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Design principles of educational virtual worlds for preschool children

A Case Study of JumpStart World Kindergarten's pedagogical methods

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Tiivistelmä – Abstract

This thesis studies the design principles of educational virtual worlds for pre-school children. It examines the culture and contextualization of the virtual worlds for children used for the purpose of informal education through learning games in the case study of JumpStart World Kindergarten. The theoretical background provides an overview of the historical development of educational virtual worlds based on the progression of MUDs, MOOs and MMORPG. In addition, the issues in implementation and adaptation of information and communication technologies (ICT) as part of educational methodologies are examined, thus a perspective is given of possible problems and solutions for optimization of use of virtual worlds as an alternative way for acquiring knowledge with a constructionist approach. In the second part of the study, the design principles of virtual worlds are elaborated by framing the technical aspects, content, virtual world typology and user types thus mapping educational virtual worlds between other genres of virtual worlds. The design principles, as well as the cultural and social aspect of educational virtual worlds provide a base for the analysis of the pedagogical approach of JumpStart World Kindergarten. In this section a qualitative and quantitative study of this virtual world's game-play, characteristics and learning games was made. The results indicated the pedagogical problems in the implementation of the learning by doing theory, thus proving that this model is not well adapted to the interactive method of learning where a player learns most efficiently by meaningful interaction and personal constructivist experience.

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Educational virtual worlds, children, constructionist, ICT, pedagogy, pre-school

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Tiivistelmä – Abstract

Tämä lopputyö tutkii esikouluikäisille lapsille suunnattujen koulutuksellisten irtuaalimaailmojen sunnittelua. Se kuvaa JumpStart World Kindergarten tutkimustapauksen kautta virtuaalimaailmojen kulttuuria ja kontekstualisaatiota. Tarkemmin sanottuna irtuaalimaailmojen, joita käytetään epävirallisen koulutukseen niiden sisältämien oppimiseen tarkoitettujen pelien avulla. Teoreettinen taustatutkimus luo yleiskatsauksen koulutuksellisten virtuaalimaailmojen historialliseen
kehitykseen, joka perustuu MUD, MOO ja MMORPG:n kehittymiseen. Lisäksi tutkimus ulottuu informaatio ja viestintäteknologioiden (ICT) toteutukseen ja sovellutukseen osana koulutuksen metodologiaa. Tästä osasta tutkimusta syntyy perspektiivi mahdollisiin ongelmiin ja ratkaisuihin optimisoida virtuaalimaailmojen käyttö vaihtoehtoisen tiedonhankkimisen välineenä konstruktionistisen lähestymistavan mukaisesti. Tutkimuksen toisessa osassa virtuaalimaailmojen suunnittelun toimintaperjaatteet käsitellään yksityiskohtaisemmin raamittamalla tekniset aspektit, sisältö, virtuaalimaailmojen typologia ja käyttäjätyypit. Täten sijoitamme koulutukselliset virtuaalimaailmat muiden, eri genrejen virtuaalimaailmojen kartalle. Suunnitelun toimintaperjaatteet sekä virtuaalimaailmojen kulttuuriset ja sosiaaliset aspektit antavat pohjan pedagogisen lähestymistavan analyysille JumpStart World Kindergarten:sta. Tässä osiossa kvalitatiivinen ja kvantitatiivinen tutkimus kyseisen virtuaalimaailman oppimispelien pelattavuudesta ja ominaisuuksista rakennetaan. Tutkimuksen lopputulokset osoittavat suuntaa pedagogisiin ongelmiin
"tekemällä oppimisen" mallin toteutuksessa, täten osoittaen että tämä malli ei ole riittävän hyvin sovellettu interaktiiviseen oppimismetodiin, jossa pelaaja oppii tehokkaimmin tarkoituksenmukaisen kanssakäymisen ja henkilökohtaisen konstruktiivisen kokemuksen kautta.

Asiasanat – Keywords kasvatukselliset virtuaaliset maailmat, lapset, konstruktionistinen, ICT, kasvatustiede, esikoulu	
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1. Introduction

The rapid growth of population of role-playing virtual worlds hat began in 1996 (Castronova, 2003) led to dispersion in their evolution towards social, educational, instructional and content creation virtual worlds. Currently these active online spaces unite millions of users worldwide and are estimated to expand to host 80% of all active internet users who will have experience in at least one virtual world by the end of 2011 (Stamford & Gartner, 2007). The virtual worlds designed for children have also attracted a significant number of users in the past few years. By 2007 *Club Penguin, Habbo Hotel, Neopets* and *Whyville* were all visited by over a million young children and teenagers. The growing rate in a period of few years was remarkable. *Webkinz* reported 342% increase in registration of accounts in 2007 compared to the previous year and over 6 million visits (Edery & Mollick, 2008), while Knowledge Adventure announced 175% increase in traffic on JumpStart.com from the world's release in November 2008 to January 2009 (Lord, 2009). This interest of the 10-15 year old youth in the online social platforms also proved to grow higher than all the other ages, reported Kzero (2009).

Educators and educational institutions and mostly commercial companies saw this phenomenon greatly potent. Considering that the pedagogical practices in education haven't been progressing in the past century, experiential learning through communal play could be put to practice via educational virtual worlds (Kluge & Riley, 2008). From 2005 onwards, a great deal of universities and some Jr. & secondary schools based virtual campuses in a VW as part of their standard program. Out of all, Second life in 2008 had "widest possible coverage of developments in educational technology world-wide" according to the *British Journal of Educational Technology*. With the introduction of the SimTeach platform, Harvard Law School's Austin Hall, Hong Kong Polytechnic University, Ohio University, Northern Illinois University, University of Edinburgh and hundreds of other educational campuses started experimenting with the technology in formal education curriculums. Apart from these

VWs, the technology is being tested for younger students therefore forming cultures of various educational VW models. For the pursuit of knowledge through a playful adventure, educational virtual worlds were designed as a blend of elements of educational games and software, MOOs and role-playing online games. However, the question of using the platform's full potential to employ practice of the learning by doing theory properly remains open.

My interest in this topic came from my personal involvement in virtual worlds. For several years, I have been witnessing the participatory culture of creation of the many functioning layers of the virtual society in the adult virtual world Second Life by its users and user groups. Among commerce, entertainment, art and culture, the development and use of the educational platforms has been the most fascinating for me. After I got familiar with other educational online applications, I found that the method of contextualizing the educational content in them differs depending on the aimed age, subject of study and nature of the world. Considering that the massive participation in educational 3D virtual worlds is a fairly recent phenomenon, I believe that the use of educational technology should be examined and reviewed. Given that the educational content in educational virtual worlds is designed by the educational virtual world producers, rather than its users or user groups (as is the case in many adult virtual worlds), this thesis aims to examine the contextualization of the educational technology in the design of educational virtual worlds for pre-school children through a case study of a popular commercial educational virtual world – Jumsptart.

Previous research conducted on the effectiveness on the use games and simulations in instructional technology that support learning has resulted in a rich body of practical knowledge. Nevertheless, in his study on educational video games, Squire (2003) points out a summary of many studies which prove "*that there is actually very little agreement among educational technologists as to the theoretical underpinnings of why we should use games, how games should be designed to support learning, or in what instructional situations games make the most sense. " (p.5)*

Even though in the past, video games, instructional software and MOOs have been used as technology to improve educational practices, the results of their effectiveness were not always as expected. The findings of Wentworth and Lewis (1973) who reviewed the results from nearly fifty research studies on learning through gaming show: "*In the majority of these studies, students did neither significantly better nor worse than other learning experiences in their impact on student achievement as evidenced by paper and pencil scores.*" Similar findings in contemporary instructional design theory have been noted in 1991 on games and simulations in social studies. *Clegg (1991) argues that the instructional context that in a game environment is much more significant predictor than the actual game itself In other words, the way the game is contextualized, the types of cooperative and collaborative learning activities embedded in gameplay, and the quality and nature of debriefing are all critically important elements of the gaming experience.*

In the context of modern commercial educational virtual worlds, the biggest influence in the design can be seen from previous educational games that support drill and practice for factual recall. Bowman (1982) *points out that drill and practice games such as Alga-Blaster, Reader Rabbit, or Knowledge Munchers have been popular because they can easily be integrated into a traditional, didactic curriculum as "enrichment exercises" during independent study time*. Using action genre of video games to engage learners as an instructional method however, doesn't exploit the possibilities of the technology and game/virtual world, but merely adapts them to serve as tools which would provide to the traditional methods of practicing knowledge.

On the other hand, the games that have been designed as simulations of a world, such as: *Civilization, Age of Empires, Alpha Centauri* – where the player plays and learns about civilizations; *The Sims* – where the player lives in a family, thereby learning family relationships; *Zeus, Pharaoh, Cezar* – where a player is a historical figure, living and creating history, have provided a game world that has been a role-play experiential learning game. This type of learner's experience correlates to the constructionist

theory of constructing knowledge through "living" and building the blocks of knowledge.

Squire (2003) emphasizes that computerized simulation games can be much more powerful educational games than the drill and practice games because they allow:

a. Manipulating otherwise unalterable variables.
b. Enable students to view phenomena from new perspectives.
c. Observe systems behavior over time.
d. Pose hypothetical questions to a system
e. Compare simulations with their understanding of a system.

This implies that role-playing simulated game environments provide fruition of the impersonated characters as students, players and actors. In virtual worlds, this method can be also applied enriched by the social aspect that a virtual world can provide. Considering these elements and many other, in this study I am also providing the possible solutions and implications that might improve the contextualization of the learning by doing theory in educational virtual worlds.

1.1 Structure of the Research

According to latest research, educational virtual worlds can be looked at from the prism of narration (literature studies), game systems and game design (game studies), game culture (digital culture studies), educational discourse (pedagogy) and online social networks (sociology and communication studies). In this study, qualitative content analysis methods have been used by means of participant observation and theoretical analysis of pedagogy, sociology, game studies and digital culture studies materials.

At the beginning a progressive timeline of the history and development of virtual worlds is given in the second chapter – Virtual worlds. The overview begins with a classification of MUDs and MOOs as genres and predecessors of educational virtual worlds. In addition a short history of virtual world developments and typology is given,

closing the progress pattern to the modern virtual worlds. In order to establish contemporary educational virtual world design elements, a historical perspective of the evolution of these three groups is given with the parameters of each group, based on Haynes & Holmevik's (2001) overview of educational online educational communities, Richard Bartle's (2003) theories on design of virtual worlds, Educational Technology Journal and GameStudies.org. The insight in the three provides an insight base of the development of the educational virtual worlds, thereby offering grounds for categorization of design, an element that is important to further the study.
In Chapter 3, I discuss about the educational technology and the advantages of practicing a constructivist paradigm of learning versus traditional paradigm of teaching through engagement and experience in video games and play.

