administrators

The other important goal of this research was to identify the factors or considerations for the teachers and administrators through investigating their perspective and by looking at the hurdles that one may face while implementing virtual worlds. It can be expressed in the following way:

- "What are the issues that teachers and administrators need to consider in facilitating the use of virtual worlds in schools?"

One aspect of it is the choice of classroom teaching and implementation methods but that is discussed in section 5.2.1.

The literature review about the teacher's perspective and the hurdles of implementing virtual worlds in education, have been presented in chapter 2. In addition to that, the perspective of the teachers during the study that resulted in

PV and PVI, inform us about these considerations which can be summarized as a list which is presented as follows:

- The teachers need proper training, documentation and support in order to learn about virtual worlds and to implement them in their teaching.
- The needs of the curriculum have to be addressed. In other words, the teachers need to follow a certain curriculum and the learning in virtual worlds shall explicitly fulfill this need. Quest Atlantis, for example, follows the curriculum standards of USA. This caused some problems in the study that was conducted in Pakistan. Mainly, this topic is not part of curriculums in Pakistan and that resulted in decreased motivation of both teachers and students. Another issue is that of language and local context. Quest Atlantis is entirely in English as is used in United States of America (USA). In Pakistan British English is taught. In Pakistan and Finland most of the students will not be as proficient in their English as compared to the citizens of USA, United Kingdom or Australia. This poses a challenge of completing activities in Quest Atlantis in time-periods suggested by the Quest Atlantis team. Local culture and educational context also varies significantly between USA, Pakistan and Finland.
- The teachers also require a learning management system (LMS). This LMS shall empower teachers to: assign activities to students; monitor their progress, collect their answers, provide feedback; and provide content. This LMS could be integrated with the virtual world in use or could be a standalone LMS. For example, in the case of Quest Atlantis the LMS is part of the learning environment. It is largely web-based and tightly integrated with the virtual world of Quest Atlantis. 'Sloodle' is a standalone LMS designed for Second Life and is modeled on the 'Moodle' LMS. There is a need for a standardized LMS which can be used with all virtual worlds. This will reduce the learning curve for teachers.
- The teachers also need concrete instructional delivery methods, practices and procedures as well as lesson plans and materials. This has been accomplished well in Quest Atlantis where all these aspects have been taken into account, providing detailed lesson plans and materials for teachers who use Quest Atlantis.
- Technical support is essential for teachers as well. The teachers shall be liberated from technically implementing and running a virtual world.

There is also a need to convince teachers, administrators and parents about the benefits of using virtual worlds in education. This may need a shift in the way people think about games, virtual worlds in general. The research about learning gains and engagement, as is presented in chapter 2, is quite compelling and it shall be made available for teachers, parents and administrators.

One factor that is not mentioned as a need is the issue of high costs associated with making virtual worlds. It was not mentioned as a need of teachers because it's the administration that thinks about these aspects. The guidelines for using virtual worlds in schools are presented at the end of this chapter and there the suggestions to reduce costs are also mentioned.

5.2.1 Instructional delivery methods

In order to take virtual worlds into the classroom the teachers need to know which classroom implementation strategies work and which ones do not work. Which instructional delivery methods result in learning gains as well as engagement and which do not? The goals that were related to this theme of research were as follows:

> "Which instructional delivery methods, teaching methods, can be used to implement virtual worlds into classrooms? Which one is best in terms of learning gain and student satisfaction?"

Based on this research one cannot deduce which instructional delivery method is best for the ease of implementation or improves the motivation of the teachers. However, based on the study that resulted in PV and PVI, one can decide which instructional delivery methods results in significant learning gains and which method results in motivating the learners.

Three different instructional delivery methods were compared in that study which were: explanatory instruction with exploratory inquiry-based learning in Quest Atlantis (IDM1); group discussion with exploratory inquiry-based learning in Quest Atlantis (IDM2); and self-exploration through guided inquiry instruction in Quest Atlantis (IDM3).

The results reveal that IDM2 resulted in most learning gains and the learning gains were significant as well. The results of IDM1 also showed learning gains and those gains were almost significant. One shall keep in mind that the classes of IDM1 and IDM2 had gender imbalance. IDM1 had more boys and IDM2 had more girls. This was because the school did not allow us to rearrange the classes because each class was conducted at a different time and it could have caused many problems if some of the students of a class would be in other class. However, one cannot conclude comprehensively if a particular gender preferred a particular instructional delivery method.

IDM3 students showed no learning gains and they were least happy as well with their learning experience. It is evident that IDM3, that is self-exploration through guided inquiry instruction, shall be mostly avoided, whereas the students of IDM2 were most sure and happy about their learning experience through Quest Atlantis. The students of IDM1 were also sufficiently satisfied with their instructional delivery methods. Thus, it can be recommended that the teachers should explain the topics in detail in the classroom and ask the students to indulge in group discussions. While exploring the virtual world the teachers shall provide guidance. This is an interesting result and also some-

thing that might help teachers to better understand how virtual worlds and technology in general, is just one part of the teaching and learning activities.

This method of teaching, that is learning through a mix of guided inquiry and teacher led in-class interpretive sessions, has also occurred in another study (Ketelhut et al., 2006a).The other two implementations, one with expert agents embedded in River City and the other based on community of practice, showed no significant gains in the same research (Ketelhut et al., 2006a).

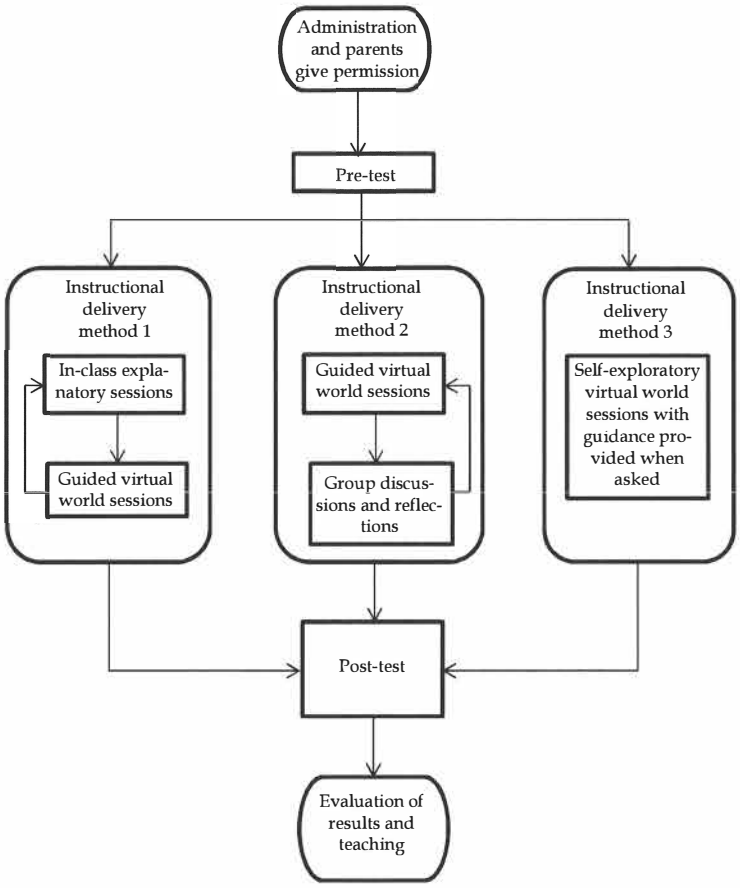

FIGURE 2 The overview of study conducted in Pakistan.

The whole process of teaching in the above mentioned study is explained in Figure 2. The researcher first contacted and convinced the principal and owners of the school then the teachers were convinced. Later the teachers and volunteers received training for one week. The parents were explained and

convinced about the research by the researcher and the school and consent was obtained from them allowing their children to take part in this research.

All participants took a pre-test and then received teaching through their respective instructional delivery method. IDM1 and IDM2 students had to move in between the class and the computer-lab while the IDM3 students received all teaching in computer-lab. The participants had to share computers because there were only eight computers in the lab. After the completion of the teaching the participants appeared in a post-test. The school, teachers and students each received a certificate of participation.

5.2.2 Trying new instructional delivery methods

The virtual worlds, and also games, can be used in education through instructional delivery methods that have been seldom applied before. Middleton & Mather (2008) suggest that machinima through virtual worlds can be used for different topics in education. For example, in a study where I was also involved, two English language courses were run at a higher secondary school in Finland in which the students created a short machinima movie using Second Life. In the initial phase of both courses, the students wrote a story and a script in supervision of their English teacher. Later, they went to Second Life and shot the script where they acted through their avatars and the other support staff, including me, served as director, camera man, technical support and the post production team.

Another interesting method is to include the families of the students in the learning process as well through the virtual world. This was exactly what was done in the 'Family Quest' program where students used Quest Atlantis with their family members after the school hours and the researchers call it 'intergenerational play' (Siyahhan et al., 2010). The same principle can be applied to create a learning experience across different grades. For example, students in eighth and ninth grades can learn together. This form of inter-grade learning based on common interests is proposed by Robinson & Aronica (2009).

5.3 Framework of educational facilitation in virtual worlds

The researchers have tried over the years to understand the motivation of games and suggested different models for game based-education. Many suggest that the ultimate goal should be to achieve a state of 'flow' as is presented by Malone (1980) and Csikszentmihalyi (1992). Prensky (2001, p124) summarizes this as:

> "In the flow state, the challenges presented and your ability to solve them are almost perfectly matched, and you often accomplish things that you didn't think you could, along with a great deal of pleasure. There can be flow in work,

sports, and even learning, such as when concepts become clear and how to solve problems obvious."

This kind of 'flow' state is desired when we implement virtual worlds in education. 'Exploratory learning model' could be one that achieves that in virtual worlds (de Freitas & Neumann, 2009). This cyclic model, which is an extension of Kolb's 'experiential learning' (1984), is based on the steps of: experience; exploration; reflection; forming abstract concepts and testing (and experimentation or reinforcement).

Earlier, de Freitas & Oliver (2006) developed a 'four dimensional framework' of learning in virtual worlds. The first dimension in that framework is 'learner specifics' which focuses on profiles, roles and competencies. The second dimension is 'pedagogy' and they suggest it shall be based on associative, cognitive and /or social or situative models. The interactiveness of the learning is covered in the third dimension, 'representation', which focuses on levels of fidelity, interactivity and immersion. The last dimension is 'context' in which learning takes place.

Koh et al. (2011) suggest a framework for the adaptation and use of games in the classroom. The framework is based on 'push', 'pull' and 'demographic' factors. The 'push' factors push a teacher to use games and virtual worlds in teaching and they are the policies and curriculum as well as the environmental support available to the teachers. 'Pull' factors refers to the inner motivation of the teachers to use games and virtual worlds in education and it depends on the personal interest of the teacher as well as the gaming-mindset. The third factor is that of 'demographics' of the teacher for example teaching experience, grade and subject.

A framework of participation in virtual worlds was developed in PII and then it was extended in PIII (Figure 3). The framework identifies the role of the virtual worlds in the process of participation and the participatory practices that children indulge in virtual worlds. The virtual world can act as a playground, as a social community, as an arena for learning civic skills and as a public sphere or media. The participatory practices have already been discussed in section 5.1.

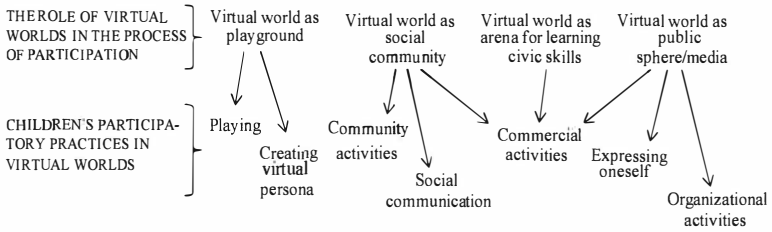

FIGURE 3 Participatory practices and the role that virtual world plays in facilitating them.

This framework can be extended to convert it into a framework of educational facilitation in virtual worlds as is shown in Figure 4.

FIGURE 4 Framework of educational facilitation in virtual worlds.

This framework consists on roles of five stake holders. The roles can be dined as follows:

- **Role of administration**: the role of the administration of the school is to make sure that virtual worlds get accepted among parents and teachers as well as to look at the technical issues. They shall implement and maintain virtual worlds in their schools and provide technical support as well. The teachers will need explicit policies about the use of virtual worlds and would require training.
- **Role of teachers**: the teachers are going to be the backbone of success if virtual worlds get accepted on a large scale. However, the idea is not to make the whole process teacher centric but rather make it student centric. That is why, the participatory practices

serve as the core of this framework and teachers shall inquire about them from their students and take into account their views about learning with a virtual world into consideration. They will need to provide content and teaching to the students and provide guidance and feedback during the whole process. They will have to assess the learning outcomes and shall reflect on their own practices so that they can improve in the next time when they use virtual worlds in their class.

- **Role of researchers**: the researchers need to provide results about learning gains and engagement. They also need to provide the pedagogical instructional delivery methods to the teachers and contents including lesson plans which shall be based on research.
- **Role of designers:** the role of designers is very important as well. Firstly, they need to take the needs of the teachers which mean design virtual worlds according to curricular needs and structure of the school day as well as implementing or integrating a LMS. In doing so, they shall keep the participatory practices and gaming rules in consideration. They will also need to provide a detailed documentation as well.
- **Role of the students:** the students need to be a part of the teaching design process. They shall inform about their participatory practices, choice of virtual worlds and even about instructional delivery methods. The students need to indulge in activities according to the guidelines provided by the teacher and the environment. They shall play, discuss, do homework and reflect as well as provide support to their peers. It is important that the students act as active and engaged learners.

All these roles have to be centralized around the role of virtual worlds, and that role is to support the participatory practices and utilize the affordances of virtual worlds for education.

5.3.1 Applying the framework to a virtual world

It could have been very beneficial if the above mentioned framework could have been thoroughly validated through applying it extensively on a virtual world-based education scenario and then evaluating the results. However, it was not possible to do that during the time-period of this thesis but in the following text the framework is applied to Quest Atlantis which, I think, uses some of the key factors of the framework.

Quest Atlantis was designed and developed through extensive research at Indiana University, USA. The team at Indiana University not only took the role of researchers and designers but also that of developers and they were the ones who deployed it at schools as well. In their own words, their research focused mostly on:

"Our research focuses on understanding the pedagogical and motivational impact of the medium, differences among genders and from different socio-economic backgrounds, the relationship between play and learning, the challenges in maintaining and participating in a globally-distributed online community, how to best facilitate the meaningful crossing of multiple life worlds, and how different design features of the project impact children's participation."
ARX Grant Support (Online)

A review of the research conducted on Quest Atlantis shows that the participatory practices in virtual worlds were not investigated, which they should have, instead they tried to get hints of motivational factors from video games.

A factor that could have been vital in the success of Quest Atlantis is that the Quest Atlantis team itself got involved in the process of deployment to schools. Thus they overtook much of the role of the administrator, as is defined in the framework, and got involved in all the steps from convincing the parents and administrators to training the teachers to use Quest Atlantis at schools. However technical implementation and maintenance of the virtual world is supposed to be done by schools themselves.

The role of the teacher, as is presented in the framework, was assisted very well by Quest Atlantis team. First the teacher receives training then gets the permission to register the class. The teacher is provided all teaching material and material for students as well, which is developed according to their curriculum requirements and includes detailed unit and lesson plans which makes it easier for them to teach through Quest Atlantis and may help in convincing and motivating them as well. The teachers also get pre and post-tests to assess the learning of their students. The teachers teaching through Quest Atlantis can get support in six ways: buddy teacher; buoy; teacher toolkit; how-to guide and resources; teacher listserv; and community of teachers in Facebook (Quest Atlantis Professional Development Workshop, Online). Therefore the support for teachers is very good and multi-dimensional.

It can be summarized that if the framework of educational facilitation is applied to Quest Atlantis, it follows the framework mostly but Quest Atlantis ignores to acknowledge the role of virtual worlds and its affordances as the center point of the facilitation process. It takes motivational and affordance factors of video games as the center point. Virtual worlds have many features similar to video games but it has its own intrinsic features as well which result in affordances and participatory practices that are not there in video games at the moment. Thus, it can be suggested that the participatory practices and affordances of virtual worlds can be the central point of the framework.

5.4 The process of facilitation of virtual worlds in schools

There process of facilitation can be largely divided into two parts: (1) facilitation of teaching; and (2) facilitation of technology. The overall process of facilitation

is shown in Figure 5. Facilitation of teaching is covered in section 5.2.1 and 5.2.2 where the instructional delivery methods are discussed. Thus, an overview of the whole process of facilitation is discussed next which will be followed by facilitation of technology.

5.4.1 Overview of the facilitation process

The whole process that is mentioned in the following texts was used at the school in Pakistan while conducting research for papers PV and PVI. However, in that process it was I, the researcher, who made most of the choices. This was due to lack of knowledge about virtual worlds among students and teachers. Although, this process was hectic due to time restrictions but was completed in time.

The whole process starts after administrator convinces the teacher, or vice-versa, to use virtual world at the school as is shown in Figure 5. They both can be convinced by some other entity as well such as researchers, government officials, virtual world makers and etc. After the school is convinced then the parents shall be convinced and their consent shall be taking. The school may be tempted to skip the consent from parents and consider the use of virtual worlds as a part of the school strategy but it is suggested that the school shall avoid this as games and virtual worlds could get polarized responses from parents. The teachers shall look into participatory practices of their students and inquire students about them. They shall also take into account the views of the student about learning through a virtual world and about their preferences. Then the teachers should analyze and choose a virtual world they wish to use for teaching. In choosing a virtual world they shall consider their needs of teaching as well as the technical capabilities of the computers.

The teachers shall use the virtual worlds themselves and shall undergo training if needed to use the virtual world successfully and to avoid any unwanted situations during the teaching process. Then teaching shall be carried out. It is suggested to use IDM1 and IDM2 as teaching method as are mentioned earlier in this chapter. Next Phase is that of evaluation of the teaching and assessing the learning gains and learning quality. It is recommended that the results of evaluation shall be conducted to the parents as well.

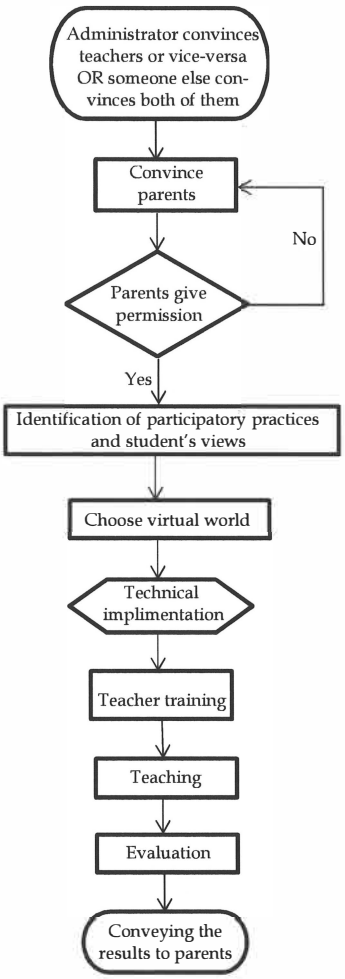

FIGURE 5 Process of facilitation of virtual worlds at schools.

5.4.2 Technical facilitation of the virtual worlds

In order to use virtual worlds in educational contexts, especially in formal institutions like schools, it is necessary to get a basic understanding of the technological aspects of them. These technological aspects can be examined in terms of technology that is used to deploy them to the users and the features that these virtual worlds possess. These two aspects are discussed further in the following texts. However, the dissertation does not discuss how virtual worlds are developed as this is of little importance to the end-users. At the end of this chapter, the process of technical implementation of virtual worlds at schools is discussed.

The deployment or access to virtual worlds significantly depends on the type of virtual world and the requirements for graphics. Three-dimensional virtual worlds can be accessed through computers with a graphic card that has adequate processing power for high-end graphics. That is why they require higher bandwidth as well to access the virtual world on the servers through internet as is shown in Figure 6. Limited contents of three-dimensional virtual worlds, such as text chat and mini-map, can be accessed through tablet and smartphone apps as is shown in Figure 6 as dashed arrows. The smartphones and tablets are not yet capable of processing three-dimensional virtual worlds. Since the three-dimensional data is very large and complex thus the servers that are needed for them should also be good enough. Running several three-dimensional virtual worlds on a network puts significant load on the bandwidths and the educational institution shall consider it.

Two-dimensional virtual worlds are not as technologically demanding and can usually be accessed on a computer, tablet or smartphone through a flash-enabled browser. Some two-dimensional virtual worlds can also be accessed through tablet and smartphone apps. The network bandwidth requirements are also not very high for two-dimensional virtual worlds.

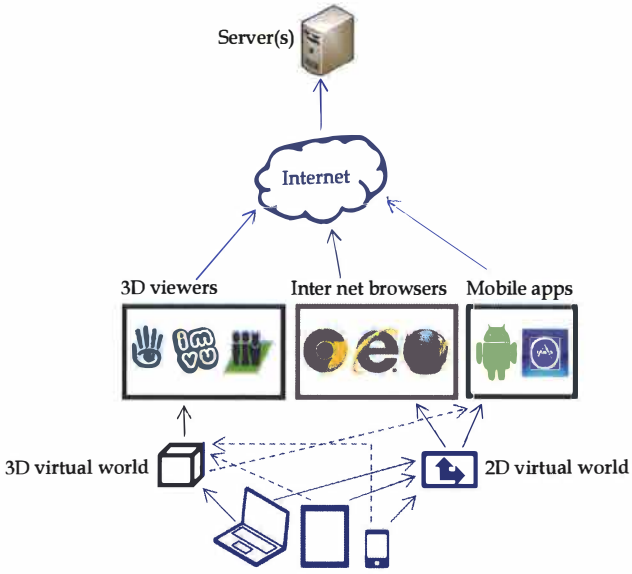

FIGURE 6 Deployment of virtual worlds to users.

The features available vary significantly from virtual world to virtual world. However there are some similar features that are can be found in most of them. There are many factors that affect the availability of different features and the most significant factor is whether the virtual world is two-dimensional or three-dimensional.

In most of the three-dimensional virtual worlds the experience is immersive and that is why they are also referred to as 'immersive' virtual worlds. This is mainly due to the fact these virtual worlds have three-dimensional avatars that navigate into a three-dimensional space and the visual and audio effects add to the experience as they feel the way it is in the real world. For example, the sound gets louder if an avatar moves closer to the source of the sound. Another feature that is present only in three-dimensional virtual worlds is the freedom for the users to build objects for virtual world. For example, most of the virtual world of SecondLife is built by the users. Most of the two-dimensional worlds do not have this feature. 'Metaplace' was the only two-dimensional virtual world that was planned in such a way that users could build in it but it ended in beta phase in 2010. However, in most of the virtual worlds the objects can be purchased by the end users using real money. This is a source of revenue for many virtual worlds such as Habbo, Club Penguin and SecondLife.

Another feature that is available in most of the virtual worlds is the availability of a private space in which the user can arrange the objects he has acquired and can also arrange different events such as games, parties and etc.

Text-based chat is a common communication mechanism in virtual worlds. However, some virtual worlds such as SecondLife and ActiveWorlds also support voice chat. Other means of communication can be avatar gestures. This brief overview of features can help in choosing the virtual world.

After the teacher has chosen a particular virtual world than the computer administrators need to implement the technology at the school. The process technical facilitation is shown in Figure 7. First they should check if the computers meet the minimum requirements for a virtual world or not. If not, then they should upgrade them. Then network requirements shall be tested. Virtual world need to be then installed or prepared. Following that the whole technology shall be tested. If there are technical problems then they shall be removed. If not, then the teacher's and user's accounts shall be made. During the use of the virtual world if a technical problem arises then it shall be solved immediately. It is suggested to test the virtual world before each session to identify and solve the problem before the teaching session starts.

I hope that these will serve as guidelines and will be beneficial in facilitating the use of virtual worlds in schools.

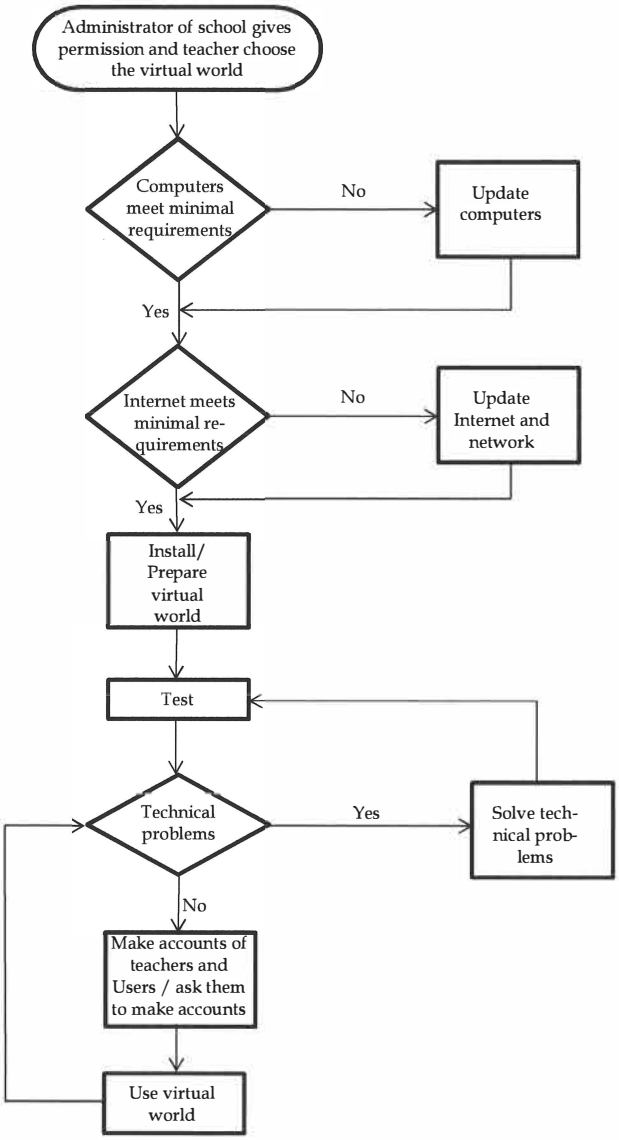

FIGURE 7 Technical facilitation of virtual worlds.

6 CONCLUSION

In this last chapter, an overall conclusion of the thesis is provided. Main findings and contributions of the thesis to the research field are presented. The limitations of this thesis and research are also mentioned and direction for future research in this area is given.

6.1 Conclusion of the dissertation

It can be concluded for this dissertation that for pedagogical facilitation using virtual worlds the needs of different stakeholders shall be considered and addressed. In this thesis I have tried to find answers to all the questions that were raised for this research.

The participatory practices resulted from the research that was conducted for PI, PII and PIII. The considerations that the teachers and the administrators have to take in account for a successful facilitation of learning in virtual worlds were derived from literature review and from the results of the study that resulted in PV and PVI. Classroom implementation strategies were also compared in the same study that resulted in PV and PVI and it was found that in-class explanation by teacher plus the group discussions shall be accompanied with guided-inquiry sessions in virtual worlds.

At the end we created a framework of educational facilitation in virtual worlds. The framework asserts importance on the role and suggests actions that shall be taken by administrators, teachers, researchers, designers and students. These roles are centered around the role of the virtual worlds which is based on participatory practices and affordances for education.

6.2 The contribution of the research

The research presented here has contributed to the field of educational technology and e-learning in general and educational use of virtual worlds and games in particular. The aim of this research was to create a better understanding of the different aspects of facilitation of education in virtual worlds.

This research achieved most of its aims. It did succeed in identifying the participatory practices in virtual worlds; the considerations for teachers, and administrators, through evaluating learning gains, instructional delivery methods and looking into the facilitation process. Thus, the aim of creating a better understanding and providing a framework about the use of virtual worlds in educational contexts, especially schools, was achieved. These can be taken as guidelines also for implementing virtual worlds in schools which, one hope, will help teachers and administrators immensely.

Thus, the academia is further empowered in using virtual worlds and this thesis could prove to be a big step towards bringing virtual worlds in education. However, there were some limitations as well and further investigation is needed about the issues that are presented in the following text.

6.2.1 Limitations

Although the contribution of this thesis to the research field is quite significant as is mentioned above, there are some limitations of this research which need to be further investigated and can serve as a temptation for future research. Many issues were raised in this research towards which this thesis provides a small contribution but does not provide enough conclusive results to be generalized at a large level.

Some of the biggest virtual worlds were not used in this study, although participants mentioned using them in different parts of our research, because they are mostly not used for educational use. However, they were included in that part of the research where participatory practices were investigated. Virtual worlds like Poptropica, Stardoll and Habbo each have more than 200 million users worldwide (KZero Q1 Universe Chart, 2012) and if you combine the number of users of five top virtual worlds, the total number is approximately equal to that of Facebook (Facebook, 2012).

Although not as popular as other virtual worlds among teens, Second Life was only briefly investigated for the use of education in this research. There are two big reasons for that, one being the age limit for Second Life users which is 16 at the moment and that nearly makes it impossible to use it in elementary and secondary schools. Only students of higher secondary, known as 'lukio' in Finland, can use Second life, and in them also, the last year 'lukio' students may not like to diverge their attention from the final exams. The second biggest problem was the uncertainty that surrounded 'Teen Second Life' during the time of this research. Closure of the teen grid in December of 2010 (Teen Second Life wiki) was not predicted and it caused problems for our research resulting

in avoiding Second Life for the rest of research as it is anyway not popular among teens.

6.3 Future research

It could be logically suggested that any research that further investigates the issues that are identified above as limitations could serve as good direction for future research. The role of gender, virtual world variety, and global diversity shall be especially researched.

We noticed in our research that interest in virtual worlds is significantly dependent on gender. Boys like different kinds of virtual worlds than girls. Girls may like to engage in activities in which boys are not interested in. This can pose a serious challenge for mixed-gender classes, and a classroom implementation strategy for mixed-gender classes shall be proposed. However, there is a need to deeply investigate our suggestion and weigh our guidelines.

Virtual worlds exist in much variety. They vary from gender specific to universally attractive and the theme can range from sports to hang-out. There are those with three-dimensional graphics and those which have two dimensions. All this choice and variety, on one hand, gives us freedom and on the other hand confuses us. Thus far, most of the research on the educational use of virtual worlds has focused on three-dimensional virtual worlds. For example, River City and Quest Atlantis were both made in three-dimensional 'Active worlds', and 'Second Life' and its previously existing teen-grid were also three-dimensional. One must point out that the biggest virtual worlds have so far been ignored by the educational research community. There lies a big opportunity in them and their use in education shall be researched.

We used virtual worlds which are mainly made in the USA. We researched in Nordic countries and even did a study in Pakistan. Quest Atlantis, which follows and implements the curriculum based in the USA, was used in our research that was done in Pakistan. Thus, topics which are relevant to a curriculum in one country cannot fit into other country's curriculum as in the case of Pakistan. Besides, the school systems can be very different and require different implementation strategy. The issues of local context, culture and language shall be kept in consideration when implementing a virtual world for education. All these challenges shall be researched in future to get a better contextualized understanding of implementing virtual worlds in education.

In this thesis, it was not a goal to identify the subjects that could be best taught using virtual worlds. The research about the use of virtual worlds in science education and socio-scientific enquiry is quite convincing but what about mathematics, language and history. Although, some research has been done in this area but there is a dire need for further research so that administrators and teachers could make their decisions easily about using virtual worlds in education.

YHTEENVETO (FINNISH SUMMARY)

Virtuaalimaailmoista on tullut viime aikoina yhä suositumpia, ja siten myös tutkijat ja pedagogit ovat alkaneet kiinnostua niistä. Siitä huolimatta, että monet oppimisen asiantuntijat uskovat virtuaalimaailmojen olevan hyödyllinen opetusteknologia, niitä ei vielä ole laajasti otettu käyttöön kouluissa. Tämän tutkimuksen tavoitteena on tarkastella näkökohtia, jotka liittyvät virtuaalimaailmojen käytön edistämiseen kouluissa. Ensinnäkin tavoitteena on identifioida virtuaalimaailmojen käyttöön liittyvät osallistumisen käytänteet. Pedagogit voivat hyödyntää tätä tietoa valitessaan tarpeisiinsa sopivia osallistumiskäytänteitä. Toisena päätavoitteena tutkimuksessa on selvittää näkökohtia, joita opettajien ja koulun johdon tulee ottaa huomioon edistääkseen virtuaalimaailmojen käyttöä kouluissa, kuten erilaisten opetuksen tarjoamisessa käytettävien menetelmien valintaan liittyvät kysymykset.

Väitöskirja koostuu johdannosta ja kuudesta artikkelista. Ensimmäiset neljä artikkelia käsittelevät osallistumisen käytänteiden tunnistamista. Neljäs artikkeli liittyy myös toiseen päätavoitteeseen, jota käsitellään myös viidennessä ja kuudennessa artikkelissa. Kuudes artikkeli vertailee erilaisia menetelmiä opetuksen tarjoamiseen. Tutkimuksen eri vaiheisiin osallistui viisi suomalaista ja pakistanilaista koulua. Tutkimuksessa käytettiin pääasiassa mixed methods -lähestymistapaa.

Väitöskirja rakentuu perusteellisen kirjallisuuskatsauksen pohjalle, ja tutkimuksen tuloksena tunnistetaan keskeiset osallistumisen käytänteet sekä luodaan suosituksia, jotka tulisi ottaa huomioon otettaessa virtuaalimaailmoja käyttöön kouluissa. Tutkimuksessa esitetään viitekehys oppimisen edistämiselle virtuaalimaailmoissa. Viitekehys kuvaa tutkijoiden, suunnittelijoiden, koulun johdon, opettajien ja oppilaiden roolit, jotka kaikki yhdistyvät toisiinsa virtuaalimaailmojen roolin kautta, joka puolestaan määritellään affordanssien ja osallistumisen käytänteiden kautta. Väitöskirjaan sisältyy myös pohdinta virtuaalimaailmojen koulukäytön edistämisen prosessista: tässä tarkastellaan käyttöönotossa huomioon otettavia teknisiä näkökohtia, fasilitaatioprosessia sekä virtuaalimaailmojen toimintoja.