The potential of learning through playing digital games or participating in virtual worlds has been studied by many in the past decade, and through several domains: Serious gaming (Abt, 1987) (Godwin-Jones, 2005) (Ling, et al., 2007) (Michael & Chen, 2001) (Muratet, Torguet, Jessel, & Viallet, 2009) (Squire, 2003) (Squire, Games, learning, and society: Building a field, 2007), experiential learning (Jenkins, Clinton, Purushotma, & Robinson, 2006) (Kolb, 1984), situated learning (Brown, Collins, & Duguid, 1989), edutainment (Buckingham & Scanlon, 1979) (Lehtinen & Sinko, 1999), digital game-based learning (Prensky, 2001), educational games (Brown, 2002, February) (Jenkins, Klopfer, Squire, & Tan, 2003).
All these concepts are united in the idea of placing the learners in an active role of participants rather than passive listeners in a social, digital, gaming context. (Oblinger & Oblinger, 2005) (Prensky, 2001) (Jonassen, Peck, & Wilson, 1999) (Wilson, 1996) (Gros & edt Barajas, 2001)

"The social culture has changed, the communication and media technology has changed, the experiences are very different from the ones of students from two decades ago but the methods in transferring knowledge are behind" (Papert, 1994)

Based on this previous research, the thesis proposes application of educational virtual worlds in formal and informal education for children, as a good complementary tool of obtaining information as a form of instructional software to traditional learning practices (Prensky, 2001). For this reason issues of implementation and adaptation of ICT in the past are brought up to determine relevant problems of implementation. (Brown, 2002; Maddux, 1991; Papert, 1994).
Chapters 4 and 5 determine the main content concepts of educational virtual worlds for 5-7 year old preschool children by looking at them as a virtual society.

Virtual Worlds have attracted a lot of attention from researchers since their popularization in the beginning of the 21century. From an architectural and environmental design perspective, the aesthetical views on geographies in virtual worlds positioned them in a wider perspective. *"Virtual worlds must be thought of as part of, rather than apart from, the real world in which they take place."* (Hayot & Wesp, 2009). From a cultural and sociological perspective the most plentiful research has been done on virtual worlds. Most scholars agree that the nature of the online communities is highly influenced by the rising digital culture and that their social systems are mirroring or improving the structure of the real world societies (Anderson & Tracy, 2001; Kolo & Baur, 2004; Salazar, 2009). Castronova (2007) implies that it is possible *that a virtual world can provide civic, social, economic, and political order that is superior to that of the real world.*
To be able to construct a clear social overview, Shi & Huang (2004) have found the Social Analyzing System, an analysis system well known for social study, to be a good way to understanding the social flow and network organization in massively multiplayer online role-playing games. On the other hand, a new fertile ground for opening a virtual office was recognized by real companies who saw a potential of using these online spaces as a new frontier in e-marketing. Three years ago as *Second Life* showed prospects for in-world advertising and branding, the interest of corporate research groups as well as marketing consulting agencies arose.

Apart from these and other scientific research made on virtual worlds, the design of educational virtual worlds for children has not been studied in depth. Bringing out these concepts will contribute to the field of research in virtual worlds, pedagogy, social sciences and children psychology.

The thesis looks at educational virtual world as a social network that is sustained by two main motivational game elements: entertaining games and educational game missions. The motivation of participation is looked through four main perspectives: The virtual landscape and social demographics are being explored in relation to the game dynamics and the game/virtual world culture of play contrasted to educational goals within the world. Few examples of popular educational virtual worlds for children are used as references (such as *Club Penguin, Chuggington, JumpStart Kindergarten World* and *Panwapa*) that are being reflected on adult popular virtual worlds (*Active Worlds, Second Life and World of Warcraft*). The method is qualitative, based on information provided by the virtual worlds' publishers, blogosphere, forums, observation of game-play and the author's personal participation in them. The theoretical framework is based on a content design outline that is proposed by contemporary virtual world investigators such as Edward Castronova (2003, 2007), Richard Bartle (2003) and Kurt Squire (2003, 2007).

The main focus is on elaborating the pedagogical approach in the educational virtual game world for children *JumpStart Kindergarten World* a product of *Knowledge Adventure*. This is addressed in the case study of the chapter 6.

The proposed method of Aarseth (2003), Salen & Zimmerman (2003) and Castronova (2003) for online game analysis consists of analysis of:

a. Game-play (the players' actions, strategies and motives),
b. Game-structure (the rules of the game, including the simulation rules),
c. Game-world (fictional content, topology/level design, textures etc.).

Considering the responsibility that these worlds' designs have for hundrets of thousands and even millions of children, it is nececery to point out the pedagogical

problems in educational virtual worlds and finally propose solutions for their improvement.

2. History

The ancestors of today's contemporary educational virtual worlds can be traced even before the World Wide Web in the late seventies with the appearance of the first Multi User Dungeon (MUD). From today's perspective, the MUD is considered to be the first form of a virtual world, a text based multi-user interactive environment. There are two main groups of MUDs: The first one is an adventure based MUD that is a fantasy game world. It is usually built around a medieval landscape with objectives of solving puzzles, slaying monsters or dragons and discovering little treasures. The second type of MUDs is a relatively open virtual game world where the users play with the things in the world that open their imagination. They can create, control and invent content and are much more social environments. The users interact with each other in various ways, including building objects together and architecture of interest. Because of their significant feature of building, they are known as the MUDs of the object oriented variety or MOOs. In their development in the past, numerous MOOs expanded their socially creative function to an educative, experimental and a professionally oriented one. Their appearance is very significant in the history of computer-based learning. In other words, MOOs adjusted and transformed the gaming technology for professional and educational use. (Haynes & Holmevil, 2004)

2.2. From MUDs, MMORPG to educational virtual worlds

The first MUD was designed in 1979 by British students from Essex University, Roy Trubshaw and Richard Bartle. Consequently, something that began as an experiment on the campus, in the mid-1980s was licensed by CompuServe and became a popular game world, played until the late 1999 (Toth, Trubshaw, & Bartle, 2004) in Australia, Norway, Sweden, the United States and other countries. The attractiveness

of the MUDs game-play is visible even today, as there are several multi user dungeons that are still active. Their place in the history of electronic games is quite important for game studies, but also for several other research disciplines as well. Because of the fact that in the past few decades the online user-to-user interaction can be digitally documented and later on analyzed, scientific research on psychological, social, cultural, linguistic, strategically and behavioral became available . This was a huge step for science in terms of localizing research subjects and topics with an open access and a worldwide audience. Besides, studies were conducted for improvement of the MUD and their expansion to other frontiers.

From a genre perspective, MUD ignited an explosive appearance of online adventure based, fantasy and role-playing multi-user environments forming a new genre of electronic games known as massively multiplayer online games (MMOG and MMORPG). Furthermore, because of the multi-applicative nature of the platform, many other types were born.

In 1989 James Aspnes wrote *TinyMUD* which had a different type of user experience. It was conceived of a player-extendable place for social interaction in spaces that resembled rooms, houses, hotels and castles. Similar TinyMUDs appeared in the following few years, developing a feature that was quite important for the future virtual world systems – player programmability. With this feature, players were able to build new objects, new rooms and also write programs that can affect the MUDs greatly. Out of these TinyMUDs, the first MOO was born in the hands of Stephen White. Pavel Curtis developed it further, and in 1990 he wrote *LambdaMOO* with enhanced the server technology. In the next seven years, it became a popular place for players from all over the world (Haynes & Holmevil, 2004).

The potentials of the improved MOO system was recognized and developed even more in other directions. In 1992 Amy Bruckman at the MIT media lab adapted this platform for media researchers, thus elevating the significance of MOOs to a professional scientific tool. The *MediaMOO* quickly became a meeting place for thousands of curios visitors and academics from various backgrounds, who connected

professionally through the platform. In 1993 in Israel, Gustavo Glusman and Jaime Prilusky formed the *BioMOO*, a meeting place for biologists. Inspired by all the possibilities of the MOOs, a social worker by the name of Jeanne MacWhorter made a MOO that combines multiple disciplines in one platform - the *Diversity University*, one of the largest MOO academic meeting points in the following ten years. Because of their nature and conceptual resemblance to the modern ones, some game theorists consider the MOOs to be the first generation of educational virtual worlds. Their interaction dynamic was similar to classroom interaction with tools that aimed to give the users a variety of activities. The first MOO online classrooms were equipped with a foundation set of Education Tools that included:

***** Writing tools: '$note', 'MOO mail'

***** Standard communications features: 'say', 'page', 'emote' and 'think'

***** Exploration tools: 'look', 'read', and 'exam'

***** Manipulation tools: 'get', 'grab', 'drop', 'move' [1]

In addition to these tools there were also some 'generic codes' that were created by the so-called wizards of the MOO or individual programmers. With all of them the learner-user could navigate and utilize the system for social and educational involvement.

Most of the educational MOOs had a high academic level and 6 months courses, like in the cases of *Diversity University, Collegetown (conference and research lab), EON, MOOville* (English language course), *WriteMush* (English Composition), *GNALab* (Programming testing lab, *MediaMOO*. Even though most of them were used for typical learning topics, some educational MOOs had a different idea about the subject of learning. For example *Meridian* was created to expand intercultural communication and exchange of cultural experiences while *BayMOO* was a virtual theater for creation of objects and the weaving of communities and tribes. MOOs like *Donut, MariMUSE Global Learning Collaboratory* and *MicroMUSE* were designed specifically for children and successfully implemented in elementary schools as experimental learning tools for children. A typical example was *MOOSE Crossing* , designed to give kids at the age of 9-

[1] http://tecfa.unige.ch/edu-comp/DUJVRE/vol1/no1/education_MOOs.text, Journal of Virtual Reality In Education, 19 .01.1995, accessed 09.05.2009

13 a meaningful context for reading, writing, and computer programming. In the 1890's, Costello, Niigata Seiryo Women's Junior College designed an entertaining game through which non -English speakers will learn the language English. This development continued towards the 1990's as well. The Educational virtual worlds (EVW) from the 1990s already belonged to the latest generations of EVW in which contemporary EVW belong as well. The concept, interface and mechanics were almost identical to *Second Life* and *Active Worlds* today. The interface and navigation function in the equal manner, combining communication tools like a type of chat system and graphic emotional expressions with destination map, transportation system and viewpoints. The content of each one is appropriate to its study field and the target group spans from 9 year olds to adult users. Open access and virtual traveling to different in-worlds is already possible which assures cultural, social and academic exchange. The first virtual world that had a 2D interface that resembled a 3D perspective was WebWorld created by Ron Britvich in 1994. Its users could move around in a virtual space, interact via a chat system and also build objects. Tens of thousands were using the platform until it was reformed to *AlphaWorlds* and in 1997 became *Active Worlds*, the biggest online world of the time. In 1999 Active Worlds launched an in-world educational program called AWEDU (Active Worlds Educational Universe), intended for students, educators and pedagogical researchers for

knowledge exchange in virtual classrooms and virtual tours.

Illustration 1

[2]

AWEDU: Navigation Panel

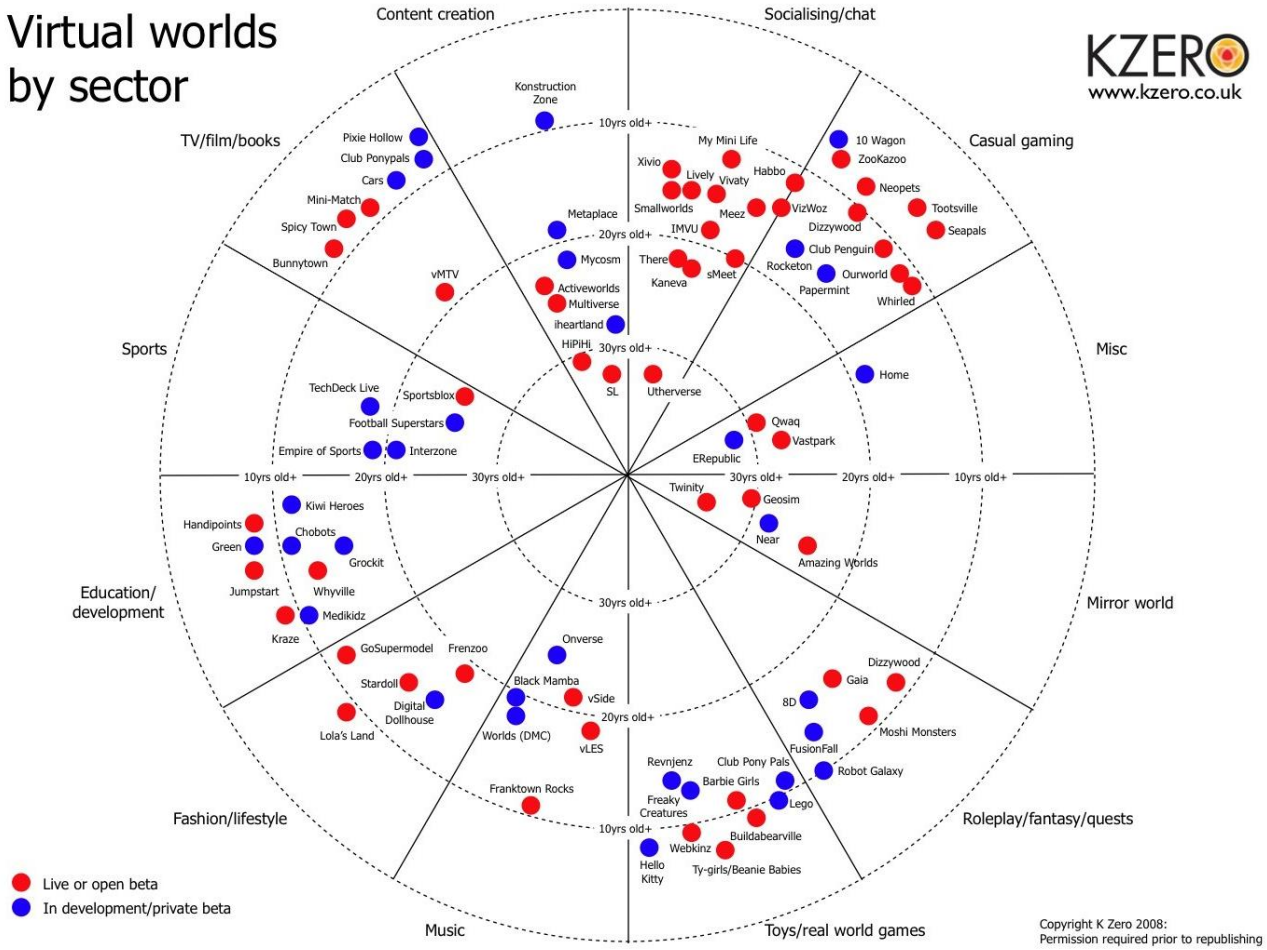
University of London's Science City

University Of Colorado's Virtual Computer

Already in 2001, many 3D Virtual worlds were designed with an educational purpose for educational institutions and informal self-explorative learning. With their help students could experientially learn about for example the solar system, navigating in the virtual universe and access to its elements (*VTOUR World, LUNA World, and ARES World*), science (*SCICENTR World*), veterinary medicine (*CHEMEET World*), painting (*Van Gogh*) as well as use them for simulations and tests for a certain issue. (*Natural Disaster Area*). One important thing that happened to influence the further development of educational virtual worlds was the appearance of *Quest Atlantis* – learning and teaching platform that employed a multiuser, virtual environment to immerse 9-12 year old children in educational tasks. *Quest Atlantis* combined strategies used in commercial gaming environments with lessons from educational research on learning and motivation. Consisting of eleven worlds in danger, the world was designed for a quest, in which the participants were role-players and functioned cooperatively in realizing the actions to solving a problem. They could learn together about a topic by living it, and in addition they would socialize and entertain themselves. This marked the beginning of experiential game-based learning in educational virtual worlds. Starting from 2004 the growth of virtual worlds led to

[2] http://www.activeworlds.com/edu/, Information retrieved 5th june,2009;

establishment of mega-popular metaverses. The concept, mechanics, interface and navigation remained basically the same as the older generation of virtual worlds, with some improvements in the graphics interface. A novelty in these worlds was the appearance of sound in the game world and VoIP communication. In the following few years, the emergence of a number of social/entertainment virtual worlds was followed by several educational virtual worlds that noted a big number of registered accounts as well.



Graph 1: Virtual worlds division in sectors [3]

[3] http://www.kzero.co.uk/research-reports.php, accessed 08.06.2009

From the graph we can see that the circle that has the largest virtual world community belongs to the age group 10-20 years, with a largest number of new worlds designed for socializing and entertainment.

A recent study[4] showed that out of 579 million virtual world registered accounts in July 2009, 334 million or 57% were age 10-15 and 114 million or 20% of 5-10 years of age. Compared to last year's number of users, the registered accounts have increased by 38.6%. These numbers may not reflect the correct numbers of active virtual world users, as many times individuals register out of curiosity but don't become active users of the world. Nevertheless, from these numbers we can judge that virtual world's popularity is quite high and increasing every year. This might imply that virtual worlds are maybe becoming the future classrooms, playgrounds, social clubs and game studios. For this reason it is of big importance to study their design, function, socialization and education methods. How will they develop, we are about to witness.

[4] http://www.kzero.co.uk/blog/?p=2793, information retrieved 30.06.2009

3. Issues in implementation and adaptation of information and communication technologies (ICT) as a part of educational methodologies

ICT[5] has been a part of educational methodology since the technology became available. However the process of its application and adaptation for students in formal educational settings has been surprisingly slow compared to the creative, collaborative and participatory learning possibilities offered online as well as an array of contemporary mobile technologies.

Regardless of the continuing practice of traditional learning methodology in education, the impact of globalization and the emerging communication and information technologies do affect us as learners. The way we search for information has changed, where we look for sources, how we memorize, how we share information and most importantly how we challenge value of good information has changed. Nevertheless, this doesn't mean that the way we learn is and will be completely changed by ICT, but by the learning activities or pedagogical practices in education.

Pedagogy in the past century is not changed significantly compared to development of other sciences, yet students learn well. A recent report from the McArthur Foundation (2009) claims that formal education has not progressed in terms of new pedagogical methods because schools and universities continue showing good results and have the value of the tradition of endurance and stability like University of Oxford for example. Does this mean that the old, confirmed pedagogical method is still the most effective way of acquiring knowledge in a society deeply influenced by digital

[5]Abbreviation: Information and communication technologies

culture? Is it possible that a constructionist learning method is closer to the generation of learners raised with digital culture?

3.1. Digital native learners

The first individuals that were raised as a digital native[6] generation were born in the late seventies. They were familiarized with computerized technology in preadolescent age. The later generation, was not only born and raised with computers, the Internet, mobile phones, MP3s but was an active creator of the digital culture. The Berkman Center for Internet & Society at Harvard Law School and the Research Center for Information Law at the University of St. Gallen in Switzerland are currently researching this topic, aiming to explore the impacts of this generational demarcation between those born with these technologies and those who were not. As the hypothesis claims vast differences in the approaches of extracting information of the two, the project addresses the issues and benefits of this digital media landscape and the way digital natives make sense of their experiences online. This issue has been intriguing many researchers in technologically advanced countries, and explored from various aspects in the past two decades. In the western developed societies digital learners, about twenty years ago, were already showing strong motivation to the use of computers for informal learning. In 1993 the US Census Bureau reported that 30% of all 3-17 year olds were using the computer for educational purposes. This number increased to 90% use in 1997 and by 1999 computers were used for educational purposes in all cases. [7]

6 Digital native – term coined by Marc Prensky in his work *Digital Natives, Digital Immigrants* published in 2001
7 http://www.census.gov/population, accessed 09.10.2009

User age	Number of children (1,000)	% computers at school	Percent using computers at home \1	Home use activity (percent)			
				Word processing	Connect to the Internet	E-mail	Complete school assignments
5 -7	11,785	72.2	59.3	9.6	23.3	7.7	16.6

Table 1. Computer and Internet Use by Children and Adolescents in US: 2003[8]

In the eastern world, from 1996 onwards, we follow the same interest from many research organizations[9] .Due to the prospective information technology, in Japan many questions were raised about the popularization of new media, communication technologies and the society, e-literacy for children, transformative use of technology for various purposes and the adaptability of children to new technologies. In the 1996, a research was conducted on fifteen children from Hiroshima in *Joyful Multi-Media Family* Camp, where a quick mastery was proven of the Color Zaurus portable computer which had just been released by Sharp, thereby proving the natural adaptation to the digital application that aimed to enhance creative expression with new technology. In July 1997 a research was conducted by Keio University, Tokyo where children of different ages were given a handbag size of a machine that featured a digital camera and available access to the Internet when connected to a PHS phone. The results were that they were highly adaptable to the use of this technology and in some cases children became instructors to the university students who were less rapid. The conclusions were that this adaptability of children to technology was much higher and more natural than to textbook material and recommendations followed that ICT should be used in early age education for gaining effective learning. (Ishii & Kawamura, 2008)

8 www.census.gov/compendia/statab/tables/09s0253.xls, accessed 09.10.2009
9 http://www.childresearch.net/PROJECT/IKP/index.html, accessed 09.10.2009

The knowledge appeared naturally in their natural environment and the concept of informal learning and playfulness in the process just added to the level of motivation. The informal meant non-traditional, interactive and personal experience and did not depend on its application in school or at home. A person who was born in the end of the 20th and beginning of 21st century and was grown up surrounded with internet, mobile phones, digital home cinemas, computers, game consoles, digital toys and gadgets, he or she skipped the step of adaptation to new technological advancements that the adults still call "new" years after they appear. The 21st century learner's ability to learn, accept and progress its usage is naturally higher than their parents'. And his/hers natural learning environment is using the technology, computers and internet. Today, the characteristics of the digital natives have still not been fully exploited in the favor of education. What should have been recognized were the unnatural learning environments in formal education, says Papert (1994). The social culture has changed, the communication and media technology has changed, the experiences are very different from the ones of students from two decades ago but the methods in transferring knowledge are behind. Especially for young students and children that have possibilities to pursue information without an instructor, in a fun and fast way. Comparing books and school exercises with the amount of knowledge children sponge up from interactive media is impossible. And most of all the idea about learning has changed. The logic of search-find that has developed with the development of interactive media is progressively in line with the ICT and the technical improvement of operating skills. It places the child and young student in situation where they need to bare the "normal" way of formal studying is slow, one sided, passive and less inspiring for someone used to use interactive media.