Lopuksi esitetään suosituksia tulevista tutkimusalueista ja -suunnista, joiden avulla voidaan edistää virtuaalimaailmojen mielekästä käyttöä kouluissa.

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ORIGINAL PAPERS

PI

PARTICIPATION OF THE YOUNG ONES IN VIRTUAL WORLDS: A LOOK AT EXPERIENCES AND MOTIVATIONS

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Participation of the young ones in virtual worlds: a look at experiences and motivations

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Abstract

Virtual worlds have become very popular and there have been some attempts to find the motivations and experiences of using them. The aim of this paper is to analyze the motivations and experiences of young ones to utilize virtual worlds. The paper identifies the activities that children perform in virtual worlds, features they use as well as the reasons for abandoning these virtual worlds. The paper presents results of a qualitative field study. The results indicate that features that are liked in the virtual worlds are similar to games. The most liked features for virtual worlds were developing characters and doing things in groups. The activities that were liked the most in virtual worlds were: chatting or doing different things with friends; playing games; and exploring new places. The main reasons to abandon virtual worlds were increased needs for social networking and better gaming experiences. Students showed interest in using games and virtual worlds at schools, but were generally rather skeptic about this possibility.

Keywords: Virtual worlds; multi-user virtual environments; user experience; motivation; computer-assisted learning.

1. INTRODUCTION

In recent years some of the Multi-User Virtual Environments (MUVEs) have seen an exponential growth in the number of users. At the end of the third quarter of 2008, there were nine MUVEs which had more than 15 million registered accounts worldwide, namely *Habbo*, *Neopets*, *Stardoll*,

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IMVU, *Poptropica*, *Club Penguin*, *Second Life*, *Barbie Girls* and *Gaia* (KZero, 2008a). The recent analysis of registered user accounts of virtual worlds shows interesting trend for the first quarter of 2009 (KZero, 2009). Firstly, there was a rapid increase in the number of registered accounts of some MUVEs which shows acceleration in interest in these environments. And secondly, the average age of users in seven out of ten of these most famous virtual worlds, as of first quarter of 2009, is under 15 years.

There are many definitions of virtual worlds, some of them being quite contradictory as well. The initial definitions arise from the sensory aspects of these environments. Schroeder (1996, page 25) defined the term *virtual environment* or *virtual reality* in a generalist style as "a computer-generated display that allows or compels the user (or users) to have a sense of being present in an environment other than the one they are actually in, and to interact with that environment". This broad definition entails many applications to be conceived as virtual environments. Then in 2006 a definition of a *multi-user virtual environment* arises as being a virtual environment, as is defined above, where other users are also present at the same time and one can interact with them (Schroeder, 2006).

Virtual worlds are essentially social spaces with social dynamics being central to their definition. For example, Bell (2008) puts the social issue at the core of virtual worlds as he defines virtual worlds as "a synchronous, persistent network of people, represented as avatars, facilitated by networked computers". Spence (2008) provides a table of 'social networking site - virtual world's hybrids' which includes many virtual worlds that are built for the purpose of social networking. Even though these virtual worlds are built for social networking, they have not been able to gain as much attention from users as the social networking websites have. One reason for this is that virtual worlds do not provide same features as popular social networking services, such as *Facebook* and *MySpace*. For example, asynchronous communication ways, access to friends of friends, status updates and media sharing in virtual worlds are not as good as in social networking services.

There are researchers (e.g. Spence, 2008; Steinkuehler and Williams, 2006), who state that virtual worlds are essentially non-game spaces where games can be part of them but are not the defining characteristic of a virtual world. This kind of discussion tries to categorize which applications can be included as virtual worlds. For example, Massively Multiplayer Online Role-playing Games (MMORPGs) are essentially games, which are driven by the motive of competition to achieve a certain task which is generally forced to be followed by the game provider. Recently developed MMORPGs provide also many opportunities for socializing but central to their functioning is the game element.

Though predecessors of virtual worlds, like Multi-User Dungeons (MUDs) and MOOs (MUDs, Object Oriented), have existed for some time already, virtual worlds themselves are quite new. For example, Habbo Hotel started in 2000, whereas, Second Life started in 2003. Also, the amount of research conducted on the use of and participation in the virtual worlds is still in emerging phase.

The aim of this paper is to explore the motivations and user experiences of the young to participate in the virtual worlds. The paper is based on a case study conducted during spring 2009 at

a Finnish lower secondary school. In this study, virtual worlds and MUVEs are defined as open-ended environments, which do not have an end as in games, in which games are not the main activity. Thus, MMORPGs like *World of Warcraft* and other games are not included in field study that was conducted at school.

The participation in virtual worlds and MUVEs has not yet been widely studied. One example is a detailed survey conducted among 58,500 respondents about their use of *Habbo* in 2008 (Habbo, 2008). The comparison of survey respondents from UK, Spain and Germany indicated that Habbo users were mostly interested in actions such as listening to music, playing video and online games, watching movies and partying (KZero, 2008b). Wetsch (2008) explored the experience of new users of Second Life. The participants were found to be frustrated by the technical requirements, which are quite high for most users. Those who had computers that met the technological requirements were amazed and surprised by the graphics. Wetsch (2008) also reports that the users enjoyed the variety of experience that Second Life provides but could not get enough interaction with others due to lack of avatars. It was initially difficult to handle avatar controls but the learning curve was very steep and it did not take much time for users to learn this. The participants in that study also complained about the lack of buildings and about unimpressive architecture.

1.1. Motivations and experiences for games

However, during recent decade there has been a growing research interest to find out motivations and experiences of playing video games, RPGs (Role-Playing Games), MMORPGs and MMOGs (Massively Multiplayer Online Games). This research interest has emerged at the same times when video games have gained widespread popularity among different age groups and cross sections of society (Entertainment Software Association [ESA], 2009). According to a survey conducted by Schuurman, De Moor, De Marez and Van Looy (2008), the strongest motivations for playing a video game were indulge (the ability to feel completely indulged in the video game), arousal and pass-time. On the other hand, social contact was the weakest motivation for playing a video game. Sherry, Lucas, Greenberg and Lachlan (2006) composed a list of gaming motivations which included social, competition, challenge, fantasy, identification, escapism, pass time and arousal. Tychsen, Hitchens and Brolund (2008) suggest 12 motivational factors that form two different clusters for multi-player digital Role-Playing Games (RPGs). First cluster includes tactics, character optimization, competition and grief play. The second cluster focuses on socializing, depth of character and role-playing, discovery and immersion. These two clusters are connected by escapism, which means that one avoids thinking about the real world. This is related to above mentioned motivation labeled as indulge by Shuurman et al. (2008). Yee (2005) divides motivations for playing MMORPGs into three categories which are achievement, social and immersion. These three overreaching categories include many motivational factors.

Bartle (1996) suggests that users in MUDs enjoy achievement within the game context, exploring, socializing and imposing (i.e. to help or to distress). He reflects that MUDs are games to achievers; pastimes to explorers; sports to killers; and entertainment to socializers. Thus, Bartle (1996) defines the MUDs in terms of the motif that the user has and the activities that one performs in MUDs. Bartle's (1996) and Yee's (2005) work has influenced many researchers. Many of the motivational

studies previously mentioned, use Yee's (2005) motivational factors as a basis to design their surveys for probing motivational factors.

Salovaara, Johnson, Toiskallio, Tiitta and Turpeinen (2005) studied the motivations of play-makers in open-ended multi-player games. They describe play-makers as those users who arrange and make resources for other users to play a game. They probed *Habbo Hotel*, live-action role-playing games, *Geocaching* and *Neverwinter Nights* users. The results indicated four categories of motivating factors for these environments, namely: community orientation, personal reputation, effects on the community and socializing in the community. The motivations of creative room designers in *Habbo Hotel* were reported as fun, getting admiration and compliments and making people happy.

Above mentioned studies show that some of the motivational factors are based on the features of games while others are outcomes of the gaming experience. The motivational factors that depend on the features of games are character growth, competition and socialization. The outcomes of gaming experience are fun and arousal that one feels through a game.

1.2. Educational use of MUVEs

Many researchers have suggested that virtual worlds or MUVEs or 3D environments can be used effectively for education in different subjects (Dalgarno, 2002; Martinez-Jimenez, Pontes-Pedrajas, Polo and Climent-Bellido, 2003; Zumbach, Schmitt, Reimann and Starkloff, 2006). There have been also several attempts to develop MUVEs for different school subjects, especially for science learning. For example, Dalgarno (2002) and Martinez-Jimenez et al. (2003) created 3D virtual labs to carry out experiments of chemistry and Zumbach et al. (2006) developed a virtual molecular biology lab for learning of life sciences. Some examples of game-like MUVEs developed for sciences learning at schools are *River City*, which deals with the health science issues and *Quest Atlantis* about ecological issues. Barab, Warren and Ingram-Goble (2008) found learning gains when children used *Quest Atlantis* based curriculum. In addition to science learning, virtual worlds or MUVEs can be utilized to rebuild historical settings in order to enhance the authenticity of history learning. For example, 'the virtual dinosaur museum' (Tarng and Liou, 2007) can be reconstructed in virtual worlds or MUVEs.

2. METHODS

This study was carried out as a qualitative case study at one Finnish lower secondary school. All the research sessions were conducted in the school computer lab. The participants were 15 students, aged between 13 and 15 in eighth and ninth grades. Eight of the students were girls and seven were boys.

The study was carried out using a mixed-method approach. The data was collected through questionnaires, interviews and observation of user sessions. There were two different questionnaires. The aim of the first questionnaire was to gather initial background information about user experiences and also to group the participants according to the virtual worlds they have been using. The students were requested to fill in a form that contained questions about their use of

virtual worlds and the frequency at which they were using them. The form contained a list of 26 virtual worlds as well as empty space to mention up to three virtual worlds which were not in the list. The participants were requested to answer three questions for each virtual world. In the first question, they were asked how long they had been using a particular virtual world, which was followed by a question about the frequency of use. Thirdly, they were asked how long ago they had stopped using a particular virtual world if they were not using it any more.

The aim of the second questionnaire was to find out about the use of computers, games and virtual worlds. The students were asked to answer an online survey, which contained 25 questions concerning background information about the use of computers, games and virtual worlds. It also included queries about their experiences, expectations, motivations and perceptions about using games and virtual worlds in education. The survey questions were designed based on earlier studies focusing on motivations and experiences (e.g. Schuurman et al., 2008; Tychsen et al., 2008; and Yee, 2005).

The aim of the user sessions was to understand the activities that users usually perform in MUVEs. User sessions of different MUVEs were conducted in five groups of participants, each related to a particular virtual world (or a group of virtual worlds). The groups were formed based on the answers of the first questionnaire. Those which mentioned a significant use of a particular virtual world were grouped together. The groups were *Club Penguin* (4 participants) *Neopets* (3), *Habbo Hotel* (3), *Barbie Girls/Barbie.com/Stardoll/pollypocket.com* (3) and *IMVU* (2). Three participants mentioned also Meez. However, they had only used the character generation feature which is used to make 3d characters for other applications. None of them had used the virtual world from Meez, thus the user session was not held. However, their interview was conducted. Each group used the virtual worlds for about 20 to 30 minutes and explained the activities that they performed in the virtual worlds as well as the features that they liked and disliked. The session of use was followed by an open ended interview. The purpose of the interview was to probe at a deeper level about the answers in the survey and to find views to use these environments in education. The interviews were conducted after the user sessions, in the same groups, and they lasted from 30 to 45 minutes. The themes of the interview were: use of virtual worlds; features liked; reasons to use and abandon virtual worlds and perceptions about using games and virtual worlds for education. The user sessions of virtual worlds and interviews were video recorded. The interviewer and the observer also wrote field study notes.

3. RESULTS

In this case study we were interested in getting an insight into the experiences and motivations of participants for using virtual worlds. The results of the study are presented in two parts, namely in regard of 1) student's experiences in utilizing virtual worlds and 2) student's motivations in participating in virtual worlds. The reasons for abandoning virtual worlds are presented in the motivations part.

3.1. Student's experiences in utilizing virtual worlds

Student's experiences in utilizing virtual worlds are examined by determining which virtual worlds students have used, the length of use, the frequency of use, and the period of abandoning the virtual worlds. The students were asked to name which virtual worlds they have used. There were 19 students that answered this question. Four of them had never used any virtual world. The students with user experience mentioned altogether 14 different virtual worlds that they have used.

The length of use varied a lot among the mentioned virtual worlds. Students had used most of the virtual worlds for less than a year. For example, five out of eight users of Neopets and six out of seven users of Habbo Hotel had used them for less than a year (Table 1). The length of participation was better in gender specific virtual worlds that were targeted at girls, namely Stardoll, Barbie.com and pollypocket.com. For example, three out of four users of Stardoll and two out of four users of Barbie.com had used these virtual worlds for 1-3 years (Table 1).

Also the frequency of use was greater for virtual worlds that are aimed at girls. Three participants used some times in a week Stardoll and Barbie.com (see Table 1). Stardoll and Barbie.com are based on the real world dolls. These virtual worlds offer girls different activities and some of these are based on the real world products. Other virtual worlds were used less frequently either 'some time in a week' or 'not so often', with participants mentioning 'not so often' slightly more than 'some times in a week'. Three participants also mentioned using Neopets, Club Penguin and Habbo Hotel some times in a week.

The results indicated that most of the users had stopped using any virtual world more than six months ago. Only three out of the fifteen students were still using virtual worlds. The virtual worlds they were still using were Club Penguin, Neopets and IMVU. Club Penguin and Neopets are two-dimensional virtual worlds that are aimed at mostly 10 to 13 year olds. However, IMVU is for adults and built around the themes of dating and romance.

Table 1. Results of the initial questionnaire

Virtual World	**No. of participants who used**	**How long have you used?**			**How often have you used?**			**If you do not use anymore, then how long ago have you stopped using?**		
		Less than a year	1-3 years	More than 3 years	Every day	Some times in a week	Not so often	Less than 6 months	More than 6 months	Still using
Neopets	8	5	3	0	1	3	4	1	6	1
Club Penguin	7	4	2	1	0	3	4	1	5	1
Habbo Hotel	7	6	2	1	0	3	4	1	6	0
Stardoll	4	1	3	0	0	3	1	0	4	0
Barbie.com	4	1	2	1	1	3	0	0	4	0
Pollypocket.com	3	1	1	1	1	2	0	2	1	0
IMVU	2	2	0	0	0	1	1	0	1	1

Student's motivation in participating in virtual worlds

Student's motivation in participating in virtual worlds is described through the activities they performed in them; features students liked in particular virtual worlds; and also the reasons for abandoning them. Questions about features and activities were present in the survey form and were

probed further in the interviews. Reasons for stopping participation in virtual worlds were mentioned in the interviews.

Students were asked to choose activities that they performed in a virtual world by a question in the survey form which was: What do you usually do in virtual environments? They were presented with nine choices which were: 'chat or do things with my friends'; 'play games'; 'explore new places'; 'create new objects or buildings'; 'party'; 'purchase things'; 'decorate my virtual space or room'; and 'other' with free space provided to mention the other activity. There were three activities out of eight that appeared to be most common for the students (Table 2). The most common activity was chatting or doing things with friends as 10 out of 15 students indicated this. The next common activity was playing games with nine students mentioning it. The nature of games was revealed in the interviews, indicating that most of the students were playing embedded mini-games. Most of the girls who mentioned playing games were involved in playing gender specific games, such as dress-up games in Barbie.com, which were mentioned by four girls. And finally the third common activity was engaging in exploring new places, as this was mentioned by six students. Also all the other activities had been chosen by two students.

Table 2. Activities that students performed in virtual worlds

Activity		Number of respondents
Chat or do things with my friends		10
Play games		9
Explore new places		6
Create new objects or buildings		3
Party		2
Purchase things		2
Decorate my virtual space or room		2
Other	Visiting other's homes	1

Some of the questions of the survey were aimed at finding the features of games and virtual worlds. In one question ("What are your favorite games?"), the participants were asked to provide the names of five games they play the most. Then they selected the features that they adored in each of those games. The accumulated number of games mentioned was 37, and there were not many games that were mentioned several times. There were seven features to select from: 'freedom to do things'; 'developing the character'; 'competing and challenges'; 'doing things with others'; 'exploring new places'; 'feeling of being there'; and 'feeling of reality'.

Features that were mentioned for each game were summed up across all games. The results are presented in Table 3. There were three features that were liked in over 20 games, namely freedom to do things (in 25 games), developing the character (24 games), and competing and challenges (21 games). Three other features were found as enjoyable altogether in 17-19 games. Such features

were possibility to do things with others, exploration of new places and feeling of being inside the virtual world. There were also ten games which were brought forth because they gave feeling of reality.