3.2. The language of digital learners

The Information Age enabled the creation and dispersion of new media through a universal media machine - the digital computer. In a very short period, its primary purpose of a tool that performs various calculative operations was preceded by a

multifunctional one of production, storage, distribution, playback and communication. Naturally, new forms of interaction were formed and new languages of communication were born, so many that the borders of the linguistics, communication and media studies expanded significantly. A number of languages of production of software were invented, followed by as many languages of interaction as there are software possibilities in all genres. To study them it is essential to consider that each application, whether it's a specific software, electronic game, communication tool or social network has its own system that the user has to learn to be able to practice it. The language spectra is so wide that even an application that has had the same function for 30 years, has a difference in functioning depending on the development of the technology and software. For example, a drawing software from the 80s required a certain amount of knowledge in a programming language for the user to be able to produce a simple cube. Today, the software with the same aim enables the user to produce a cube without any prior knowledge, but simply by using a defined button for making a cube. The process differs, the graphic results have different quality, the time required for a certain action is different and the possibilities grow constantly. In this sense Manovich (2002) confirms that the language of new media is diverse and alive. The dynamically progressing diversity of the language of new media exceeds significantly the evolution in form of other types of established languages such as the spoken/written language.

The capabilities of the computer as the universal media machine were even more confirmed with the appearance of the World Wide Web. The language of digital media became as complex as the digital media cultural products did. A similar example from the past can be found in the diversity of the language of cinema. Compared to printed media and radio, the invention of cinema was actually the invention of the first complex media that combined the languages of image, sound and motion as a unique form of expression.

As a variety digital media appeared on the net, new language of various online hypermedia appeared and developed. Websites, online forums, digital games, interactive applications and social networks could be interpreted not only as narratives

but as a coherent experience of communication where the process of interaction can be totally different for each user. How can we define this process? What are the ways to find information online?

> *A definition of twenty-first century literacy offered by the New Media Consortium (2005) is "the set of abilities and skills where aural, visual, and digital literacy overlap. These include the ability to understand the power of images and sounds, to recognize and use that power, to manipulate and transform digital media, to distribute them pervasively, and to easily adapt them to new forms" (p. 8). We would modify this definition in two ways. First, textual literacy remains a central skill in the twenty-first century. Before students can engage with the new participatory culture, they must be able to read and write. Youth must expand their required competencies, not push aside old skills to make room for the new. Second, new media literacies should be considered a social skill. (Jenkins, Clinton, Purushotma, Robinson, & Weigel, 2009)*

This definition of the twenty-first century literacy opens up few interesting issues: The multimediality of language, written text as a premise for literacy and the new social aspect addition to literacy.

Combining text, hypertext, image, sound, virtual movement, electronic games, social networks and virtual worlds, the new language of the digital learners is one of multimedia, multifunction and multiprocessing. In this view, the sea of information is obvious as well as the fact that the endless combinations of roads that lead to the desired information cannot be equal for each user. So how can we define the frame of search for a searcher?

If the process of the search is specific for each user, based on the awareness of the existence and functionality of certain applications, then the complexity of the process of learning by using the multimedia activities is explainable through the navigation and the choice of navigational pattern of the individual. Including email, chat, blogs, social networking sites, e-videos, e-libraries, wikis, music, video games, virtual worlds and other communication and information technologies, the net generation (Oblinger &

Oblinger, 2005) combine sources and methods in the personal pursuit of interests. In this sense, Brown talks about the new digital learning generations as bricoleurs[10].

> *"The new literacy, beyond text and image, is one of information navigation. The real literacy of tomorrow entails the ability to be your own personal reference librarian-to know how to navigate through confusing, complex information spaces and feel comfortable doing so. "Navigation" may well be the main form of literacy for the 21st century. "*(Brown, 2002, February)

The way the bricoleur/ digital learner finds sources for academic content or leisure material is active, experiential as opposed to the passive non-interactive linear traditional way. He/she is a discovery learner, one who surfs on the internet and desktop applications as roads of information, where the crossroads are linked shortcuts that lead to the desired information. The process of discovery consists of a series of decisions in the process. Whether the user will use wikis, blogs, e-libraries, MMO's, social networks at one crossroad or another is entirely dependent on the users' experience. Consequently - judgment is the discovery learners' principal trade. In this regard, constructionist Gregory Ulmer explains the new form of literacy as electracy:

> *"What literacy is to the analytical mind, electracy is to the affective body: a prosthesis that enhances and augments a natural or organic human potential. Alphabetic writing is an artificial memory that supports long complex chains of reasoning impossible to sustain within the organic mind. Digital imaging similarly supports extensive complexes of mood atmospheres beyond organic capacity. Electrate logic proposes to design these atmospheres into affective group intelligence. Literacy and electracy in collaboration produce a civilizational left-brain right-brain integration. If literacy focused on universally valid methodologies of*

[10] Bricolage is a concept studied by Claude Levi-Strauss more than a generation ago and it relates to the concrete. It describes the abilities to find something- an object, tool, document, a piece of code-and to Use it to build up something you deem important.

knowledge (sciences), electracy focuses on the individual state of mind within which knowing takes place (arts) "(Ulmer, 2003)

Ulmer here gives a perspective to the multimodality in the multimediality of information sources. If we connect this notion of multiple forms of language in new media to the new net generation of children discovery learners, we can assume that children don't necessarily need to be able to read to be literate because text is just one form of an ability to read information. Papert (1994) interprets this to be the new form of literacy as opposed to letteracy. [11] Children from a pre-school age can watch videos online, play games, listen to music, video-chat and extract information and content aimed for that purpose. The ICT and the internet provide the opportunity to combine all types of media and games for educational goals. In this process of discovery, the child is the navigational learner, she/he is the junior librarian, she/he is the creator, and most importantly a critical thinker and problem solver.

3.3. The path of ineffective implementation of ICT

The hope of utilizing instructional and educational technology in formal education was very high in the end of the 80s. Educational software was about to revolutionize the standard pedagogical methods and replace the teachers forwarding style of teaching by creating computer learning labs for this purpose only. However, effective implementation and gain of knowledge was not achieved as planned. Instead, in an effort to provide computer access to every student at an affordable cost despite the low ratio of computers to students, schools often placed computers in a single room where children/students use them once a week under a teacher's supervision.

Students would learn about the nature of the computer, its function and ability, commonly used software etc. This situation of a nucleus environment was disconnected from the students' natural learning environment. As a result the object of

11 Letteracy is the ability to read text according to Seymour Papert.

learning became the subject. In this regard, Papert makes an analogy of the body's immune system in a response to an impostor, to the idea of removing computers from the classroom and downgrading them to an isolated lab. By making technology a separate field of study, the new subject "computer literacy" reduced the attention of the subject that was supposed to get the benefit, thus minimizing the potential effective impact that computers can have on education.

> *" All experiments purporting to implement progressive education have been disappointing because they simply did not go far enough in making the student the SUBJECT of the process rather than the object"* (Papert, 1994)

In the past two decades we are witnessing an explosion of creation of educational software produced by both commercial and educational institutions. However, most academic institutions have had problems in implementing instructional and educational software in their curriculum in the way that it will exploit its full potential. In the US, one study found that even though 99 % of K–12 schools have Internet access, as do most classrooms (87 percent), these resources are rarely used effectively. (Digital Divide Leadership, Consortium for School Networking (CSN), 2004) What was found was that instead of focusing on applying a specific tool for a certain objective, the formal educational institutions concentrated on studying the system of work of the chosen software as a premise for its student's application in the future and on continuing training of the teacher staff on its use. The biggest long-term effect failure happened in some institutions that devoted too much on studying the system rather than using it and adapting to the problems they found. Because of this miscalculation of rapid change and progress the information learned about these systems today was going to be useless tomorrow.

In *Tools for the Mind,* Burns (2005) gives an overview of the possible reasons of the failure of appropriate integration of ICT in formal education:

> *- Many districts have concentrated on professional development that trains teachers in skills instead of teaching them how computers can enhance student learning. This focus on technology skills has diverted needed attention from*

helping teachers understand the instructional practices best suited to capitalize on technology's potential, serving instead to hide or exacerbate weaknesses in instruction, lesson design, and assessment.- Many districts have not made the kinds of accommodations necessary to allow for the full capitalization of classroom technology, failing to provide such supports as long-term professional development in technology integration; access to sufficient hardware and software; creation of sufficient instructional time for inquiry-based, technology-integrated activities; onsite technical support; and instructional leadership to help teachers understand how they can use computers to extend and deepen student learning.

-Schools have conflated technology use with instructional quality and student engagement with improved learning and higher-order thinking. In all the excitement about new ways of teaching with technology, we educators may have neglected to pose the most fundamental question: Are students really learning?

-We often classify all software applications as cognitively and instructionally equal. This misconception has resulted in an overreliance on conceptually easy kinds of software—lower order applications that, although engaging, focus on simple cognitive tasks—at the expense of more conceptually difficult kinds of software—higher-order applications that are more aligned with higher-order skills.

Like Burns, other critics also felt that the problem for full acceptance of computer-aided instructional or educational software in the past was the lack of quality software, meaning that these programs were too complex for students (Maddux, 1991) mostly because the missing element was an entertaining value in the content presentation. Considering that the lack of motivation for a young student determines the difficulties in accepting a method, effortless learning with this model was not accomplished. Educational software, games, online applications and other information and communication technologies should not replace the traditional practices in formal education, but enrich them. Edward Ayers (2002) points out that "*It is not until we find ways to integrate electronic teaching (and learning) into our established rhythms, strategies, and purposes that the very real potential of the new media will begin to be*

realized." In his essay on technological revolutions, he argues that each type of interaction between students and teachers using ICT accomplishes a specific aim. For this reason a balanced interactive working space of individual active learning with the collaborative and passive learning to achieve maximum results was proposed.

By creating problem solving tasks of personal processed solution, helped by a facilitator the students will be motivated and learn from the process itself. In this way they would have been accepted as instruments for gaining knowledge. Shade & Watson (1990), talk about this integration as a vital element for instruction of real problems for a real purpose. When this happens, the most valuable thing that students will get is the ability to use computers as a natural learning tool.

3.4. The relation of constructionist approach to today's digital learning

From the 1960s onwards, the establishment of a variety of progressive educational methodologies like cognitivism followed by constructivism and constructionism started to shake the boat of traditional educational practices. Constructivists and constructionists promoted use of instructional software as a tool for experiential learning. With this sort of approach, pro-IT constructionist Seymour Papert argued that learning is most effective by making, rather than passive learning. In his book *Mindstorms: Children, Computers, and Powerful Ideas (1980)* proposes educative practices where *children the "builders" of their own intellectual "buildings"*[12] with the help of computers. His theory was practiced when a LOGO programming language is given to children to use as a powerful tool to formulate algorithms and build patterns to test them. In this case the child has full control of its creation in the software, thereby understanding its meaning and function, opposite to the typical cases of instructional software where the computer is there to create meaning by presenting content to the child.

[12] Term coined by Raimond Reichert

The "online" world today works in a very similar way. Users are producers and consumers at the same time in very many social networking cites, wikis, blogs etc. A recent survey from 2009 by Two Pew Internet Project shows that nearly three quarters (73%) of online teens and an equal number (72%) of young adults use social network sites. The main concept of these networks is to produce, share and discuss ideas to be learnt. In this learning process that developed logically with the concept of sharing, the online learner highly relates to constructionist belief where "*learning involves students drawing their own conclusions through creative experimentation and the making of social objects*." (Wikipedia, 2008) This progressive , active form of learning might lead to solutions to the problems mentioned. Constructionists agree that "*It will require a return to original assumptions—the need for critical thinking, for learner centered instruction, and for students to use computers as mind tools. It will also require professional development for teachers that systemically and intensively addresses these needs*". (Burns, 2006, p.53; see also Boethel & Dimock, 1999 Means & al., 1993; Roehrig-Knapp & Glenn, 1996). If the implementation of ICT in formal education proceeds in line with the constructionist approach, there are high probabilities that it will bring in new light in successful learning through play and discovery.

4. What are the main design principles guiding the creation of educational virtual worlds for pre-school children?

"Virtual Worlds are places where the imaginary meets the real"

Richard Bartle, Designing Virtual Worlds, 2003

A virtual world (VW) is a constructed imaginary reality that is shared and inhabited by individuals who are active in its realm. The label *virtual* refers to a computer-based simulation of an environment, whereas *world* represents a persistent, self-contained, shared reality that forms a discourse for action and interaction of its population.

What does it mean to create a virtual world? Conceptually, designing a virtual world means creating the premises for a habitual and mental attitude for its inhabitants who will have an equal mindset for action and interaction in the same environment. Practically, when a virtual world is being created, there are three main factors that determine its outcome: business, technical and game-play, says Bartle. According to Bartle (2003), once the commercial and management operations are planned, a technical team of software developers, artists and animators proceed to the making of the world, based on the game-play design plan from the conceptual designers. The conceptual design is usually clearly distinguishable in the genre and platform of the world. According to KZERO research group, in 2008 twelve distinct VW

1. Content Creation
2. Socializing
3. Casual Gaming
4. Miscellaneous
5. Mirror Worlds
6. Role-play fantasy
7. Toys/Real World games
8. Music
9. Fashion/Lifestyle
10. Education/Development
11. Sports
12. TV/Film/Books

genres could be mapped (see Graph 1):

The genre determines the objective/purpose of the world, which directly influences the roles of the users, the main motivation, elements of play and interaction. To clarify the specific design of educational virtual worlds for children, in this chapter, I will compare their structure, function and overall concept to several types of virtual worlds for adults. The comparison is based on their similarities and differences reflecting on the concepts of Richard Bartle's *Designing Virtual Worlds* and Marc Prensky's *Digital game-based learning*.

4.1. Technical aspect

From a technical perspective, virtual worlds are computer-based simulated environments that run on a server-client type of system and are active and accessible online at any time. The main architecture, content and character logs are stored in a number of servers and can be accessed by the users in several ways. The most common way the user can establish a connection to the virtual world is to install the software that will enable the connection to the servers from a PC (Macintosh, console, mobile phone). In other cases when the virtual world is text based or doesn't include rich 3D graphics, the platform can be adapted to a Java application accessible with a browser or a mobile phone without previous installation.

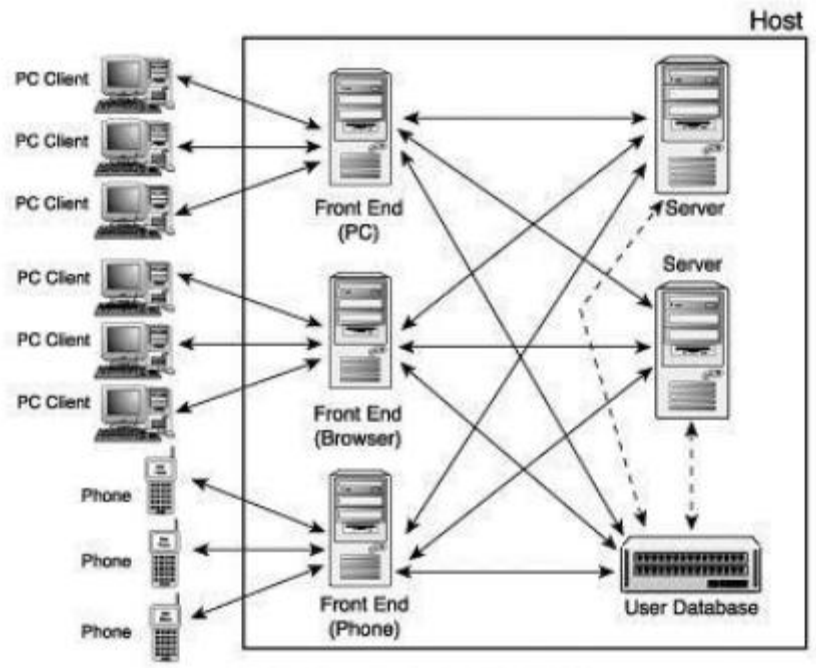


Figure 2.1 Overall architecture.

(Bartle, 2003)

The architecture and platform are adapted for the type of involvement in the virtual world and vary depending on the users' age. Very few EVWK[13] require a particular installation of the application from a CD or online installation, while the majority are designed for a Java or Flash platform, easily accessible through a browser.

Contrary to adult content creation or social VW, these worlds have quite limited or no communications tools, very few or no tools in object creation, and have a graphically simpler interface. The accessibility, interactivity and feedback systems are also quite different. One of the most important features in adult virtual worlds is the interactivity in a simultaneously responsive world that is pervasive and in constant growth. In EVWK the age is a factor that conditions a safe communication system, monitored activity and a controlled creative interference. In this case, the pervasiveness of the virtual world can be seen as illusionary, because the main elements of real-time play and interaction with others are not present.

[13] EVWK abbreviation from educational virtual worlds for kids

The accessibility of virtual worlds is an important element in relation to availability for anyone. On the surface, virtual worlds seem to have a democratic availability for anyone interested in participation. Most of them provide free membership and the open entry to the exploration of the world. However, because of their commercial nature, many features like the use of certain objects, access to some spaces and activities are not a commodity for everyone and are available only for fully registered members.

4.2. Content and content creators

Many researchers agree that one of the main conceptual differences in the design and dynamic of various virtual worlds is found in the world's main content creators. While the technical structure and interface are provided by the producer in goal free VW such as There and Second Life, the content, props and themes of the parcels are mostly generated by its users (whether they are individuals or organization participants). These users are the content creators. For example, a virtual theater group can build a stage, props and invite actors to practice. The nature of the objects and activities that are built can be professional, entertaining, social or all of these. As a consequence, the environmental design is changing, and because it is dependent on its user's interests it is in constant growth.

On the other hand the content, activities and props in the goal-oriented worlds such as EVW (Whyville, Handipoints, JumpStart), Sport VW (Sportblox; Interzone; TechDeck Live) and in Role-playing VW (WoW,) are created solely by the VW producers and its coverage is to a limited virtual territory. The design of the geography of the land is highly dependent on the theme (fun park, classroom, fair-trade center) of the region, making the environmental design decorative, functional and properly corresponding to the narrative. In view of that, the content of a region regulates the geographical design for its users. For example, in the cases of pre-school EVW like Panwapa, JumpStart, Woogi World, Chuggington and Virtual Builders the users themselves

cannot influence the geographical and structural spread out or design their own active spaces.

In most EVWs for children, the users only have the option of building their own house from a small number of predefined design choices in a specifically appointed "homepage" space. These homelands don't intersect with the surrounding and don't change the nature of the occupied place in any way. The user in these worlds is in a rather structured society that has rigid rules for creative and original immersion in the place. Consequently, considering that rules are elements of games, this particular EVW concept puts the participant in a player's role, rather than a user's hence giving the playful learning experience of a game-like character. (Zimmerman & Salen, 2004)

It can be concluded that in a virtual world that is goal oriented, the users are limited in their influence of content with their own creations. Their motivation for engagement is to be affected by the world rather than affecting the world.

4.3. Virtual World Typology

The principal division in Virtual Worlds typology is defined with the answer to the question of what the world's goal is. Is it to pursue a mission; to build a social network; to improve cognitive skills, to learn a subject, train or simply provide all of these options for the user to function in the world as he/she chooses? The goal characterizes the nature of the gameplay, dynamics, type of immersion, motives of participation and user group interests. The existence of a goal defines the virtual world's rules of play and the context of being there is more close to a game rather than an experience based on free association. In this case, a concept of a digital game and the concept of social dynamics in a virtual world meet. If a virtual world is goal-free in terms of a given objective, then it has no motivational foundations of a digital game and therefore the in-world user lifestyle is characterized mostly from his personal interests. The purpose and existence in a pure virtual world is internal, defined by the user while the purpose and existence in goal oriented virtual worlds is external or

defined by the virtual world producer. On the other hand, the nature of a content creation VW as a reflection of capitalist western societies has a driving force in development from commerce rather than organic socialistic creative spirit as it was in the beginning (Catronova, 2003). This means that even though the nature of the world was primarily based on creative individual expressions, the way the virtual world developed determined that commercially interested parties became the main content creators. Consequently the dynamics changed so that the initial content creators, who were building their own goal before, adopted goals of other content creators of commercial background.

The goal oriented VW have a different sort of dynamic. MMORGs type of VW such as World of Warcraft form a participative engagement in collaborative gaming activity of a competitive nature within the VW (Bainbridge, 2007) .These parameters of a fantasy world where the participants play roles of a chosen character from the narrative, shape the dynamics of a game-like concept that has an independent reality from the reality of the offline world. Interaction between users happens, social groups are formed but it is clearly separated from the activities in the offline world.

The general goal of all EVW is to educate the participants in a certain field using a participatory method in an edutaining[14] environment. When it comes to specific learning objectives, the most common challenges for pre-schoolers are in improvement of spelling, reading skills, basic math and creative expressions. (examples: *JumpStart, Handipoints, WoogiWorld*). Other worlds like *Panwapa, Secret Builders* and *Chuggington* focus more on building a value system in cultural understanding, ethic in traffic, digital literacy and culture, critical thinking towards information, personal safety online and similar issues in personal development.

[14] Edutainment comes from combining entertainment and education.

4.4. Users

What kinds of characteristics are distinguishable in the users in virtual worlds? Bartle (2003) offers a typology of the users regarding the type of immersion they experience in the virtual world. The process gives the user the feeling of being in the world and the more immersive the world is, the bigger its ability to immerse users. Goal oriented virtual worlds have a higher immersion of the users as players to the narrative, whereas goal free virtual worlds strive for as low immersion as possible and achieve the same immersive effect by giving a sense of freedom in being there.