Table 3. Features of games.

Feature	Number of games in which it was liked
Freedom to do things	25
Developing the character	24
Competing and challenges	21
Doing things with others	19
Exploring new places	19
Feeling of being there	17
Feeling of reality	10

Students were asked to evaluate the features of virtual worlds. Features that were most liked in virtual worlds are very intrinsic to them. The basic list of the features was same as in the case of games, but there were to additional features added here, namely role playing and question related to the environment mechanics. The order of most liked features was somehow different as it was in regard of games. The variation in the amount of students favoring a single feature of virtual worlds was from 4 to11. The most liked feature was the possibility to develop a character as 11 out of 15 students mentioned it. Three other features were ranked almost as high, namely doing things with others (mentioned by nine students) as well as exploring new places and freedom to do things, which both were mentioned by eight students (Table 4). Competing and challenges and role-playing were mentioned by six participants. While, feeling of reality, feeling of being there and how the environment works were each mentioned by four students.

Table 4. Features of virtual worlds

Feature	Number of respondents who liked it
Developing the character	11
Doing things with others	9
Exploring new places	8
Freedom to do things and roam about	8
Competing and challenges	6
Role playing	6
Feeling of reality	4
Feeling of being there (Immersion)	4
How the environment works (Environment mechanics)	4

The comparison of features liked in games and in virtual worlds indicates a clear overlapping. For example, developing the character, doing things with others, exploring new places and freedom to do things were liked in games as well. Competition and challenges is an intrinsic property of games, thus it was not quite as essential and important in virtual worlds.

In the interviews, reasons for not continuing participation in the virtual worlds were discussed. The most important reasons that were revealed are as follows: Needs for social networking not

fulfilled by using virtual worlds; non availability of good games; being bored; need to spend money in order to enjoy them further, for example in Club Penguin, Habbo and Meez; not being able to understand the environment and activities; childish graphics; and technical reasons, for example the virtual worlds did not work properly on the computer.

The two most important reasons, out of the ones mentioned above, were increasing needs for social networking and playing games. This was revealed by two factors in the interview: by the applications that the participants mentioned that they switched to, and by explicitly mentioning that they wanted something to enable them to socialize with their real life friends. Social networking applications were found to be very popular among these students: nearly all of the children were using online social networking websites (such as Facebook) and software (e.g. Skype). Most of the boys (all except one) wanted to play better games while nearly all the girls thought they needed to socialize more.

4. DISCUSSION

There are many activities that can be performed in a virtual world or MUVE which are essential part of virtual worlds and can be taken as motivational factors. Exploration of new places, partying, creating objects alone or with others and decorating ones room and arranging events are very essential activities in all virtual worlds. Developing ones avatar is also very basic activity in a virtual world and was also the feature that was liked the most and is mentioned to be a motivational factor in games (Sherry et al., 2006; Tychsen et al., 2008). Many students mentioned character development as an important feature both for games and virtual worlds. However, there are some differences in ways this can be realized in games and virtual worlds. In games, character development is strongly dependent on the aspects of game-play. One's choice of character strongly affects the way the game is played and the way the character is developed while the game is being played. However, in virtual worlds and MUVEs the avatars are the characters. Mostly, avatar development means to choose the face, body, clothes and accessories for the avatar. The variety of choices may depend on the amount of use of the virtual world and the number of coins that one has to purchase clothes and accessories.

The results for activities performed and features liked in virtual worlds or MUVEs show that users need features and tools that enable them to socialize in an effective way which is in accordance with the motivational factors that are mentioned for games, MMORPGs and MMOGs (Sherry et al,. 2006; Tychsen et al., 2008; Schurman et al., 2008; Yee, 2005; Bartle, 1996; Salovara et al., 2005). Most of the participants were socializing with the persons they already knew. Virtual worlds at the moment including those which are made for social networking (Spence, 2008) do not provide the same amount of opportunity and flexibility for socializing as the popular social networking websites like Facebook and MySpace. Virtual worlds provide limited possibility for sharing media, communicating asynchronously and providing updates on the current activities of friends. These features are essential for all social networking sites and it seems that young people at this age value their social relationships very much. However, socializing in virtual worlds does not only mean to get together

and enjoy. It also includes activities like doing something together, for example exploring new places with someone and building or creating objects in groups. This feature was also liked in many of the student's favorite games, which shows the importance given by today's youth to being able to do something together with others.

Half of the students used to play games in these virtual worlds as well. Most of them were playing embedded mini-games. Most of the girls were involved in playing gender specific games, for example dress-up games in Barbie.com.

The possibility to explore new places was quite popular among the students as well. This feature has been mentioned as a motivation by Tychsen et al. (2008) and as 'discovery' by Bartle (1996). Most of the time, these new places were explored to play games or to socialize with others. Another feature that was liked by many was the freedom to do things and this has not been mentioned in the reviewed literature on motivation mentioned earlier. This feature is very powerful in virtual worlds as many virtual worlds allow users to create things and do activities of their choice. Thus, playing games and socializing are very important activities that the young people were looking to do in these virtual worlds.

The reasons for abandoning these worlds included increased needs for socializing and gaming, economic reasons, lack of understanding of the nature of the environment, graphics, and technical reasons. Many of the participants stopped using virtual worlds as they grew older and thought that they were not children anymore. Many of them mentioned childish graphics in Club Penguin and Barbie Girls. Users that liked IMVU particularly mentioned that they liked the graphics, as the environment is three-dimensional and more realistic. Similar experiences of admiring the graphics were also noted by Wetsch (2008) for Second Life. It could be that as children grow older, they start liking three-dimensional virtual worlds more, as compared to two-dimensional virtual worlds.

When the participants were asked to give their views on using games and virtual worlds for education, all of them showed concerns that education and games or virtual worlds are difficult to bring together. However, three of them mentioned that some games can be used to practice for exams. The participants were rather skeptic about using virtual worlds or games for education. They all agreed that education at school is boring but important in order for them to proceed in their lives. All of them had the view that education will become very interesting if games and virtual worlds are somehow used for this purpose. However, some mentioned concerns about the possibility of using virtual worlds at schools because the teacher and the classroom are essential for learning. There is a need to find a way to include virtual worlds in school learning, but this requires careful planning to specify the roles of teachers and students and the way the virtual worlds are used in the current school environment.

It is important to carefully design virtual worlds for education. It should be based on the features and activities that are liked by the students at a particular age. There is also a need to look deeply into the reasons for abandoning virtual worlds and to avoid hurdles that causes lack of interest. Otherwise, uninterested students will not be motivated to use virtual worlds for education.

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PII

A FRAMEWORK FOR CHILDREN'S PARTICIPATORY PRACTICES IN VIRTUAL WORLDS

by

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A Framework for Children's Participatory Practices in Virtual Worlds

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Abstract

In recent years, participation of children in virtual worlds has grown and children are also the largest number of users of virtual worlds (KZero, 2009a). This growth in participation in virtual worlds has brought out discussion about their effects on children's lives. In this article, we consider opportunities of virtual worlds to engage and educate children about their civic life.

The aim of this paper is to establish a framework for participation in virtual worlds and to test the framework by looking at current participatory practices in virtual worlds. In this paper we present a framework for children's participation in virtual worlds which is based on research review. Our framework sees children in virtual worlds as social actors, learners of civic participation and as citizens. Results of a survey conducted to find the participatory practices of children in virtual worlds are also presented. The results indicate that children are highly interested in socializing with friends and engaging in avatar related activities. It was also found that traditional forms of civic participation are not very common in virtual worlds. Thus, there is a need to promote traditional forms of civic participation and at the same time look at new opportunities presented by virtual worlds for civic participation.

Keywords: virtual worlds; virtual participation; civic participation; civic education; children's participation.

A Framework for Children's Participatory Practices in Virtual Worlds

Virtual worlds captivate children with imaginary, immersive and collaborative environments. In recent years some of the virtual worlds have seen an exponential growth in the number of users. Most of this growth has come from child-centered virtual worlds aimed at 10-15-year-old children as is revealed through a comparative analysis of registered user accounts of virtual worlds for the first quarter of 2009 and at the end of fourth quarter of 2009 (KZero, 2009a). As virtual worlds and other virtual spaces such as games and websites have become almost a natural part of children's daily life, their supposed positive as well as negative effects on children's lives have been discussed. Some people have argued that virtual spaces contain many risks for children, related to inappropriate content and social interaction, while others have emphasized the possibilities of virtual spaces for children's agency and participation (Livingstone & Haddon, 2009).

Altogether, there has been growing interest in developing virtual worlds that could enhance children's participation and contribute to better learning by motivating, inspiring and supporting while having fun. Stranius (2009) has argued that the huge potential of collective participation is accumulated in online communities and it is only a matter of time as this power is extensively launched. Virtual spaces have been seen as new arenas for children's participation because traditional ways of participating, such as voting or organizational activities, do not encourage young people to participate anymore (Torney-Purta, Lehmann, Oswald, & Schulz, 2001; Bennett, 2008; Loader, 2007). The potential of virtual spaces has been related to their competence in allowing children to express their opinions and in offering children opportunities to construct their identities as well as learn civic skills such as deliberation and decision making (Bers, 2008; Stern, 2008; Kotilainen & Rantala, 2008). At the same time, the viewpoint of children as passive consumers of technology and media has changed (Jenkins, 2006) and they are now seen as active content producers and participants of virtual communities.

Although the potential of virtual spaces has been recognized, the focus of previous research has not been on virtual participation. Research on virtual participation has been in its infancy and for example internet access, use, interests and activities have received more research attention than participation in virtual worlds. According to Donoso, Ólafsson and Broddason (2009), only eight percent of studies related to children and their online practices

have focused for example on civic or political participation while 83 percent of the studies include information about online usage. Research on children's online practices and their media use in general has dwelt on how children are at risk online and are thus in need of protection, instead of considering them as active participants who have some autonomy in developing their own online experiences and practices (Ponte, Bauwens, & Mascheroni, 2009).

Given the current research landscape, our aim in this article is to establish a framework for participation in virtual worlds and to test the framework by looking at current participatory practices in virtual worlds. Additionally, we look at how these participatory practices can be used to enhance civic participatory skills.

Framework of virtual participation

The research field of virtual participation is quite young and the concepts related to virtual participation are not yet established among researchers (Pessala, 2009). Different concepts such as participation, civic engagement and influence are used in the research field. Virtual participation also refers to participation in different contexts, for example virtual worlds, net pages or social media. In this paper, we focus specifically on children's participation in virtual worlds. Use of virtual worlds is very popular among children but research on virtual participation has focused more on websites and other technologies than on virtual worlds. A lot of research has been conducted on children's participation as well, mainly focusing on methods for enhancing children's participation in different environments. However, the focus on virtual worlds has been missing. In this article, we seek to fill this lacuna by proposing our framework of virtual participation.

Virtual worlds as arenas of participation

Theis (2010) observes that the concept of participation has been criticized as it does not specify the meaning or forms of participation. Participation simply means "taking part" but the definition leaves open an essential question "taking part in what?". As participation does not take place inside a vacuum (Polat, 2005), we have to define the context of participation. One way to approach the concept is to recognize the distinction between participation as social activity and participation as influencing or creating change in political

or societal processes (Sotkasiira, Haikkola, & Horelli, 2010). Considering virtual worlds, both of these viewpoints are important and useful. Use of virtual worlds is usually social action and can thus be considered as participation. On the other hand, use of virtual worlds may have effects for example on users' opinions, attitudes and behavior, when the concept of participation refers to the effects which emerge as a consequence of the social activity. If participation refers to a process of influencing which is focused on a group of people or on a community, we may talk about civic participation (see Montgomery, Gottlieb-Robles, & Larson, 2004). In this section, we will look more into these two viewpoints that form a basis for our framework of children's virtual participation. We will first present a figure of the framework and then explain it.

The framework consists of four levels (Figure 1). The first level describes the two above-mentioned forms of participation: participation as social activity and as a process of influencing. The second level represents the child's roles as participant in virtual worlds which will be considered more closely in the next section. The third level describes the roles of virtual worlds in the process of participation and the fourth level illustrates the affordances of virtual worlds for children's participation. By affordances we refer to intrinsic features of technologies that support actions people intend to take with the technology (Gibson, 1986; Nardi & O'Day, 1999). Affordances may be intentional, for example virtual worlds' affordance is to provide people a place for social interaction and playing games. On the other hand, some of a tool's affordances emerge during use, unanticipated by designers (Nardi & O'Day, 1999). Considering virtual worlds, unintentional affordances may refer, for example, to participatory features. Intrinsically virtual worlds were not designed to enhance user's civic participation or their civic skills but today we may see that virtual worlds have great potential for civic participation as well.

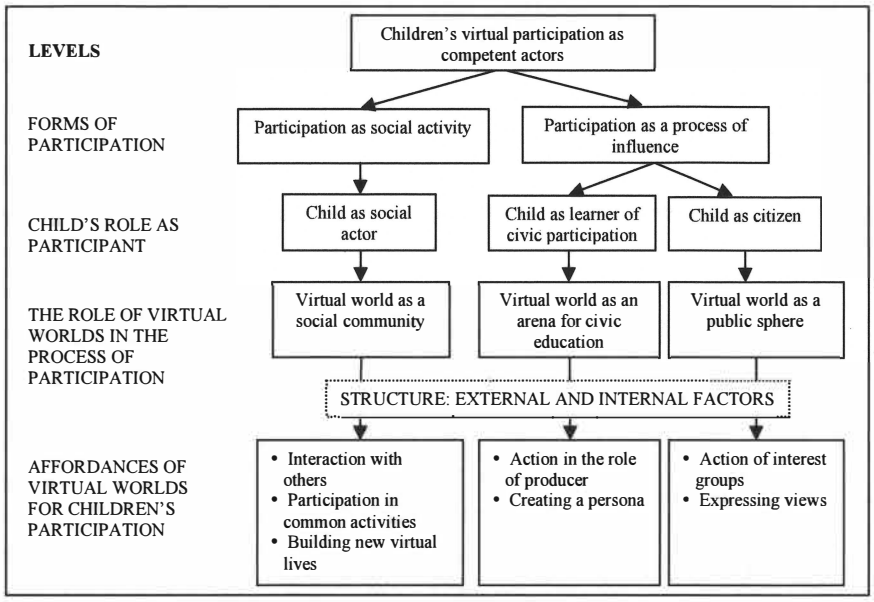

Figure 1. Framework of children's virtual participation.

The significance of virtual worlds as arenas of participation lies in their intrinsically social nature. Virtual worlds are conducive to groups coming together and spending time together, with people going to virtual worlds to seek sociability, interact with others and participate in a common activity of play or work (Noveck, 2006). Virtual worlds stimulate social experimentation and encourage people to create new virtual lives and to build new virtual cultures and identities. They are full of social cooperation but also social conflicts at the same time – in this respect virtual worlds present all the opportunities and risks of social order we find in real space (Balkin & Noveck, 2006). According to earlier surveys, social activity is one of the main reasons for using the virtual worlds (KZero, 2009b). Most of the Habbo users, for example, use the virtual world to meet and discuss with friends or to help others. In addition, the virtual world holds a specific social value for those people who may otherwise be passive, insecure and shy: virtual worlds as well as the Internet in general are important for fulfilling their social needs. (Global Habbo Youth Survey, 2006.)

A process of influence always demands that other people are involved (Kiilakoski, 2008). Thus the view of virtual participation as a social activity creates a basis for

considering virtual participation as a process of influencing. However, if the definition of participation as social activity is fairly unambiguous, defining the concept of influence is not so simple. Influence may refer to achieving certain transformations in the social or political processes or through decision making (Sotkasiira et al., 2010; Anttiroiko, 2003). In this regard, virtual worlds may be considered "public spheres". Participation takes place within a public realm (Polat, 2005) and virtual worlds have been seen as arenas for interest groups and activists to act in public. They organize meetings and events to engender public debate and in this way, seek to accomplish something together (Noveck, 2006). These meetings and events may be organized for the community of practice interested in issues ranging from transportation to clean air (Noveck, 2006). As civic engagement is understood as expressing one's views in order to participate and influence public life (Bachen, Raphael, Lynn, McKee, & Philippi, 2008), virtual worlds may be seen as arenas of civic participation as well.

It has been argued that the significance of new media for participatory activities lies in the shift from the "traditional" public sphere to everyday active participation in a networked, highly heterogeneous and open cultural public sphere (Burgess, 2007; Kalmus, Runnel, & Siibak, 2009). Since 'public sphere' has traditionally referred to the places of formal politics, such as elections and party activities, interactive net environments have expanded this sphere to everyday life and practices (Burgess, 2007; Rinne, 2008; Bennett, 2008). At the same time, forms of participation have become more personal and open: people can express their personality, values and lifestyles in a way they want (Rinne, 2008). This refers to opportunities of technology and virtual worlds as well. Virtual worlds have expanded children's environments, like other online participatory spaces, from school, home and hobbies to an extensive, world-wide virtual community and public sphere.

On the other hand, a process of influence may point to more abstract transformations in skills, attitudes and identities. According to Bers (2008), children may learn new concepts and ways of thinking about identity and civic life by using the virtual world. This is based on the ways in which the virtual world works. For example in Zora, which is a three-dimensional multiuser environment, children are put in the role of producers instead of consumers: children are engaged in thinking about issues of identity by inviting them to construct their own virtual homes and populate them with their most cherished objects, characters, pictures, stories, and personal and moral values (Bers, 2008). Another important characteristic of virtual worlds for identity construction is the avatar, the simulacrum of self within the game space. Creating a persona to represent oneself realizes the idea of freedom and autonomy and

on the other hand, forces users to think about how they want to appear as a member of a community. Thus creating an avatar is akin to assuming the role of citizens: avatars think and act as members of a game community rather than as private individuals (Noveck, 2006). In this case the significance of virtual worlds lies in their potential as arenas of civic education: virtual worlds are seen as a context for learning civic skills.

As we talk about public sphere and learning civic skills in virtual worlds, we come close to the concept of "civic participation" which can be defined in many ways. From the narrow viewpoint, civic participation refers to formal and traditional forms of participation, such as voting and taking part in demonstrations. The broad viewpoint extends the definition to active participation by community members, their interaction with others and their rights and responsibilities as community members (Montgomery et al., 2004). According to Levine (2008), civic engagement comprises even participation in shaping a culture which can mean many kinds of activities. In our study, civic participation is considered rather from the broad viewpoint though we will also look at the traditional forms of participation in virtual worlds.

The viewpoints of virtual participation as a social activity, and as a process of influence also define the roles of children as participants. Children can thus be considered as social actors, citizens or learners, depending on the context of their participation. If participation is defined as a social activity, participants may be seen as social actors in the first place. Children are social beings (Smart, Neale, & Wade, 2001) and technology, including virtual worlds, is one of the contexts in which many children fulfill their social needs. Defining participation as a process of influence, for one, sets children in the role of citizens. Children may be seen as citizens at this moment and thus virtual worlds are seen as public spheres and arenas for bringing out their own views and experiences. On the other hand, children may be seen as citizens in the future when the emphasis is on learning civic skills for the future. Thus, children are seen as learners. In the next section, we focus more on children's roles as participants in virtual worlds.

Children as participants in virtual worlds

Our examination of virtual participation is focused on children which entails some specific aspects. Children are always slightly special related to adults and hence things connected to children's well-being generate a lot of discussion, sometimes laden with moral panics. In recent years, discussions of children's use of technology, including virtual worlds,

have been intensifying. According to Ponte et al. (2009), the discussion has oscillated between two contradictory approaches to children's competence. Children have been seen as autonomous and fully-developed social actors on the one hand and as immature and incompetent agents on the other. Children's autonomous and social character has been emphasized especially in political and academic circles. Ponte et al. (2009) have recognized children's use of technology as part of their own culture and everyday life and based their argument on the United Nations Convention on the Rights of the Child which entitles every child to participate in their own culture and in all matters affecting the child. The traditional discourse, on the other hand, has been based on a view of children as incompetent beings. People using this discourse have associated children's online activities with negative feelings, problems and risks and thus brought out a critical view of effects of technology on children's well-being (Ponte et al., 2009).

The view of children's competence forms a basis for understanding their roles as participants in virtual worlds. Our basic argument is that a starting point for considering children as participants is the view of children as competent agents. We found this argument in one of the main theses of sociological childhood studies whereby children's competence justifies their roles as social actors and citizens. According to this thesis, children have the competence to be involved in the construction of their own social lives as well as of the societies in which they live (James & Prout, 1997; Smart et al., 2001). Thus, children are seen as social actors and as actual citizens here and now, not only in the future (Roche, 1999; Jans, 2004). According to Jans (2004), for example, children are strikingly sensitive about global social themes like the environment and peace. Children have a lot of thoughts and experiences and virtual worlds may provide an arena for bringing out these views. On the other hand, considering children as competent participants do not mean that adults give all the power and responsibilities to children. The fact of adult power is and will be inescapable as children always need protection from adults (Roche, 1999; Jans, 2004). What is being argued, however, is that the definitions of participation as social activity and as a process of influence intrinsically involve the view of children as somewhat competent agents.

The question about children's competence and their roles as participants can be contextualized by Giddens' notions of structure, which refers to rules and resources, and agency, which refers to people's capability of doing things (Giddens, 1984). Children have traditionally been considered as passive agents, first because they were seen as vulnerable and incompetent people (Smart et al., 2001) and second, because they have not been very

active for example in organizational activities (Myllyniemi, 2009). However, current research is beginning to indicate that today's children are indeed engaged in civic life and interested in participation, but in different ways than previous generations. Children tend to choose activism, volunteerism and virtual participation, as opposed to formal forms of participation such as participating in organizational activities (Bers, 2008). This means that children may also need new kinds of structures in the process of participation. Nevertheless, the potential of virtual worlds, for example, has not been fully realised. The potential of virtual spaces for enhancing children's participation has been noted and emphasized in many agendas (for example Lansdown, 2001; Inter-Agency Working Group on Children's Participation, 2008) and some preliminary studies have also shown the potential of new technologies to engage young people in online civic life. However, there is still a need for more research looking at *how* technology-based interventions, virtual worlds for example, can promote participation (Bers, 2008).

On the other hand, the notion of structure and agency can be considered as a viewpoint on virtual worlds. In virtual worlds, the structure may point to the external factors such as parental guidance, rules and restrictions on the one hand (Kalmus et al., 2009) and to the written rules of the virtual world on the other (Bartle 2006). Agency, for one, may refer to children's competence to participate in virtual worlds. Crucial to the children's participation in virtual worlds is the relationship between structure and agency. To what extent are children allowed to freely express themselves and discuss their opinions and experiences, for example? As we consider virtual participation from children's viewpoints, we base our framework on the view of children as competent actors. The way children's agency can be enacted relies, however, on the internal and external structures of the virtual world. It is crucial how the virtual world is constructed, the rules and restrictions which are set for their participation and the external factors which may have an impact on children's use of virtual worlds. At its best, the relationship of structure to agency is in balance so that the structure of the virtual world supports children's agency.

Defining clear bounds of virtual participation is not possible as the concept of participation is so fuzzy itself. However, we have now constructed our four-level framework of children's participation in virtual worlds, based on research literature on participation, virtual worlds and childhood. We will next present the study which sought to test the framework.

Methods

The aim of this study was to test the framework by looking at children's current participatory practices in virtual worlds. The study was carried out as an empirical survey study. A survey was conducted online at two Finnish schools in February 2010. It was distributed to schools through email with clear instructions for teachers and participants and a letter for parents. Most of the participants filled the survey in the computer labs of their schools with a teacher available for assistance. The total number of participants was 126.

The aim of the survey was to find out children's participatory practices in virtual worlds. The survey consisted of three parts: the first part asked the children about their background, the second part about their virtual world usage and the third part about their participation in virtual worlds. The first part included six questions related to name, gender, age, municipality, parents' education and leisure activities. It was followed by a question in which participants were asked about their knowledge, use and experiences of virtual worlds. We asked whether participants knew what virtual worlds were; whether they had used virtual worlds or not; and if they were currently using virtual worlds. Based on the answers to these questions the participants were directed to other parts of the survey. Those who were still using virtual worlds were asked to identify the virtual worlds they were using and answer different questions related to participation in those virtual worlds. Those who had stopped using virtual worlds were asked to identify the virtual worlds that they were using and give reasons for abandoning virtual worlds. We asked these questions in order to understand what contributes to the lack of participation in virtual worlds.

The main aim of the survey was to find out what participants are interested in within virtual worlds and what participants do in virtual worlds. The third part of the survey was designed from this point of view. We constructed the questions using earlier studies on motivations and experiences of using games and virtual worlds as a basis. For example Yee (2005), Schuurman, De Moor, De Marez and Van Looy (2008) and Tychsen, Hitchens and Brolund (2008) have studied motivational factors of games and listed the features and activities such as competition, socializing, creating and customizing character, group achievements, exploration, role-playing, game mechanics and freedom as motivational factors in games. Also Iqbal, Kankaanranta and Neittaanmäki (2010) have studied the motivational features and activities of virtual worlds and listed socializing with friends, developing the character, playing games and exploring new places as the most popular and

interesting activities in virtual worlds. As these earlier studies have not focused especially on participation, we also used our framework to get the viewpoint of participation in the questions. We listed the features and activities based on the affordances of virtual worlds for children's participation, for example expressing views refers to voting and action of interest groups refers to taking part in demonstrations in virtual worlds. As we did not want to confine participants' thinking to the features and activities that we chose, we also gave them a possibility to write on an open field about interesting things and their activities in virtual worlds.

Eventually, the third part contained four main questions. First of all, participants were asked which features of virtual worlds they were interested in. The participants were presented with 13 features and given three options (not interested, a little interested, very interested) for each feature. Secondly, the participants were asked about the activities they perform in virtual worlds through a series of three questions. There were three options, 'never', 'sometimes' and 'often', for each of the 15 activities. The features selected in this survey were not exactly the same as the activities, for example role playing was listed as a feature but not as an activity. This was done because we understand that the features and the activities have slightly different meanings. 'Feature' refers to the capacity of virtual worlds to make it possible to execute or facilitate an activity, whereas 'activity' refers to the practical process of doing things in virtual worlds. Thus every activity is facilitated by a feature but not every feature can be transformed into an activity. In this part of the survey, we also asked the participants about what kind of benefits they had perceived in using virtual worlds and what kinds of virtual worlds they would like to use.

The survey data was analyzed using both quantitative and qualitative methods. SPSS was used to collate descriptive information about participants' background, virtual world usage and participatory practices in virtual worlds. In order to deepen the understanding of participatory practices in virtual worlds, we also used qualitative classification method in analyzing participants' answers to the open form questions.

Results

General information about participants

As earlier studies have shown that certain background factors such as age and gender have an effect on virtual world usage and children's roles as participants in virtual worlds (Global Habbo Youth Survey, 2006; Johnson & Toiskallio, 2007), we also inquired about the childrens' background information. Roughly one third of the participants were studying in primary school and most of the participants were at the upper level of comprehensive school. Some of the participants who answered the survey were from higher secondary. However, these participants were very few in numbers and their impact on results is negligible. Gender distribution among the participants was even. There were almost equal numbers of boys (52%) and girls (48%). Most of the participants (84%) were 11-15 years old. In order to find out if the educational level of children's parents has an effect on virtual world usage, we also asked the children about this. Most of the participants' parents (60%) had passed either vocational school or upper secondary school and a third of the parents had graduated from university or polytechnic.

The most popular leisure activities among participants were outdoor activities and spending time with friends. A clear majority of the participants reported doing those activities more than four hours a week. More than half of the participants also reported watching television, spending time with hobbies and playing with computers or consoles more than four hours in a week. Considering leisure activities, there were no significant gender differences except that markedly more boys (71% of all boys) than girls (31% of all girls) reported playing with computers or consoles more than four hours in a week.

In order to find out if some background factors have an influence on virtual world usage in our data, we also conducted cross tabulations. They showed that participants who use virtual worlds at the moment tend to be predominantly 11-14 year olds. This is in accordance with the KZero (2009a) report which reveals that 10-15 year old children constitute the biggest age group of virtual world users. Secondly, we wanted to examine if the educational of participant's parents has an effect on use of virtual worlds. However, we were not able to find any conclusive or significant results based on this factor.

Virtual world usage

The results of the survey showed that 25% of the 126 participants use virtual worlds at the moment. Furthermore, 41% of the participants reported that they have used virtual worlds but stopped utilized them. There were also participants who reported that they know

what virtual worlds are but they have not used them (27%) and participants who did not know what virtual worlds are (6%)[1]. The most popular virtual worlds among the participants who use virtual worlds at the moment were Runescape, Habbo, Club Penguin and Aapeli. Other virtual spaces that were named but which are less popular were GoSupermodel, World of Warcraft, Travian, PollyPocket, Atlantica Online, Fishville, Farmville, MoiPal and Stardoll. Interestingly, many worldwide popular virtual worlds such as Poptropica, Neopets, Barbie Girls, Girl Sense and Weeworld were not used by the participants of our survey.

The most common reason for not using virtual worlds seems to be a lack of interest. Two-thirds of the participants who have not used virtual worlds mentioned this reason. In addition, slightly less than one-third of the participants reported that they want to be in contact with others, for example friends in other ways. The same reasons were mentioned when we asked participants who had stopped using virtual worlds to explain their reasons for doing so. The most common reason was that they were not interested in the virtual world anymore, mentioned by 62% of these participants.

There may be several reasons for the lack of interest in virtual worlds and the other reasons mentioned by the participants, for example, the need for money in order to enjoy the virtual world and a lack of understanding of how the virtual world works, may account for their lack of interest in virtual worlds. One fairly natural explanation for the lack of interest is that some young people have just grown out of the children's virtual worlds. For example, some participants mentioned the childish appearance of some virtual worlds as one reason for abandoning them. The most common virtual worlds which participants had stopped using were Habbo, Stardoll and Club Penguin. Habbo is a virtual world aimed at 13-year-olds or older but Stardoll and Club Penguin are virtual worlds aimed at 6-7-year-old children. This may not motivate all 11-15-year-olds to use the virtual worlds.

Participation in virtual worlds

The questions related to interests in different features and frequency of activities in a particular virtual world received 54 answers for each feature or activity. This is higher than the number of participants who answered these questions (32 participants) because each

[1] Percentages are rounded off to the nearest whole number due to the removal of decimals. Therefore these numbers add up to 99 %, instead of 100 %.

participant was allowed to provide answers for more than one virtual world. The percentages for each feature and activity were calculated based on 54 answers.

The results indicate that the participants are very interested in socializing with friends in virtual worlds. Chatting and doing things with friends was shown as a very interesting feature in two-thirds of the answers. Another interesting feature in virtual worlds seems to be creating one's own avatar which was considered as a very interesting feature in 60% of the answers. In slightly less than half of the answers, features such as the sense of being there or being part of, and competing and challenges were considered very interesting. One interesting result is that the participants are not very interested in expressing opinions which is one of the most essential features of civic participation.

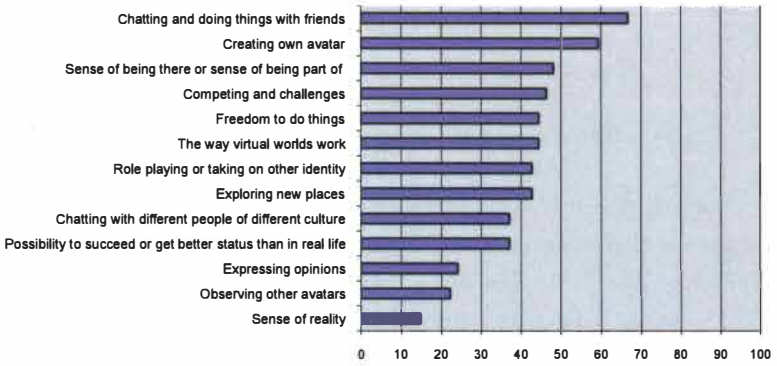

Figure 2. Percentages of features which participants were interested in.

The results related to activities that participants frequently perform often in virtual worlds are quite similar to the results of interesting features. Chatting and doing things with friends is clearly the most popular activity in virtual worlds as it was reported in nearly 60% of the answers as an activity that is performed often. Playing games, changing the appearance of the avatar or exploring new places were mentioned in about 40% of the answers. The interesting result is that again, the participants do not either perform activities that are related to the public sphere and which can be regarded as formal forms of civic participation in real life. Indeed, most participants do not participate in group activities or in voting often and

even fewer participants organize events or participate in demonstrations frequently in virtual worlds.

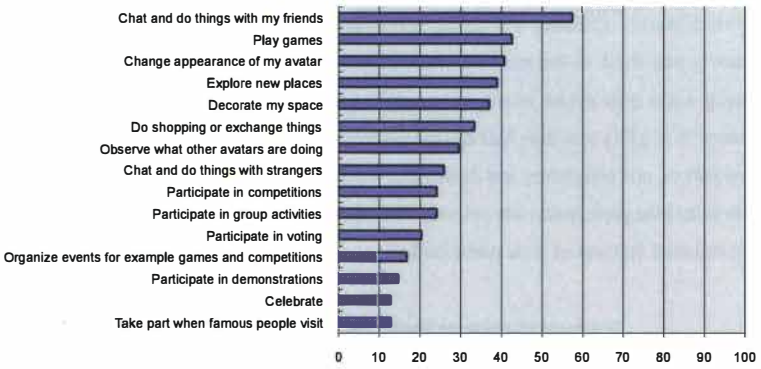

Figure 3. Percentages of activities which were performed frequently.