Considering the many possible levels of immersion in a virtual world, the users can be divided into four types:

- Player
- Avatar
- Character
- Persona

A *player* can be described as a user that associates with an object in a virtual world. The level of attachment to the control of the object is the measurement of the immersion in the world. A Players kind of involvement is noticeable in game-like virtual worlds such as fantasy or quest virtual worlds. In illustrations below we can see the player type of choices that relate to adventure virtual worlds for children.[15]

15 *http://www.JumpStart.com/, accessed 18.11.2009*

ıstration 2: JumpStart 3D virtual world

Illustration 3:
Chuggington

Illustration 2: Winglington and Wenks Virtual World for

Children

Illustration 5: PANWAPA World

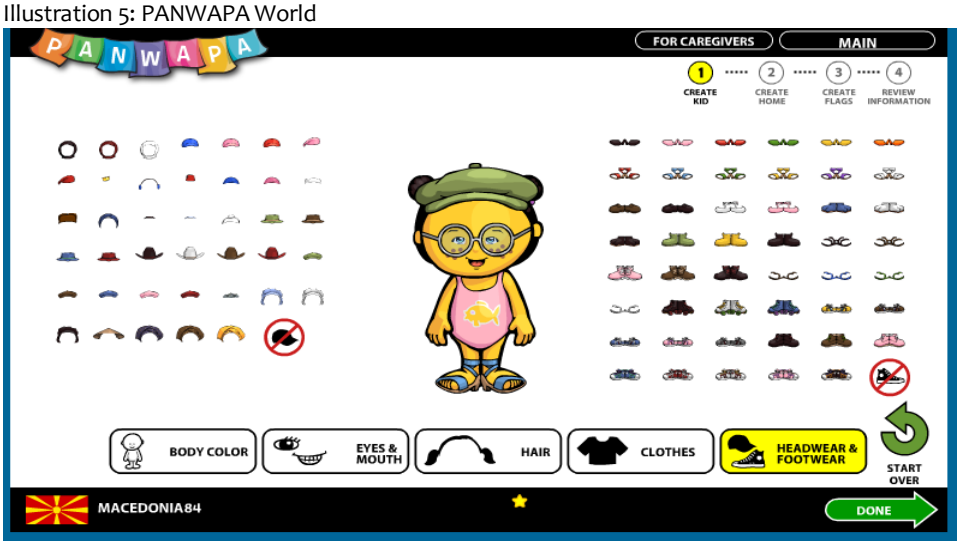


Illustration 5: Whyville virtual world

The most common type of immersion in a virtual world occurs when the user identifies with the object that he/she controls; the object becomes a representative for the virtual world – an *avatar.* This relationship of the avatar as the puppet versus the user as the puppeteer relates to the one that children have with their dolls. In the virtual world, the principal step is the customization of the outlook of the avatar that will match the idea of an acceptable puppet for the user. An avatar from goal-oriented VW like World of Warcraft can have a warrior's or hunter's kind of outlook and characteristics, while most of children's virtual worlds, regardless of their purpose, usually offer a choice of cartoon style avatars, animals or object-like mascots. In this way the child user can identify with a playful role whereas the adult identifies with a hero. Many children's virtual worlds have this feature that enables the user to personalize their avatar, and therefore personalize the world itself.

In the process of avatar identity creation Bartle (2003) poses the question of "To be or What to be?" The user's choice in combining given colors, clothes, accessories options doesn't affect the physical performance of the avatar in any way. However, it is a form of expression. If we compare the make-over "room" of the VWK to a free clothing shop for outfits, accessories, hairstyles and make up, then we can explain how avatar outlook design system works as a fashion function. Considering that fashion or fashion style comes out of the need to express ourselves creatively, the children use these tools to appear as distinct as possible, especially because of the fact that their creation of their avatar is their visual ID amongst thousands of others that have had the same provided designs to make combinations from.

The iconography of each virtual world is a good example of the possible characters a user can have as participant.

Illustration 6: Woogi World

Illustration 7: Panwapa virtual world for children

Other than visual customization of the avatar, an important activity is personalization of the avatars character through his/her interests and designing his/her home. In Illustration 5 we can see the portrayal of the avatars character and culture through the images of its interests, music, food and hobbies.

Illustration 8: Panwapa virtual world

Compared to most types of virtual worlds for children, in adult content creation virtual worlds like Second Life, Active Worlds, as well as in social virtual worlds like SmallWorlds and Habbo Hotel, the users "*stop thinking of the object they control as their representative, but rather as their representation. The object is a tokenization of the player. This is the* ***character*** *level, at which the majority of players are found. A character is an extension of a player's self, a whole personality that the player dons when they enter the virtual world.*" (Bartle, 2003)

Illustration 9: Second life avatar

The feature of customization of the avatar is present but with a whole new dimension.

Illustration 10: Second life avatar

If the user chooses to have a character that is identical to his/ herself, they can also do so by adjusting the avatar to resemble their physical features and characteristics. [16]

The users live a life in the virtual world that is not separate from their own offline life, but is merely a continuation. The extreme immersion happens when the user is the character; he/she lives in the virtual world as him/herself. Bartle refers to this type of a user as a *persona*. This relationship reflects on the outlook of the avatar that is a mirror image of the user's physical features.

Determining the design concepts of virtual world for adults as opposed to some examples of designs of educational virtual worlds for children provides an understanding of the specific nature EVWK. Based on these observations, a critical perspective can be given in the final analysis of the pedagogical approach in the virtual game world JumpStart World Kindergarten.

5. Virtual worlds as a society

If we consider that Virtual Worlds are *places* where people go, act, interact and after they return to their homes (Bartle, 2003), then the best place to start defining these places is to define the place as an environment. To study it as a social environment, many aspects should be considered: their geographic, economic, political, social and cultural environment.

5.1. Geographic

Highly reliant on the purpose of the VW, the topography of a VW is designed accordingly to the user's age group, goal and theme of the world. These elements affect the nature of the world and can result in two general types of geographic aesthetic:

a. A copy of the physical properties of the "real" world, meaning landscapes, natural forces, time, space and laws of nature

b. Adoption of an already established philosophy of nature from a previously constructed mediation of a narrative.

To illustrate, a goal-free VW for adults is mirroring the physical laws of nature of the real world. The landscapes, cities, resorts, industrial zones and overall physiology are quite realistic in relation to the same in the real world. In this category belong content creation and social VW. This sort of aesthetic sensation correlates with the intended sensation of being involved in an extension of the real world. Additional understanding/learning of the ways of the world would be inadequate considering that

the focus is on personal integration and progressive creation on top of the already established familiar.

Since EVKW are goal oriented on content that is supposed to be used in the real world, their visuals are based on examples of children's cultural products and recognizable environments. Depending on the area of interest, they can resemble a fun park, a kindergarten or even a popular cartoon or children's' TV show. In digital games in general this method of adaptation has proved to be very successful (J. P. Wolf & Perron, 2003) and the same scheme has been many times used by VW designers. A good example of remediation in VW is Chuggington, an already popular British TV series emitting on the BBC's digital children's channel Cbeebies (January, 2009) was expanded into an educational VW (April,2009). By participating with train avatars the child of 3-6 years can experience the world of traffic. This way of impersonation of vehicles, objects and forces places the child in a position where he/she has to understand the nature of the object in order to make that object fully functional in the situation of interest. So the scenery design resembles an environment that imitates a city where railroads are a metaphor of roads in life, oil is energy or food in other words, electricity is sort of a sun, sickness is mechanical malfunction and so on. The discourse is shaped by allegories and a theatrical postulate.

5.2.Economic

What sort of economical aspects exist in virtual worlds? In goal-free VW (Second Life, There, ActiveWorlds) land and property can be owned , leased and resold; companies can be registered and operational, capital is managed through the worlds own currency and is interchangeable with Euros, Dollars , credit cards and other currencies that the virtual bank supports. Educational institutions and government bodies host events and organize lectures and workshops, individuals practice hobbies in entertainment centers, focused groups, design labs, sport fields, creative workshops

and share live art and music performances. The economy of the world imitates the "real" world economy and functions interchangeably with it.

On the other hand, in EVWK the idea of economical values exists as a system only when it comes to a reward in a certain achievement, a fictional monetary system of objects of value. The role of economy in *JumpStart* for example, doesn't change the main discourse or the characters dedication to this field. However, it is one of the main motivators in the sense of pursuit of an objective. Mastering one of the dozens of learning games is rewarded by gems, which can later be used in The Zippy Mart, a virtual store that provides equipment necessary for other missions, cabin decorations and music for the in-world personal music player[17]. In the *Panwapa* world their acquisition is of equal importance to self establishment however the means (money, coins) to get decorations and accessories are not required. This significant difference between these two worlds marks an economy free EVW in *Panwapa* contrary to *JumpStart*.

5.3. Social

Like in any social networking cites in almost every VW, groups are formed and communities are built as a result of mutual interests or quests. What is a pillar in social and pure VW - the online social network, in EVWK is a bonus to the learning adventure. The reasons why in children's' edu-VW the online community doesn't reflect the social nucleus type of bonds that are common in other virtual worlds are related to security issues for children interaction online.

Many educational organizations that promote critical thinking on e-learning and educational electronic games like http://www.connectsafely.org/ , http://www.commonsensemedia.org/, http://globalkids.org/ and http://www.rezed.org/ consider the safety of the child as one of the main criteria in the quality of the product.

17 JumpStart World Kindergarten software help Manual, October 2009

In preschool EVW the interaction system is somewhat limited to availability of chat-based rooms or a messaging, email type of communication. Therefore groups can be made only in a specific playroom. In that way it is possible distinguish favorable places among certain users and theoretically recognize interest groups to some extent. So far, for security reasons the communal bond appears to be constrained by censorship in chat, prevention of over-leisured activities and focus on guided entertainment.

5.4. Cultural aspect

What kind of cultural aspects are developed in EVWK? Judging from the educational activities, promotion of ethical values, exploration of creativity in each child, the cultural aspect is quite an important side. Some VW like PANWAPA promote intercultural understanding through a series of activities about typical characteristics of a nation, thus making the educational content part of a cultural and social context.

Looking at virtual worlds as a virtual society provides an insight in the nature of virtual worlds, thus providing a wider perspective of the characteristics and possibilities that a VW can provide.

For the reason that the goal of this study to examine the contextualizing of the pedagogical methods in the educational virtual world JumpStart Kindergarten World and furthermore point out its potential as a communal learning environment, an overview of the various social aspects was presented.

6. Analysis of the pedagogical approach in the virtual game world JumpStart World Kindergarten

"Genre of edutainment ended up gravitating towards participation genres that reproduced the existing logic of competitive academic achievement."