In order to deepen our understanding of interests and activities in virtual worlds, participants were given the opportunity to talk about their interests and activities freely in an open form question. The answers did not, however, differ much from the results presented earlier. Socializing and chatting with other people (14) and playing games (11) were clearly the most oft-mentioned features among the 32 respondents. The same answers were given when we asked about the activities that participants perform in virtual worlds. Playing games was mentioned by 22 participants and socializing or chatting with others by 17 participants. Other features and activities were mentioned only one to three times. In this respect, answers given to open form question resonate with the findings presented earlier.

The affordances of virtual worlds for children's participation were explored more closely with a question on the benefits of using virtual worlds. The participants who were currently using virtual worlds were asked about their perceived benefits for a particular virtual world and they were allowed to choose multiple benefits for a virtual world. A total of 167 answers were received pertaining to benefits of different virtual worlds and the percentages are calculated based on that. In this analysis, we did not consider the benefits for each virtual world. The results show that the participants have derived many learning benefits from using virtual worlds though the most commonly mentioned benefit is entertainment.

The participants reported that being entertained (23%); learning to use computers and the internet (14%); making new friends (12%); and learning new languages (13%) were the most important benefits they had gained from virtual worlds. Some of the participants also reported benefits that can be related to civic participation, for example participants had the opportunity to express themselves (10%), learn new things about themselves (9%) and learn new cultures (8%). Thus, whether intentionally or otherwise, some of the participants were engaging in civic participation or in activities that can teach them civic skills.

Conclusion

The aim of the study was to test the framework by looking at children's participatory practices in virtual worlds. Figure 4 presents the three roles of virtual world in a process of participation and the affordances of virtual worlds for children's participation which have been specified with the lists of features and activities that children perform in virtual worlds. As we now reflect on our results on the framework of virtual participation, we may make three main conclusions.

The survey results related to interesting features and often performed activities in virtual worlds show that the participants are very interested in many features and engage in many activities relating to virtual worlds as social community. For example chatting and doing things with others and creating or changing the appearance of one's own avatar were in the top of the list as participants were asked about the features they found interesting and the activities they performed frequently . The finding is in accordance with earlier studies which have revealed that sociability, interaction with others and participating in common activities are the most interesting activities and features in virtual worlds (Noveck, 2006; KZero, 2009b). Thus, our first conclusion is that virtual worlds can be considered as arenas of participation, as far as participation is seen as social activity. Affordances of virtual worlds for children's social activity are clearly intentional, which means that children were intentionally looking for social activities..

On the other hand, the participants were not very interested in features and did not often engage in activities related to the virtual world as a public sphere, for example participating in demonstrations or expressing opinions. In this sense, our results support earlier examinations which have revealed that traditional ways of participating do not encourage children and young people to participate (Torney-Purta et al., 2001; Bennett, 2008;

Loader, 2007). Virtual worlds may not be seen as public spheres in a traditional sense which is our second main conclusion. This does not mean, however, that virtual worlds would not serve as public spheres for children for example to express their opinions. Children may fulfill these affordances unintentionally, by chatting or being in social interaction with other people, both of which are popular activities in virtual worlds.

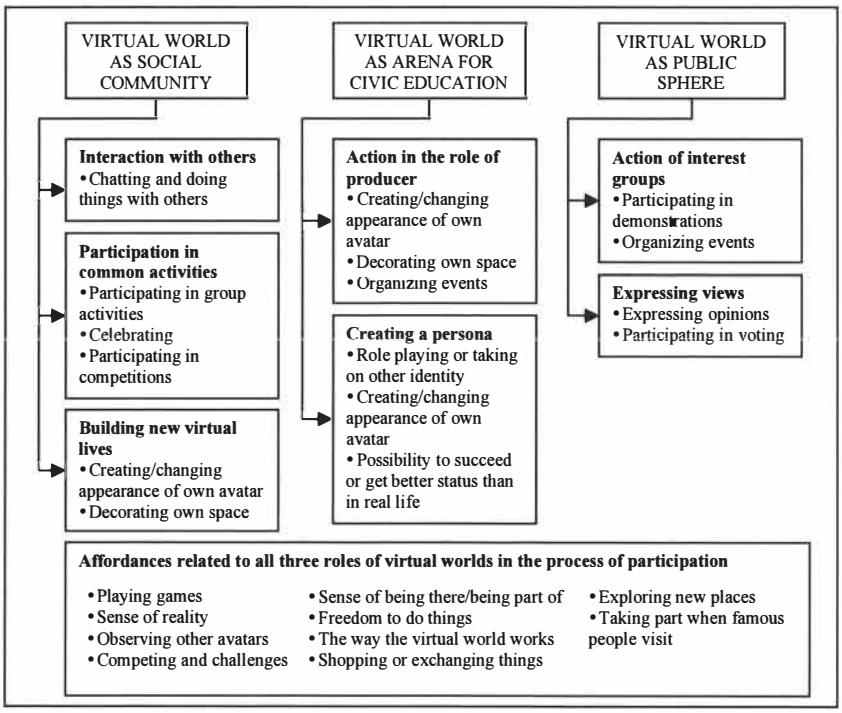

Figure 4. The affordances of virtual worlds for children's participation, according to the three roles of virtual world in a process of participation.

Participants' interest in the features and activities related to virtual world as arenas for civic education varied according to the feature or activity. Creating or changing the

appearance of one's avatar was one of the features participants found most interesting and that they performed most often but participants were not very interested in possibility to succeed or in role playing, both of which can be classified into features related to civic education. Interestingly, the potential of virtual worlds as arenas for civic education was also raised by some participants when we asked them about the benefits of using virtual worlds. The most often mentioned benefit was entertainment but some participants also mentioned the opportunity to express themselves and learn new things about other cultures. Some children mentioned that they have learnt new things about themselves as well. This may be due to social interaction but it may also derive from developing one's identity as a member of a community by through managing the appearance of one's own avatar. According to Noveck (2006), creating a persona to represent oneself in virtual worlds forces users to think and act as citizens and members of a community. Based on these results, we may argue that virtual worlds indeed have the potential to serve as an arena for civic education though the main aim of using virtual worlds is not to learn civic skills and not all children may be aware of this potential. This is our third conclusion.

Discussion

Hitherto, virtual worlds have not been extensively researched from the viewpoint of children. Also the focus on participation has been missing from studies related to virtual worlds. This has been problematic because the use of virtual worlds is growing rapidly among children and more information is needed about activities that children perform in virtual worlds. There is also a growing interest in the potential of virtual worlds to enhance children's participation as research has shown that children do not engage in traditional forms of participation in real life (Torney-Purta et al., 2001; Bennett, 2008; Loader, 2007). According to Kirby, Lanyon, Cronin and Sinclair (2003) and Kiilakoski (2008), many negative trends such as isolation from society can be prevented by promoting children's participation. The Convention on the Rights of the Child also obligates adults to take into account the interests of the children and listen to their opinions. The first step in promoting children's participation is to go where children spend their time, for example virtual worlds,

find out what is happening there and then consider what could be done to enhance children's participation in virtual worlds.

Our study has shown that virtual spaces have the potential to serve a place for children to fulfill their child-sized citizenship and acquire civic skills. This should, however, be made more concrete and noticeable in virtual worlds. As chats and games are the most interesting activities in virtual worlds, they could be utilized for example by creating games about civic skills and organizing public chats about matters that are closely related to children's own lives. Also adults could take part in these chats. Sometimes the obstacles to children's participation can be, however, in structures of virtual worlds which limit users' agency and their behavior (Bartle, 2006). This is probably one reason why children do not utilize the affordances of virtual worlds as public spheres: it is not even possible in all virtual worlds for example to vote or take part in demonstrations. Hence it is important in the future to conduct research about structures of virtual worlds and how they limit users' behavior.

On the other hand, the result of children not utilizing the affordances of virtual worlds as public spheres may be taken as a reminder of the fact that children are always somewhat incompetent and immature agents and citizens when viewed in relation to adults. Children do not have the right for example to vote in real life and thus, these traditional ways of participating are not familiar to children in virtual worlds either. Instead, children seem to be more interested in expressing themselves in chatting and other social activities. On the other hand, it has to be remembered that there are always differences between children as well. There were children in our study who reported being interested in expressing opinions and taking part in voting and demonstrations often in virtual worlds. We also have to accept that all children are not interested in virtual worlds at the moment. In many cases, the reason for abandoning virtual worlds is natural: they have grown out of them. Thus, the task of researchers and developers of virtual worlds is to consider how virtual worlds could be developed so that young people's interest in them can be preserved and virtual worlds would serve as an arena for young people to participate.

Our aim in this first phase of the study was to establish a framework for children's participation in virtual worlds and to test the framework by looking at current participatory practices in virtual worlds. In this article, we have presented one way to look at children's virtual participation and our study still continues. Based on this first phase of our study, we may argue that children are socially active in virtual worlds, which creates many opportunities to educate children about civic participation and to prepare them as citizens of

real world by enhancing citizenship in virtual worlds. However, these opportunities can only be realized when the activities and features for civic participation and education are social in nature and have a fun element to it. Thus, there is a need to carry out further research in order to enhance civic education and participation in virtual worlds.

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PIII

VIRTUAL WORLDS AS CHILDREN'S PARTICIPATORY MEDIA: CHILDREN'S PARTICIPATORY PRACTICES IN VIRTUAL WORLDS

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PIV

ENGAGING LEARNERS THROUGH VIRTUAL WORLDS

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Engaging learners through virtual worlds

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Abstract

The aim of this paper is to explore how virtual worlds could support the engagement for learning. This paper reviews the results of studies that utilized virtual worlds to engage learners. The results are examined in two levels, namely learning gains and design principles. It has been found out that deeper learner engagement results in higher learning gains. In some studies better content retention is also noted. Many studies also suggest design principles for using virtual worlds for facilitating engaged learning. This paper builds a framework for the design and use of virtual worlds in education for better learner engagement.

Keywords: Learner engagement; virtual worlds; multi-user virtual environments; learning gains; educational technology; design.

Introduction

Virtual worlds are growing in popularity very quickly as is depicted in Kzero's survey in the 2nd quarter of 2009 (Kzero, 2009). As much as 39 percent growth in the registered accounts of virtual worlds was reported in the 2nd quarter of 2009 (Keegan, 2009). According to Keegan (2009) most of the growth occurred in the registered accounts of virtual worlds that are generally populated by children, such as in Poptropica (growth of 36 million), Habbo (11 million), Stardoll (8 million) and Club Penguin (6 million).

This growing popularity of virtual worlds and multi-user virtual environments (MUVEs) has drawn attention from educationists as well, however, most of the research on the use of virtual worlds in education has so far been reported either in informal publications, including online blogs and websites, or is carried out in non-academic settings (de Freitas, 2008).

Virtual worlds can have many benefits or affordances for learners. Affordances of a technology are defined as intrinsic features of that technology (Gibson, 1986). These features or properties of the technology should efficiently support the actions that the users intend to take through them (Nardi & O'Day, 1999). In this paper we analyze the affordances of virtual worlds for the support of learning and teaching. The paper reviews the results of studies that have utilized virtual worlds for education. The results are examined in two levels, namely learning gains and design principles.

A research review is presented in this paper, which focuses on engaged learning through virtual worlds. In our traditional educational practices it is important that the learning gains of a technology or learning environment

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should be reflected statistically as well. A research review is presented which provides evidence that learning gains through virtual worlds also improves test scores. Design strategies to facilitate engaged learning through virtual worlds is also presented in this paper. Then a framework for using virtual worlds for engaged learning is described for the benefit of education facilitators.

1. Educational use of virtual worlds

The earlier research related to the educational use of virtual worlds or 3D technologies has focused on facilitating learning of different subjects, designing authentic learning environments and improving students' behavior.

There has already been wide interest in using virtual worlds or 3D technologies in education to facilitate learning of different subjects. Several researchers have reported improved learning gains related to the use of virtual worlds in science classrooms. The environments which have been most widely used in the research on pedagogical importance of MUVEs are *River City* and *Quest Atlantis*. They both are implemented in the *ActiveWorlds* platform. Both these virtual worlds involve a narrative and learners learn by playing a game to investigate different problems scientifically. River City deals with the health science issues that are rising in a virtual world called 'River City'. Quest Atlantis deals mostly with ecological issues, characteristics of different habitats and causes of problems.

Barab's research group has extensively studied the use of Quest Atlantis in science learning. The studies have indicated higher learning gains in standardized tests and also better gains than comparison groups. Barab et al. (2007c) report higher learning gains on a standardized post-test than in the pre-test in a 4th grade elementary science study with Quest Atlantis. Similarly, students at four different schools showed significant gains in the post-tests than pre-test (Barab et al., 2008) Yet another study reveals better results on standard item tests for Quest Atlantis group than direct instruction group (Barab et al., 2007b). Undergraduate students scored better on achievement tests when they learned through Quest Atlantis as compared to a group that learned through expository text (Barab et al. 2009). The use of Quest Atlantis has resulted also in significant gains in essay related questions on ecology science class (Barab et al., 2007a).

Hickey et al. (2009) report a comparative study, which was carried out with grade 6 students in science learning. Students were divided in four classes with two classes using Quest Atlantis-based curriculum while the other two classes were taught through traditional methods. Higher gains in understanding and achievement in test were achieved in the class that used Quest Atlantis-based curriculum (Hickey et al., 2009). Also, Arici (2008) has reported that the learning gain by Quest Atlantis group was higher than the traditional instruction group as was shown in post-tests. A delayed post-test in the same study also revealed better content retention in Quest Atlantis group as compared to the traditional instruction group (Arici, 2008).

However, the research on the use of River City in educational practices has indicated also some mixed results. Ketelhut et al. (2005) reported a significant increase of 32%-35% in the knowledge of biology among students who used River City as compared to a gain of 17% in the biological knowledge of those students with traditional methods. However, this improvement was only evident when children learned through a mix of guided inquiry and teacher led in-class interpretive sessions (Ketelhut et al., 2006a). The other two implementations, one with expert agents embedded in River City and the other based on community of practice, showed no significant gains (Ketelhut et al., 2006a). A significant gain of 16% was also achieved in post-tests in biology when students were learning through guided inquiry and in-class interpretation (Ketelhut et al., 2007). A significant gain on post-tests as compared to pre-tests was also encouraging for lower ability students (Dede et al., 2004). No conclusive results were achieved in a museum-based study of River City (Dede & Ketelhut, 2003). Gender differences has also been noted with girls performing better than boys in River City based curriculum whereas the boys performed better in the controlled curriculum (Ketelhut et al., 2006b). However, the overall difference in test scores between River City class and traditional class was very small (Ketelhut et al., 2006b).

In addition to science learning, the pedagogical possibilities of virtual worlds have been realised in language learning. It is suggested that virtual worlds and MOOs (multi-user dungeon, object oriented) can provide culturally and socially authentic settings for learning of different languages (Schwienhorst, 2002) (Schneider & von der Emde, 2000). Warren and Dondlinger (2008) report better standardized scores in writing tasks on a study conducted to see the effect of MUVEs on literacy education. They also found that teachers had to spend less time in answering directional questions using Quest Atlantis and students completed more voluntary writing tasks than comparison group.

There have been several interesting efforts on the design of virtual laboratories for educational purposes. In some of these 3D standalone applications have been rebuilt in virtual worlds. Again, most of these are related to science learning, for example 3D virtual experimental labs for chemistry (Dalgarno, 2002; Martinez-Jimenez et al., 2003), virtual molecular biology lab for learning of life sciences (Zumbach et al., 2006), virtual dinosaur museum (Tarng and Liou, 2007), 'WebTOP' to learn about optics (Mzoughi et al., (2007), as well as astronomical science environments (Barnett et al. 2005; Bakas, & Mikropoulos, 2003). AquaMOOSE 3D (Elliott, 2005) is an example that shows how web-based 3D technologies can be used to understand mathematical concepts. However, the gains on tests were not statistically important (Elliott, 2005) but the study can have a different effect in a virtual world.

In addition to more subject-specific factors, virtual worlds have proven to have features that afford quality learning in more general level. Among these, one of the most significant is the positive effect the use of virtual worlds has on learning motivation and behavior during class hours. Nelson et al. (2005) reported improved attendance and fall in disruptive behavior in some classes that utilized River City. Dodge et al. (2008) reports that students used Quest Atlantis for many hours voluntarily and engaged in voluntary quests as well. Similar increase in voluntary activity is realised also in Warren and Dondlinger's (2008) study; elementary school students were engaged in voluntary writing in a literacy class. It is important to notice that such voluntary activity related to the use of MUVEs does not necessitate extrinsic rewards. Arici (2008) found out that 75% of the students choose to do optional activities for no credit as compared to only 4% who opted to do extra activities for extra credit in a traditional teaching.

Earlier research has also located problems that hinder teachers in active use of virtual worlds. Falk and Drayton (2004) emphasize that the perceived importance of inquiry-based learning is undermined when teachers have to prepare their students for content that is included in high stakes testing. This forces them in to focus teaching and learning on test-preparation.

Thus it is evident, as is mentioned above, that learning through virtual worlds not only results in engagement but also result in learning gains and these learning gains do transfer to standardized tests as well. Results also depend upon the kind of teaching methodology that is used to facilitate learning through virtual world. We discuss design strategies and build a framework for facilitating engaged learning through virtual worlds in the following sections.

2. Engaged learning

Engaged learning is generally defined to a situation in which learners are active in their learning and student activities involve active cognitive processes (Kearsley & Shneiderman, 1998) and student makes psychological investments in the learning activities (Newmann et al., 1992). Kearsley & Shneiderman (1998) suggested an *Engagement Theory* which is based on three components: 'relate', 'create' and 'donate'. 'Relate' component focuses on the collaborative nature of learning. Project-based activities are represented by the 'create' component and 'donate' component emphasizes on the importance of making useful contributions to the society and community while learning. This theory is partly based on Shneiderman's (1993) definition of engagement according to which learning happens while interacting with people inside the learning community or with those who are outside of it.

Jones et al. (1994) provided a broad framework for engaged learning which consisted of 26 indicators in 8 categories, which were: (1) vision of engaged learning is that the learners are responsible for learning, strategic, energized by learning and collaborate with each other; (2) tasks for engaged learning should be authentic, challenging and integrative/interdisciplinary; (3) assessment of engaged learning shall be performance based, generative, seamless and ongoing with the curriculum and shall be based on equitable standards; (4) instructional models and strategies for engaged learning shall be interactive and generative in design; (5) learning context for engaged learning shall foster collaboration, knowledge building and shall be emphatic so that diversified knowledge is valued; (6) grouping for engaged learning shall be heterogeneous; (7) teacher roles for engaged learning shall be that of a facilitator, guide and co-learner; and (8) student roles for engaged learning shall be that of explorer, cognitive apprentice, teacher and producer of knowledge. This framework provides a comprehensive basis for engaged learning by indicating factors that can help a teacher to design (and redesign), develop, implement and assess a learning process that focuses on the engagement of students. 'Vision of engaged learning' indicator helps in defining engaged learning while other indicators propose ways in which engaged learning can be facilitated. Yoon and Ling (2003) used the indicators of Jones et al. (1994) and used them to study student engagement in students

using information technology while learning. They found that there is a difference in being physically engaged and cognitively engaged.

Willms et al. (2009) defined a framework of student engagement in schools at three levels: social engagement, academic engagement and intellectual engagement. Social engagement is the sense of belonging of students in the school life. Academic engagement is about student's engagement in the academic activities of a school. While, intellectual engagement is to cognitively engage in learning "to increase understanding, solve complex problems, or construct new knowledge" (Willms et al., 2009, page 7). A survey was conducted to measure student engagement at the Canadian schools at the three levels, social, academic and intellectual, which used participation and sense of belonging (social engagement); attendance (academic achievement); and student ratings for enjoyment, interest and motivation for language arts and mathematics (intellectual engagement) (Willms et al., 2009).

Hudly et al. (2003) defined engagement through a combination of 'behavioral' and 'affective' engagement. Behavioral engagement is represented by the actions of students to keep engaged in learning and is reflected by low rates of disciplinary problems and absenteeism and high rates of task completion. On the other hand, affective engagement represents the attitude of students about learning process and is similar to intrinsic motivation in a student (Hudley et al., 2003).

Ott & Tavella (2009) used performance of students while playing a game and attitude, feelings and behavior about the game and the playing process to measure the factors of student's engagement at computer-based learning tasks. They found that it heavily depends on content and activities that a student has to solve and if the students have skills to solve them or not.

It has been suggested that a virtual world shall include three elements, namely: education; entertainment; and social commitments, to make sure that learning through virtual world is meaningful, engaging and understandable (Barab et al., 2005b). Based on this a 'learning engagement theory' was proposed that suggests that any engaged learning in the context of school consists on the element of learning, playing and help (Barab et al., 2005b). Learning in this theory is based on three perspectives: experiential learning; inquiry-based learning; and portfolio assessment (Barab et al., 2005b). The playing element has been well researched in the digital gaming industry which uses a participatory context that contains the elements of challenge, curiosity, play and control (Cordova & Lepper, 1996). The help element suggests that the educational environments shall carry a social agenda of helping others in the community.

Based on the literature mentioned above a definition of engaged learning can be created. This definition of engaged learning has 5 aspects: (1) learner activeness aspect; (2) cognitive aspect; (3) socio-collaborative aspect; (4) behavioral aspect; and (5) emotional aspect. Jones et al. (1994) and (Kearsley & Shneiderman, 1998) are referring to similar aspects, learner activeness aspect, when they mention that learners are active and are responsible and energized by their learning. Cognitive aspect includes active cognitive processes (Kearsley & Shneidernan, 1998), psychological investments (Newmann et al., 1992), and intellectual engagement (Willms et al., 2009) and is fostered with inquiry-based learning (Barab et al., 2005a) and with cognitive apprentice (Jones et al., 1994). Socio-collaborative aspect emphasizes that learning takes place in collaboration with peer learners (Kearsley & Shneiderman, 1998) (Jones et al., 1994) and by interacting with the society (Shneiderman, 1993) (Willms et al., 2009) and should result in helping the society (Barab et al., 2005a) (Kearsley & Shneiderman, 1998). High attendance, less disciplinary problems and high rate of task-completion (Hudley et al. 2003) is represented by the behavioral aspect. Engaged learners are motivated and have positive attitude towards their learning process which is represented by emotional aspect.

In the following section, we discuss different design strategies for engaged learning based on literature presented in this and previous section.

3. Design strategies for engaged learning

Virtual worlds present very unique opportunity for learning and can be used for learning by doing. (Kearsley & Shneiderman, 1998) suggest that engaged learning takes place in project-based activities. In virtual worlds it is possible to carry out project-based activities in an immersive environment. It has been suggested that engaged learning shall be experiential in nature (Barab et al., 2005a) and learners shall embrace the role of explorer (Jones et al., 1994). Interaction with and through avatars in a graphical, immersive, and embodied context provides interesting possibilities for experiential learning and for exploration in a relatively safe environment.

Inquiry-based learning has also been proposed to engage learners and virtual worlds can be used for it (Barab et al., 2005a, 2007) (Clark et al., 2007) (Ketelhut, 2007) (Ketelhut et al. 2005, 2006a, 2006b) (Nelson et al., 2005) (Sadler et al., 2007). Barab et al. (2007) and Sadler et al. (2006) propose socio-scientific inquiry-based learning. For example, Quest Atlantis is designed for socio-scientific inquiry-based learning (Barab et al., 2007) and it is possible in River City as well. In them, a learner tries to learn while inquiring about a problem or, in other words, while solving a quest using scientific investigation methods and through social collaboration with peer learners. The complexity of the inquiry increases as the learner progresses and thus requires more cognitive involvement and social collaboration to solve the quests. The entire curriculum in Quest Atlantis and River City is arranged around quests and each quest focuses on a specific subject.

Virtual worlds are essentially social in nature and enable collaboration between learning community through many ways. Firstly, interaction between learners in virtual worlds is through avatars in a graphical context (2D or 3D) which can help them in considering each other as part of a community. Secondly, traditional methods of communication, for example chat, emails and audio conversations, are embedded in virtual worlds. Thirdly, users can also interact with each other through the interaction of avatars with the artifacts in a virtual world.

Engaged learning can be facilitated through activities that are authentic, challenging and interdisciplinary (Jones et al., 1994). Virtual worlds can provide innovative ways to create authentic and challenging tasks that are contextual as well. However, the activities shall be according to the skills of learners otherwise they will become disengaged (Ott & Tavella, 2009). Learners will also require tools to carry out these activities. In virtual worlds, many innovative tools can be designed based on the requirements of the activities. For example, River City contains a 'virtual telescope' for learners to test the quality of the water in the River City virtual world (Ketelhut et al., 2006b). Other similar virtual tools are also available in River City for blood, fecal and lice tests.

Quest Atlantis and River City have many game-like features. Thus, principles of designing a virtual world based on games are proposed as well. For example, Squire and Jan (2007) propose that a learning environment shall allow learners to inhabit roles to help them create projective identities (Gee 2003, page 55) and shall also provide achievable challenges (Squire & Jan, 2007). The goals shall be tied to places or contested space and authentic tools and resources shall be embedded within the context of the learning environment (Squire & Jan, 2007). Lastly, learning shall occur through collaboration and competition depicting the social nature of game-play (Squire & Jan, 2007).

Barab et al. (2008) suggest that while developing a conceptual play space four elements have to be balanced, namely: academic content; game rules; legitimate participation; and framing narratives. Activities in a virtual world shall be based upon authentic content that shall be based on curricula that is needed to be followed in a class. Learners can be engaged and entertained by using game rules as are mentioned above. The learners should have all the necessary tools to make sure that they can participate effectively within the social contexts of the environment. Framing narrative is an overall story that binds the whole context in the learning environment so that all the separated activities can be perceived as belonging to the same over reaching goal Barab et al. (2008).

Taking part in the designing of a technology project provides children with unique opportunities for learning (Tuula, 2008). Thus, it is suggested that children shall be involved in the design process of the educational virtual world. In addition to them, other end users such as teachers and facilitators shall be part of the design process as well so that the designed virtual world can address the needs of all of them.

It can be summarized from above literature review that in order to design virtual worlds for engaged learning the virtual world shall be: based on experiential, inquiry-based and project-based learning; shall have features to facilitate socio-collaborative interaction; shall have activities that are authentic and challenging and has tools to carry out those activities; and shall have game-based rules to make learning fun.

4. Guidelines for engaged learning

Teaching through virtual worlds is engaging and does results in learning games, as is mentioned previously, but there is a need to carefully understand the changes that might occur as compared to traditional school based learning. The teachers have to plan their courses accordingly so that learners can engage in virtual world without much hassle for the facilitators and fellow teachers. Following issues may serve as a guideline for teachers in implementing a course to engage their students through virtual worlds.

Facilitating learning through virtual worlds in a class involves consideration of many issues. Barab et al. (2009) suggests that teachers should take part in the game itself to guide and drive student's learning. This means that teachers have to see themselves as potential partners in the virtual world and need to embrace a change in their role. Jones et al. (1994) also proposes that a teacher shall be co-learner while facilitating and guiding the students. It has to be noted that Ketelhut et al. (2006a) found that better results were obtained when learners took part in guided inquiry and teacher-led in-class interpretive sessions.

Jones et al. (1994) suggests that for engaged learning students have to embrace the role of an explorer which practices cognitive apprenticeship and is teacher and producer of knowledge at the same time.

Teaching contents needs to be tailored according to virtual worlds as well. Barab et al. (2009) suggest engaging through the content in three ways: procedural, conceptual and consequential. Procedural content helps the students in understanding the procedures needed to complete a certain task. Students will need to fit the learned knowledge into the big conceptual picture. Thirdly, students need to understand the consequences of the concepts so that they can influence different situations.

Virtual worlds provide many new ways to evaluate and assess the progress of a student. Jones et al. (1994) and Ott & Tavella (2009) suggest performance-based assessment for engaged learning. In performance-based assessment students are given a task and then observing, interviewing or examining their artifacts and presentations. This form of assessment can be done effectively in virtual worlds. However, Barab et al (2005a) suggests portfolio-based assessment. However, traditional forms of assessment shall also be carried out to verify the assessment results.

5. Conclusion

Engaged learning can be defined as cognitive, socio-collaborative, behavioral and causes positive attitude in learners. Learning through virtual worlds can be engaging for learners and can affect their test scores as well as their attitude and motivation towards it. However, in order to have the most out of learning in virtual worlds, they can be designed according to design guidelines based on previous research which suggests that virtual worlds shall foster inquiry-based, experiential, socio-collaborative features that engage learners in authentic and challenging tasks and shall have game-based rules for entertainment.

Teachers need to follow some guidelines for engaged learning that suggests change in their traditional role. They shall guide learners in exploring, teaching and producing knowledge. Teachers also need to choose ways of assessment that is suitable for virtual worlds.

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FACILITATING EXPLORATORY LEARNING IN SCHOOLS THROUGH VIRTUAL WORLDS: EXPERIENCES FROM A COURSE RUN AT A SCHOOL

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FACILITATING EXPLORATORY LEARNING IN SCHOOLS THROUGH VIRTUAL WORLDS: EXPERIENCES FROM A COURSE RUN AT A SCHOOL

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ABSTRACT

The following paper examines the results of a research study in which a virtual world, Quest Atlantis (QA), was used to engage students in exploratory learning to teach about water quality issues. The main aim of the research was to find out how new digital learning environments and educational technology, such as virtual worlds, can be introduced in schools; what will be the response of the administration, teachers, parents and students; what could be the best teaching methodology for these digital learning environments; and what could be possible hurdles and hindrances. The research was comprised of comparison between different teaching methods based on student outcomes and the results of a survey which was conducted at the end of the study. The research was too big to include all results in this paper thus the findings of the survey and observations of the researcher are presented here. The survey was answered by students (N=33) and it included questions about the learning environment, perceptions about the learning process and problems that the students might have encountered during the study. During the study, the students were divided into three different groups, or classes, and each group studied using a different teaching method. Thus, there were three teaching methodologies or learning strategies: direct instruction and using QA; group discussions in class and using QA; and self-exploration using QA. The results are presented on an overall basis and also on the basis of these teaching methods as it could have influenced the answers given by the students. The results of the survey shows that majority of the students liked learning through the virtual world, Quest Atlantis in this case, and would like to continue using it both at home and at their school. Irrespective of the teaching method used, they perceived that they learned a lot about water quality and think that they could not have learned more in a traditional class. The biggest hurdles or problems reported by students were: working in pairs; wrong time to conduct this research; short session times; and technical problems related to computers and the internet.

KEYWORDS

Virtual worlds, digital learning environments, exploratory learning, teaching methodologies.

1. INTRODUCTION

Educators all over the world throughout the history have been striving to make the process of learning more engaging for the learners. For this purpose, educators also try to make use of any new technology especially those which are popular among learners. However, integration of those technologies into the settings of formal learning institutions, schools and universities, can be a challenge. Virtual worlds are one of those technologies for which many researchers have proved its potential for education. For example, Iqbal et al (2010: 3199) presented learning gains in virtual worlds as is presented by many researchers. Barab et al (2008), Barab et al (2009), Hickey et al (2009), Arici (2008) have shown learning gains when learners used the virtual world of Quest Atlantis (QA). Similarly, Ketelhut et al (2005) has also shown learning gains using River City.

However, many researchers have indicated that there are many obstacles which hinder the integration of virtual worlds in the school or university settings. Dickey (2011: 15-17) discusses that visual representation, security and costs were main hindrances as perceived by the teachers in his research. Klopfer et al (2009: 18) presents 9 barriers to adoption for learning games which are curriculum requirements, attitudes, logistics, support for teachers, assessment, evidence, uses of games, limited view and social and cultural structures.

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Technical problems, steep learning curve, student security and university liability was identified to be the major concerns in Second Life (Woods, 2010: 105-108). Koh et al (2012: 56) found that insufficient time, limited resources, high costs, non-relevance to curriculum, reactions from parents and no or less support from school are key reasons for not using games in schools in Singapore as perceived by teachers. Ryan (2008), a PhD student at Lancaster University, presented sixteen ways to incorporate Second life into a classroom.

Most of this research is conducted in western countries. These problems could amplify or more problems can arise in developing countries. Here a study is presented which is significant as it compares different teaching methods and also because it was carried out in Pakistan to find out the relevant problems in integrating virtual worlds in a developing world context. This paper presents a research in which students learned in QA through three different teaching methods. The research was focused on comparison of learning gains and experiences between these three different teaching methods. Here we present the experiences of the students and hindrances that they faced which were collected as survey answers.

1.1 About the Virtual World

The virtual world used in this research is Quest Atlantis (QA) which is currently maintained under the Atlantis Remixed Project (Atlantis Remixed Project: Online). QA engages students in, what Atlantis Remixed Project team defines as transformational play through content that is comprised of online, in QA virtual world and on websites, and off-line activities. The Atlantis Remixed Project team claims to have demonstrated learning gains in science, language arts and social studies.

1.1.1 The Topic

The topic chosen for this research was water quality which is known as 'Taiga: the water quality unit' in QA. The researchers wanted to choose a topic which was unfamiliar with the students in Pakistan. None of the students who took part in this study had ever learnt about water quality although some of them were familiar with the concepts of pH, acids and bases. They were unaware of the effects that water quality can have on the ecosystem.

The learning takes place in QA at 'Taiga National Park' where the park ranger had asked the students to help him to identify the reasons for declining number of all species of fish in 'Taiga River' (Taiga Unit Plan: Online).

Figure 1. Map of 'Taiga National Park'.

Along the banks of Taiga River live three main groups of people. 'Mulu' indigenous people use the river to grow crops and raise different animals. 'Build-Rite Lumber Company' cuts and logs the trees in the park. Lastly, there is a fishing company, 'K-Fly Fishing Company', which arranges fishing tours. 'Taiga National Park' also has a ranger station, lab and 3 water monitoring stations as is shown in Figure 1.

The material used in this research was provided by the Atlantis Remixed Project team in 'Taiga Unit Plan' (Taiga Unit Plan: Online) which is available online.