(Ito, 2009)

In 2008 Kebritchi and Hirumi pointed out a risk coming from the premature growth in the commercial edutaining industries. They found that video game technology is significantly outpacing research on its design and effectiveness. In their study of 55 educational digital game-based environments only 18 game producers replied to the survey grounding their designs on established learning theories and instructional strategies, four games described unclassified pedagogical approaches, two explicitly stated that no established theories or strategies were applied and the rest did not reply to the survey officially. Seventeen of 18 games with explicit pedagogical foundations used learner-centered approaches. (2008) Direct instructional teacher-centered methods, grounded in behavioral learning theories, are giving way to more learner-centered approaches. Only one of these 18 games used a direct instructional method. Based on this research and personal observation of the design of virtual worlds and educational video games, it can be concluded that in today's sea of educational video games, many games and virtual worlds are commercial products of the gaming industry rather than research-based experimental tools for innovative and learner-centered educational methods. Unlike more exploratory or construction-oriented software titles, the majority of genres of educational software are marketed and keyed to the social demands of middle class achievement. (Ito, 2009) Considering the responsibility that these worlds' designs have for hundreds of thousands and even millions of children, I believe that is nececery to point out the pedagogical problems in educational virtual worlds and propose solutions for their improvement. In this chapter

I am making a qualitative analysis on one of the most popular virtual worlds for children in 2009 (KZERO research group, 2009) JumpStart World Kindergarten, by examining its game-play, game-world and game strategy from a pedagocigal and game study perspective. The pedagogical approach is the main interest in the study of the presentation of educational content in a virtual game world environment. A qualitative method based on Aarseth (2003), Salen & Zimmerman (2003) and Castronova (2003) online game analysis is used to determine the design principles in JWK, while mapping questions of interest about educational content. A combined method of quantitative and qualitative study based on statistical information on the learning objectives in the learning games inside the world provided by Knowledge Adventure is used for determining the efficiency of the games for the player as a learner. Through this, I aim to point out the problems in popular commercial virtual worlds for children as tools for ICT, and finnaly propose solutions for a better use of them in the future.

6.1. JumpStart World Kindergarten (JWK) history

In the period of 1994 to 1998 the American company Knowledge Adventure released a series of children's educational games for PC under the name of JumpStart. By 2000 the JumpStart collection expanded its palette with a number of games for young children at the age of 3-10 years old, categorized in titles for toddlers, kindergarten, pre-school, 1st- 6th grade. The model of the games was based on earlier concepts of educational digital games like Reader Rabbit and Math Blaster. Through immersion in a playful experience of reading, calculating, creativity and problem solving games, the aim of the player was to receive multidisciplinary improvement in skills and knowledge.

The first JumpStart Preschool edutaining game for preschoolers was released in 1995[18] (1996[19]) for PC, followed by an upgrade in 2000, 2002 and 2006 under the title

18 Information retrieved from http://en.wikipedia.org/wiki/History_of_JumpStart_products, accessed 05.04.2010

JumpAhead Preschool. A notable popularity in the US in 2007 stimulated the expansion of the game concept to a *game world*, Knowledge Adventure's new version of educational games. The games kept the adventure based immersive play concept with multidisciplinary objectives, but in a 3D environment where the player is able to explore and play various entertaining and educational games in a different platform. In 2008, the same game world packages were redesigned and renamed to 3D virtual worlds, improved in online content update, knowledge feedback both for the player and the parent[20] and opening an online game for play with another peer. The games were renamed as follows:

JumpStart world Preschool = JumpStart 3D virtual world ages 3-5, My first adventure

JumpStart World Kindergarten= JumpStart 3D Virtual World Ages 4-6, Legend of Grizzly McGuffin

JumpStart World 1st Grade= JumpStart 3D Virtual World Ages 5-7, Trouble in Town

JumpStart World 2nd grade= JumpStart 3D Virtual World Ages 6-8, Quest for the Color Meister

JumpStart World Kindergarten (JumpStart 3D Virtual World Ages 4-6, Legend of Grizzly McGuffin) is a commercially produced 3D educational virtual world for children, adapted for the US and Russian market. If we relate the design of the world to the framework presented in the previous chapter, JWK belong in the genre of educational/development type of virtual worlds, where the only content creator is the producer of the virtual world which can define the world more as a virtual game world, rather than a virtual world. The immersion of the player is one of an individual play with the environment and virtual characters, according to Bartle's typology of types of immersion. In this virtual game world a particular pedagogical method of the learning

19 Information retrieved from http://www.gamefaqs.com/computer/doswin/home/959371.html, accessed 05.04.2010

20 Information retrieved form JumpStart staff member through the JumpStart official blog http://www.JumpStart.com/discussionboard.aspx?g=posts&t=2094, accessed 04.10.2009

by doing theory is undertaken. The game-play engages the child player in a mission during which he/she seeks meaning through exploration and performance.

6.2. Pedagogical approach

In the pedagogical approach of experiential learning by doing theory (Kebritchi & Hirumi, 2008) five instructional strategies can be classified: (a) learning by doing, (b) experiential, (c) guided experiential, (d) case-method teaching, and (e) combination of experiential and inquiry-based learning. JumpStart World Kindergarten adopts a guided experiential game world approach, a learning method that already is well practiced in real classroom environment. This poses the question of the type of benefits a game can give to learning as opposed to what traditional educative practices offer.

In contemporary digital games the full immersion happens when the player is living and breathing, sort to say, the simulated world in a reality. Therefore, the computer game world environment should be used to enhance the experience and improve the potential of learning-by-doing by simulating the environment with instructional strategy. An effective instructional strategy, summarizes Kolb (1984) cited by (Kebritchi & Hirumi, 2008), is the one that embodies the principles of experiential learning consisting of the following sequence of events: 1.Concrete experience; 2. Reflective observation ; 3. Abstract conceptualization; 4. Active experimentation. What we encounter in JWK through the players' experience can be defined as a skill-centered concrete experience that mirrors results in several ways of feedback for the player and for the parent /caregiver. In this way, the motivation from the feedback triggers action in another concrete experience - more games, forming a cycle of experiences that form the abstract conceptualization of the game world. Active experimentation, however, is not achieved on an individual level, but as an exercise.

6.3. Game-play

6.3.1. Roles and dynamics

Richard Bartle (2004) classifies four types of roles in virtual worlds: Achievers – players that experience virtual worlds as games, where their goal is to improve, advance and ultimately win; Explorers – players that see themselves as pastimers[21] such as readers, gardeners, trainees that seek their reward in further understanding and discovery; Socializers – players that experience the virtual world as entertainment and socializing; Killers – players that experience the virtual world as a sports playground, where they can hunt, fish or kill. In JumpStart World Kindergarten, the type of immersion in the world is on the level of a player that performs as an achiever. As Poole (2000) states, the narrative of videogames can be broken into diachronic and synchronic stories, where the background plot is diachronic layer, processed through the active narrative in the present –the synchronic stories. In this case, the diachronic narrative is postulated in many learning, character and tournament games waiting to be discovered in an adventure world, while the synchronic stories appear on the path of discovery of the player - Boy Scout. On a mission to demystify the closed areas of the world, the player is guided to experience specific areas of the game world in a clear consequential order. Thus, as in backgammon and domino where the success of an action gratifies continuation in the intended direction, in JWK skill is transmuted into strategy. To be able to receive a scout-badge, gems must be earned and trophies won in the manner intended by the game rules and type of access. With these rules, the achiever's goal has to be processed in a linear manner, therefore leaving very little space for active learning through personal discovery in a learning-by-doing digital game world environment.

[21] Richard Bartle uses the word 'pastimers' in reference to people who play games as a leisure activity, to spend time

6.3.2. Actions and strategies

In the world the player can learn from various activities. On one hand there is the *Math and Reading Arcade* where the player learns about literacy, arithmetic, geometry and logical thinking, and on the other hand there are the character development games. The games from the second group are dispersed around the game world in several areas designed for creative expression, farming, pet raising, tournament games and character building games. What is quite important is that all of the character development games are available for the player only when he/she has mastered learning lessons. Therefore their value is smaller compared to the value of the *Math and Reading Arcade*. Moreover their importance and the pedagogical approach in them are quite valuable as they formulate the child's attitude toward the character. Both of these types of games have an impact on the child's development as a player, learner and person, therefore in the following pages I am presenting these games' structure, objectives and gains.

Illustration 11: JumpStart's Treasure Tracker

The *Math and Reading Arcade* is the biggest concentration of educational games in JumpStart Kindergarten World. With about 17 games per unit, it can be accessed from numerous places in the world such as the *Camp, the Cabin* and the *Treasure Tracker*.

The learning games[22] are divided in units and must be played in a

22 A visual illustration catalog of the games can be found in the Appendix 1

progressive, linear manner per unit, meaning that the player can choose from a game from the first unit as a beginner and only when most of the missions of the unit are accomplished, the games of the next unit can be accessed. Most of them can be played and replayed by choice of difficulty (easy, medium or hard). As a measurement of success, the player is awarded with gems displayed in the *Treasure Tracker*. Gems are the prevailing reward system for playing learning games within the whole virtual world, as they are the virtual capital to be used in all the virtual shops. Thematically the learning games can be divided into five categories: games for mastering letter recognition, shape recognition, reading, counting and puzzle games.

The house *My Cabin* is the virtual home of the player in the game world. The presentation of the significance of a virtual home is recognizable in the way that the Cabin aims to connect the player to multiple doorways to learning games, creative activities, virtual library, virtual media and feedback to accomplishments. From here he/she can access *Learning games*: by playing them on the virtual computer; *Recognize* his/her success in the learning missions with the trophies on the shelf; *Design*: apply textures by using the machine for textile and create a t-shirt with the Me-Shirt Maker; *Entertain*: watch JumpStart movies on TV and take pictures from the room.

Painting, Farming and Pet Training

The Art Studio and *The Billboards*, *Planters and Music Players* areas underline free play by engagement of the player in a creative activity. The *Art Studio* is a space where the player can create an artwork by using brushes, colors, prints, textures, photos and sound. The interface presents the colors, tools, options and the art work through correlating visual symbols and sound guidance.

Illustration 14: Art Studio

This playful activity is positive for self-expression, experimentation and acknowledgement. It can result in an audio-visual collage piece, a physical print or a decoration applied in the game world's billboard spaces in the *Billboards* area.

Illustration 15: The Growing Nursery in the Farming Area

The possibility of having an own garden and caring about the wellbeing of the plants can be a preference of the player as a camper in the *Farming* field of the *Camp* area. Planting a seed means taking care for its health and growth by using the appropriate tools and providing light, water and food. Technically, the player has to choose from a list of plants and point-and-click the buttons that visually signify the requirements. If the process is done correctly, the result is a grown flower. The child can continue observing the results of the grown flower and rotating its view to acknowledge results.

Illustration 15: Pet training

In the *Pet Valley* as well as in the *Farming area* the same issue of responsibility is the subject of discovery. The player must buy a pet from the

Pet Store, train it, groom it and finally organize tournaments if he/she is instructed to do so.