1.1.2 The Missions

There are five missions in 'Taiga: the water quality unit' but due to time constraints it was decided that the students will try to solve first three missions including an introduction week to using QA. The educational year in most of the schools in Karachi, Pakistan, runs from April to March. This study started in January and as the final exams were approaching thus the school administration was not ready to give more time.

The first mission is called 'Getting a handle on Taiga' and in this mission the students meet with all the stake holders of the Taiga National Park. They talk with all of them and get their respective versions of the possible problems of water quality and who may be responsible for the situation. In doing this, the students start understanding that it's not as straight as it might look initially and that the situation is complex. At the end of the mission the students have to fix responsibility for declining population of fish.

The students continue to talk with different people in the second mission, 'Digging deeper', and take photos of Taiga River. Then they compare the photos taken and try to analyze them in order to come up with a hypothesis. Students learn about distinguishing between guess and hypothesis.

In mission 3 students collect water samples from three different sampling sites and then take it to the park lab to analyze it. This mission is called 'Building a case' and students learn about and analyze 6 water quality indicators which are pH, nitrates, phosphates, dissolved oxygen, turbidity and temperature. Based on the results of the analysis the students inform the park ranger about the group responsible for the problems.

2. METHODOLOGY

The research had mainly two parts. Firstly, to compare different teaching methods based on student out comes. In order to do this the students (n=48; 27 male, 21 female) were divided into three classes which were organized according to three different teaching methods. Teaching method 1 (TM1) had 16 students. Teaching method 2 (TM2) had 15 students. While, teaching method 3 (TM3) was comprised of 17 students. The teaching methods are briefed later in this section.

The second part was to get an insight into student's experiences by asking them to answer a survey. The total number of students who answered the survey was 33 (19 male, 14 female). Out of that, 13 were from TM1, 12 were from TM2 and 8 were from TM3.

Although, the survey was supposed to be conducted online but the teachers suggested that it will be easier and quicker to do it on paper. Thus, the students took the survey on paper and later on their answers were put in the computer.

Throughout the study the researcher observed the whole learning process and had many discussions with owners, administration and teachers.

2.1 Context of Research

The research was carried out in a privately owned school in Pakistan by a university in Europe (Nordic countries. The name of the institution is not mentioned to maintain the anonymity of the author). On the contrary to Europe, the schools in the educational sector in Pakistan can be divided into government-owned or privately-owned. Privately-owned schools in Pakistan are considered to be of better quality as compared to the government-owned schools. Therefore, mostly all privately-owned schools, except those run by non-profit or charity organizations, charge a monthly fee to meet their expenses and to generate profit on their investments. In return they provide better facilities, teachers and resources.

This context of research is important to mention here because the researcher had to convince owners of the school, administration, teachers and parents about the importance of the research in order to justify using the resources of the school. In this research, certificates of participation were given to the school, teachers

and students. The school was also given a complimentary gift by the research unit which conducted this study. The students were so enthusiastic when they heard about this study that they played a crucial role in convincing their parents.

Another aspect that has to be mentioned here is that the teachers and a group of volunteers went through a week of training period in which they used Quest Atlantis as the teachers were not accustomed to playing video games and/or using virtual worlds. This proved to be very helpful when the research was carried out.

2.2 Teaching Methods

All students who took part in the study were divided into three groups or classes and each group or class learned through a different teaching method or learning method. These three methods can also be called classroom implementation strategies. These teaching methods are mentioned as under.

2.2.1 Teaching Method 1 (TM1): Explanatory Instruction and Exploratory Inquiry-Based Learning in QA

In this teaching method the students (n=16) learned through traditional direct instruction method where the teacher explained the topic and the main concepts in the class. After that, students went to the computer lab to use QA in pairs in which they undertook the missions.

2.2.2 Teaching Method 2 (TM2): Group Discussion and Exploratory Inquiry-Based Learning in QA

The students (n=15) used QA in the computer lab in groups of two (pairs) however one of the groups had three students. Afterwards, the students went into class where they took part in group discussions where they discussed the topic in larger groups consisting of three to four students and then shared their understanding with the whole class.

2.2.3 Teaching Method 3 (TM3): Self-Exploration Through Guided Inquiry Instruction Using QA

There were 17 students who were divided into groups of two (pairs) however one of the groups had three students in this teaching method. The students learned through self-exploration by using QA on their own and they were allowed to ask questions and get guidance from teachers if they wish to.

2.3 Survey Design

The survey can be hypothetically divided into three main parts. As the survey was supposed to be taken at the end of the comparison study, thus the survey contained questions about the experience of learning through a virtual world, QA in this case. First question asked the students whether they liked learning through QA or not? They had to respond by choosing one of the following: 'yes, it was very fantastic', 'yes, it was good', 'it was ok', 'no, it was not good' and 'not at all, it was really bad'. Another question was 'would they like the school to continue using QA?' And they had to choose between 'no, not at all. It is useless', 'yes, it is very good educational software' and 'may be. I am not sure'. Thus, the students had equal positive and negative and a neutral statement to choose from. The students were also asked whether they would be using QA at home or not. They answered by choosing 'yes, definitely', 'yes, sometimes', 'no, never' and 'I do not know'.

The other part of the survey asked students about their perception of learning through QA. They were asked how much they perceive that they have learned in this research. The answer choices were: 'I learned a lot'; 'I learned something'; 'I did not learned much'; 'I learned nothing at all'; and 'I do not know'. Thus, the students had equal positive and negative and a neutral statement to choose from. They were also asked whether they would prefer learning through 'traditional class', 'through QA' or 'through a combination of traditional class and QA'. There were two questions related to this theme, one about the perceived learning benefit and the other about enjoyment.

In a question they were also asked about the features of QA that they liked. The features about which the students were asked about were: graphics; teacher guidance system; missions / quests; gaming elements; interface; customization of the avatar; story; topic; answering system and the learning process.

The last main part of the survey was about the difficulties, hurdles and hindrances that the students faced during the study. They were asked about the problems that might have occurred due to the way it was conducted. They were also inquired about the problems that they encountered in QA or technical problems about computers and internet.

3. RESULTS AND DISCUSSION

The total number of students who answered the survey was 33 out of the 48 students who took part in the research. The students mainly liked learning through QA in all teaching methods and they would like to continue learning from QA. Three questions specific to the missions in QA were also asked from the students in the survey but there results are not presented here as they do not fit in the theme of this article. Main results are discussed under the following sections.

3.1 About Learning Process in QA

The students were asked three questions about the learning process. First question inquired if they believe that they have learnt in this research or not. A total of 18 (54.55 %) students agreed that they had learnt a lot in this study which is more than half of the students as is shown in Table 1. Eight (24.24 %) students expressed that they learnt something. If we combine the number of students who expressed that they had learnt a lot with those said that they had learnt something, then the total number of students, 26 (78.79 %), who expressed that they learnt using QA is quite large. On the contrary, only 6 (18.18 %) students mentioned that they did not learn much. There can be many reasons for not being sure if they learnt something or nothing. One of that could be that the topic was totally unfamiliar to them and it was not covered in a tradition course book as is in Pakistani schools the curriculum is strictly taught through an assigned book. Thus, if they were not learning from a pre-assigned book they were not sure what and how much were they learning. Curriculum requirements are one of the barriers to integrate video games, and educational technology, as was indicated by Klopfer et al (2009: 18). Secondly, they were not made aware of the post-test results which they could have compared with their peers.

Students of TM2, 8 (66.67 %), were more sure that they learnt a lot than students of TM1, 6 (46.15 %), or the students of TM3, 4 (50 %). Thus, one can infer that group discussions in class do result in a belief that one has leant a subject. This could be because the students get a chance to share and adjust what they have learnt through discussing with peers.

Table 1. How much do you think you learned about water quality from Quest Atlantis?

	I learned a lot	I learned something	I did not learned much	I learned nothing at all	I do not know
TM1 (n=13)	6 (46.15 %)	3 (23.08 %)	3 (23.08 %)	0	1 (7.69 %)
TM2 (n=12)	**8 (66.67 %)**	3 (25 %)	1 (8.33 %)	0	0
TM3 (n=8)	4 (50 %)	2 (25 %)	2 (25 %)	0	0
Total (n=33)	**18 (54.55 %)**	8 (24.24 %)	6 (18.18 %)	0	1 (3.03 %)

The students were also asked to specify in which of the following methods they could have learnt the most about water quality: traditional class learning; learning through QA; or a combination of both traditional class and QA. This was asked to find out their preferences after taking a course which involved a virtual world, in this case QA. There were 32 students who answered this question. Majority of the students, 22 (68.75 %) as is shown in Table 2, expressed that they could have learnt the most through QA across all teaching methods. Students of TM3, 7 (87.5 %) out of 8, believed the most that they could not have learnt more than learning through QA. A majority of students of TM1, 8 (66.67 %), and TM2, 7 (58.33 %), also thought the same.

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Table 2. In which of the following method do you think you could have learned the most about water quality?

	Traditional class learning	Learning through Quest Atlantis (Taiga)	Traditional class learning + Learning through Quest Atlantis (Taiga)
TM1 (n=12)	1 (8.33 %)	8 (66.67 %)	3 (25 %)
TM2 (n=12)	1 (8.33 %)	7 (58.33 %)	4 (33.33 %)
TM3 (n=8)	1 (12.5 %)	**7 (87.5 %)**	0
Total (n=32)	3 (9.38 %)	**22 (68.75 %)**	7 (21.88 %)

In a similar question to that of the previous one, the students were asked about the method in which they could have enjoyed the most while learning about water quality. Surprisingly, most of the students of TM3, 5 (62.5 %), expressed that they could have enjoyed most in the traditional class learning as is shown in Table 3. this could be because, as the researcher observed, the students of TM3 were very unsure about whether they are going in the right direction or not during the study. This created a sense of uncertainty in them. This could be because they are not used of learning outside the class, that too, from a video game or a virtual world.

Most of the students of TM1, 8(61.54 %), and half of the students of TM2, 6 (50 %), thought that they could have enjoyed the most while learning through QA. one can infer from these results that it is necessary to hold simultaneous explanatory lessons in class to keep the confidence of the students in their learning process.

Table 3. In which of the following method do you think you could have enjoyed the most about water quality?

	Traditional class learning	Learning through Quest Atlantis (Taiga)	Traditional class learning + Learning through Quest Atlantis (Taiga)
TM1 (n=13)	2 (15.38 %)	8 (61.54 %)	3 (23.08 %)
TM2 (n=12)	2 (16.67 %)	6 (50 %)	4 (33.33 %)
TM3 (n=8)	**5 (62.5 %)**	2 (25 %)	1 (12.5 %)
Total (n=33)	9 (27.27 %)	**16 (48.48 %)**	8 (24.24 %)

3.2 About Likeness of QA

The students were inquired if they had liked using QA during this research or not. About half of them, 16 (48.48 %), agreed that QA is fantastic (Table 4). Another 10 students, 30.30 %, expressed that it was good to use QA. Thus, if we combine both who said it was fantastic and those who said it was good then most of the students, 26 (78.79 %), liked using QA. The number was again low for the TM3 group as only 3, 37.5 %, who agreed that using QA was a fantastic experience.

Table 4. Did you like using Quest Atlantis?

	Yes, it was very fantastic	Yes, it was good	It was ok	No, it was not good	Not at all, it was really bad
TM1 (n=13)	**7 (53.85 %)**	4 (30.78 %)	1 (7.69 %)	1 (7.69 %)	0
TM2 (n=12)	6 (50 %)	4 (33.33 %)	2 (16.67 %)	0	0
TM3 (n=8)	3 (37.5 %)	2 (25 %)	1 (12.5 %)	2 (25 %)	0
Total (n=33)	**16 (48.48 %)**	10 (30.30 %)	4 (12.12 %)	3 (9.09 %)	0

In another question, the students were asked if their school should continue to use QA or not. Most of the students, 21 (63.64 %), agreed that the school should continue to use QA (Table 5). The number was highest in the TM2 group where 10, 83.33 %, agreed with the statement and it was lowest in TM3 in which only 3, 37.5 %, agreed.

Table 5. Do you think that your school should continue to use Quest Atlantis?

	No, not at all. It is useless	Yes, it is very good educational software	May be. I am not sure
TM1 (n=13)	2 (15.38 %)	8 (61.54 %)	3 (23.08 %)
TM2 (n=12)	1 (8.33 %)	**10 (83.33 %)**	1 (8.33 %)
TM3 (n=8)	2 (25 %)	3 (37.5 %)	3 (37.5 %)
Total (n=33)	5 (15.15 %)	**21 (63.64 %)**	7 (21.21 %)

The students were also asked if they would be using QA at home or not and 41.67 %, 10, chose 'yes, definitely' while 19.17 %, 7, chose 'yes, sometimes'. It means most of the students, over 70 % of them, take QA as a legitimate virtual world for leisure as well.

These results show that overall, with the exception of TM3, most of the students liked using QA and they think that it is enjoyable and schools should use it in future. However, the way it shall be used in schools shall be considered carefully as it can affect the satisfaction of the students.

3.3 Features of QA that were Liked

The students expressed their likeness for different features of QA in a question in which they had to specify their level of likeness for ten features which were: missions / quests; graphics; teacher guidance system; gaming elements; topic; story; answering system; learning process; customization of avatar; and interface. 28 students answered this question. Most of the students (n=28), 18 (64.29 %) liked the missions/quests the most (Table 6). Graphics was liked by 17, 60.71 %, and teacher guidance system was liked by16, 57.14 %, students. The most disliked was the interface as 12, 42.86 %, students said it was ok and about 21.43 % said that they did not liked it much. The interface of any game, and virtual worlds, should be simple enough (Kohler, 2012) but it seems it was not in the case of QA. The same feelings were conveyed to the researcher by the students and by the teachers many times during the research. One of the reasons could be that the students and teachers were using a virtual world for the first time.

Table 6. How much did you like the following in Quest Atlantis?

	Very much	It was O.K.	Not much	Not at all
Missions/ Quests	**18 (64.29 %)**	9 (32.14 %)	1 (3.57 %)	0
Graphics	17 (60.71 %)	7 (25 %)	3 (10.71 %)	1 (3.57 %)
Teacher guidance system	16 (57.14 %)	10 (35.71 %)	1 (3.57 %)	1 (3.57 %)
Gaming elements	15 (53.57 %)	11 (39.29 %)	2 (7.14 %)	0
Topic	13 (46.43 %)	12 (42.86 %)	3 (10.71 %)	0
Story	13 (46.43 %)	7 (25 %)	2 (7.14 %)	6 (21.43 %)
Answering system	12 (42.86 %)	11 (39.29 %)	2 (7.14 %)	3 (10.71 %)
Learning process	12 (42.86 %)	10 (35.71 %)	5 (17.86 %)	1 (3.57 %)
Customization of the avatar	11 (39.29 %)	11 (39.29 %)	4 (14.29 %)	2 (7.14 %)
Interface	10 (3571 %)	12 (42.86 %)	6 (21.43 %)	0

3.4 Problems and Hindrances

The problems that were mentioned in the survey can be largely divided into the ones due to the design of the research and the technical problems. The owner of the school, administration, teachers, students, 13 (39.39 %), and parents, all of them expressed to the researcher that it was a wrong time to conduct this research as final exams of the students were near and the school nor their students wanted to divert their attention as promotion of the students to the next grade depends on that. 14 students, 42.42 %, also mentioned that working in pairs was problematic. The main reason for that, as was mentioned by students during the study, was that the students could use only one QA account to proceed. The student having the other account was feeling left behind and some students tried QA from home to cover the difference. Students and teachers also complained about the short session times as was also mentioned by Koh et al (2012: 56). Each session was about 40 minutes long as per guidelines from Atlantis Remixed t team but it proved to be short on many occasions. It is recommended that each session shall be at least 60 minutes long for non-native speakers of English.

Most of the students, 16 (48.48 %), and teachers also complained about the slowness of the internet. Although, the internet had sufficient speed but the bandwidth proved to be lacking when all computers tried to access QA at the same time. This resulted in QA getting stuck many times or the answers not sent properly. The computers barely met the minimum requirements and had to be upgraded for this study which resulted in some spending for the school. The technical problems were also a cause of concern in Second Life (Woods, 2010: 105-108) and have to be sorted out to make the experience better.

4. CONCLUSION

This was an important study for many reasons. Firstly, it was one of the few researches that have been conducted in developing nations on the use of virtual worlds in education especially at schools. Given the Pakistani context, the research can prove to be very beneficial for future studies and can serve as a starting point to incorporate digital educational technology in schools. To do this, one must take into consideration the timing of research, the nature of school system, local context, curriculum and culture.

Mostly, students liked using virtual world in schools and would like to continue using it at their schools. However, the teaching methodology has to be chosen carefully to make sure the students are satisfied with the learning process and enjoy it too.

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FACILITATING EXPLORATORY LEARNING IN SCHOOLS THROUGH VIRTUAL WORLDS: A LOOK AT INSTRUCTIONAL DELIVERY METHODS AND FACILITATION PROCESS

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