With the *Farming, Painting and Pet training games,* a humanistic value is being tendered. A parallel to this sort of achiever's pursuit can be found in the online game application for Facebook -Farmville, where the player relates to the environment from the level of an Explorer - Achiever. He/ She should have an emotional attachment to the product that is being raised, continuously coming back to see its progress and wellbeing. In this dynamic the motives and goals point out to strong characteristics to a mechanical activity of play. The goal of nourishing life and, as a result, sustainable, continuous input implies either an indefinite amount of steps to a goal or an inexistence of a goal. However, Järvinen (2008) debates that mechanics seem to exist so that goals can be achieved, and thus there would be no mechanics if the game, or a specific set of actions, has no goals. The fact that the mechanics of this activity are recognizable in the few possible strategies in success of the activity, clear tools and required actions, the goal can be recognized in less obvious achievements. Furthermore, a reward is given as a confirmation to a good progress. A grown flower, a complete artwork or a trained pet manifests a level of responsibility mastered by the child player and rewarded by scout badges. The element of reward is one of an emotional value to the player, a motive to further progress. Also, another aspect of these activities is their role as a part of the game pursuit. Since their availability for play is granted only as a privilege to players that have already completed a certain amount of missions, the chance to play here can be seen as a reward itself. This sort of conditionality in the availability of play brings out an importance in terms of player's experience. If we look at them as rewards to a prior achievement, their value compared to the importance of achievement in the learning missions decreases in the eyes of the player. As awards or choices of another type of play, the question of free play choice arises. Järvinen comments on this sort of player experience as to playing for mood management, where in the best case scenario the player can choose what sort of dynamics and challenges are his/her preference.

"As consumers of entertainment, we match our preferences and tastes to the products that we end up liking. Matching is media consumption through trial and error, which constitutes operant learning. This is what happens with games as well : as players, individuals prefer specific aspects of games, be they challenges, goals, teams, contexts, and/or game mechanics that suit their tastes and the desirable moods they associate with playing games. By trying out different games, we find ones we like, i.e. those that evoke positive hedonic tone by providing excitement and relieving boredom. On the other hand we also find those that we dislike: those that elicit anxiety and boredom with negative hedonic tones. "(Järvinen, 2008)

In summary, it can be concluded that the *Farming, Painting* and *Pet training* activities are a type of awarding game activities in the world that become available when an achievement is in the learning games is made. To enter and play the player should have already earned gems in the learning games, and afterwards be guided towards this area. Thus, participation in them is considered as an achievement already, as opposed to a challenge in creative exploration of the player's personal interests and mood.

Illustration 16: Play Catch with Eleanor

Tournament and Character Games

Competition based activities are one other aspect of the worlds play. The objective is to win a tournament in racing, running, swimming against four player-bots in a run-and-discover-clues adventure.


Illustration 17: Sunny Shores with Cappy

Games for character development are based on outdoor children's games. Here there are three variations: Play Catch with Eleanor, Play Hide-and-

Seek with Hops, Race with Kisha, Fish with CJ and Pierre's Treasure Hunt. They can be played in three different manners: Collaborative - play together with the other player, Competitive - compete with the other player and Time Competitive - compete with the other player limited in time.

In the Tournament and Character games, competitiveness is the underlining virtue in the race to win against other player-bots. In this immersive experience, as Mihaly Csikszentmihalyi (1991) describes it, even though the surfaces of the activities differ from one another, the experience is of the same kind. The player experiences a"flow", where he/she can barely distinguish between self and environment, stimulus and response, or between past, present and future. In the various games, experiences are attained when there is a perceived match between the demands of the activity and the subject's skills. The players are given visual and audio instructions to a goal, an approach that is consistent with direct coaching that is grounded in the behaviorist learning theory implying that learning occurs through stimulus-response conditioning and generates and sustains motivation through pacing and reinforcement (Hirumi, 2005).

6.3.3. Motives

The motives for play in this skill-and-action virtual game world can be seen in fantasy fulfillment, social lubrication, exercise and finally acknowledgment of knowledge(Crawford, 2004)

The JumpStart world is a mysterious place, full of learning arcades, training areas, entertainment parks, creative spaces and game characters. Many of those are visible but inaccessible and remain mysterious until the player accomplishes the required goals in the available areas. Thematically and visually, the world resembles a fun park, thereby evoking the excitement of exploration of a new, fantasy world. "*Fantasy is an important component of human play. It is critical to our recreation, our art and our games. Fantasy fulfillment frequently takes the form of symbolic exploration.*" (Crawford, 2004) In this world the participation is presented as persistent by the info-

bots that are frequently reminding the player of the endless amount of activities, available games and upgrades. With this action, the aim for giving a sense of living a virtual life in JumpStart world can be recognized. The info-bots, player-bots as well as the game narrators in the world are an important element for motivation and social lubrication. In the process of discovery of new areas, their role as guides and virtual friends is crucial for the building of a virtually social environment. The player is obligated to encounter them before entering any area for the first time and listen to a narration guide for the following mission. In the tournament and character games, the player is encountering virtual players that are competitive or collaborative to him/her. The interaction with the virtual characters in the world is quite limited to a passively informative, narrative, and automatically competitive, for this reason the sociality of the virtual world can be seen as illusionary.
In the learning and tournament games, cognitive and motor exercise is an additional motive for playing. The objective of mastering a skill in quick answering, memory and puzzle logic development combined with the manipulation of the game application and a higher level of accomplishments in learning lures the player to replay certain games and win more gems.

Every one of us, especially children, have the need to be acknowledged. In JumpStart kindergarten world, the acknowledgment as a pedagogical element is especially underlined in several ways:

1. Recognition

Recognition of the player's success is forwarded in several ways:

- Trophies – displayed on the shelf in *My Cabin*;
- Gems – a reward for proficiency in math, spelling and shape recognition games
- Scout badges – awarded to the player when he/she fulfills the requests of the virtual player-bots as for a friend in need
- Pet Certificate – awarded for achievement in pet training

All of these elements as signs of success for the player entail recognition through mirroring results in an abstract, non-active manner. The trophies, badges and certificates serve as the fundamental pedagogical approval of the player's deeds, a "bravo" to a success. Their importance quickly becomes stale in the continuous play, as new rewards are awaiting the player. This sort of reward in the type of simple feedback for a student has been known in traditional learning methods, and is not hailed by modern pedagogy. (Ito, 2009) . The gems on the other hand are an interactive reward. They are used in *The Zippy Mart*, a virtual shop where the player can buy virtual objects, music and decorations. Here the player can claim his reward with the learning games award.

As means for the player to buy an item by request of the player-bots, they are needed for an interaction for the player in the shop. This motivational element might raise consumerist values or appreciation as rewards to the successful learning.

2. Audience

The illusion of an audience for the player's success in various activities is formed in the creative accomplishments. For example, a billboard in the world showing of an artwork of the player, certificate of pet ownership and a characteristics and healthy plant as a present to a player-bot, and a photo album made during the course of the game are elements that insinuate presence of an audience, a factor well appreciated in children's psychology for learning. Furthermore, the parents have the chance to act as real audience and follow the progress of the child's achievements in the JumpStart Parent Center log directory of the child's learning progress. *JumpStart World* supports parents' involvement with their children, keeping them apprised of educational progress and providing home activities that reinforce and enhance computer learning in mathematics, reading, and critical thinking.

3. Pets

The presence of a virtual pet is another implication of possibility of accomplishing a feeling of acknowledgement. In reality, we can interact with pets, talk to them, play with them and emote with them. A dog is an especially responsive creature; it can read our facial expressions and interpret our tone of voice. In the game world, a virtual pet can evoke a similar sensation (Crawford, 2004) (Järvinen, 2008) (Poole, 2004)

4. Interaction with a real player

Interaction as a premise for acknowledgment and competitiveness of two or more players can be found in only one game in the world that functions online. In the dance music studio that enables players to perform a virtual dance by following visual instructions and skillfully fulfilling the required steps, two players can play online and compete by showing off their motor skills. This activity underlines competitive characteristics in a player, a motive for better performance.

6.4. Game world aesthetics

"Aesthetics describes the desirable emotional responses evoked in the player, when she interacts with the game system." (Hunicke, LeBlanc, & Zubek, 2002)

The enjoyment factor is one of the strongest motivational elements in a game (Crawford, 2004). In a game world the aesthetical elements valued by the players are good graphics, colors, themes, animation and sound. As a whole, they form a fantasy land that is a sensory proof of the game's reality. The sensory emotions that players get from a game can be traced in the color effect on emotion. Marcel Zentner of the University of Geneva conducted a study on color perception and its connection to evocating emotion for adults and children. (2001)

Zentner experimented with three and four year olds with nine colored cardboard rectangles and asked them to forward them to the mentor one by one, starting with the one they liked best. After that the children were shown images of three faces: a happy face, a sad face, and an angry face, they were supposed to match them with six colors. The same exercise was executed with adults.

The results were that adults have a very different association of colors to emotions than children. All of the adults chose yellow-happy, black-sad, angry-red and blue as the most favorable color. On the other hand, the children chose red-happy, blue-sad, a variety of choices for the yellow. The interesting thing was he discovered that there was no color that any child associated with angriness. There was no indication that dark colors associate neither happy, nor bright colors -sad feeling.

In JWK, the interface's color palette abounds with very bright colors, cheerful and happy from an adult designer's point of view. Saturated blue tones prevail, followed by

Illustration 18: JumpStart virtual world interface

green, pink, yellow and lastly, red tones. This fact proves that the designers of the world's graphics may have not considered the emotional attachment of children to colors as a motivational element, but a supposed color scheme that creates positive effect on adults. However, so far there has been no evidence how the children players relate to the colors in the world. In the educational games the color prevalence is equal to the one of the world visual impression, with a difference in the palette the tones of the colors that is much less saturated. This difference makes the ambient in the learning games characteristic and different from the visual graphics in the game world.[23]

If we look as the aesthetics as desirable emotional responses evoked in the player when he/she interacts with the game system, we can specify a dynamic according to the aesthetic taxonomy. (Hunicke, LeBlanc, & Zubek, 2002).

1. **Sensation**
   Game as sense-pleasure
2. **Fantasy**
   Game as make-believe
3. **Narrative**
   Game as drama
4. **Challenge**
   Game as obstacle course
5. **Fellowship**
   Game as social framework
6. **Discovery**
   Game as uncharted territory
7. **Expression**
   Game as self-discovery
8. **Submission**
   Game as pastime

Aesthetic components that create their respective player experiences are very informative. Hunicke & le Blanc value this framework as a premise for typology in virtual game worlds and mention several examples:

- *Charades*: Fellowship, Expression, Challenge;
- *Quake*: Challenge, Sensation, Competition, Fantasy;

[23] Learning games are listed in Appendix 1

- *The Sims*: Discovery, Fantasy, Expression, Narrative;
- *Final Fantasy*: Fantasy, Narrative, Expression, Discovery, Challenge, Submission.

If we apply this dissection of aesthetic components in educational virtual worlds for children, we can find variations within the category itself as well:

- *Panwapa virtual world for children:* Fellowship, Expression, Submission;
- *Chuggington* : Narrative, Challenge, Discovery,
- *Whyville*: Challenge, Fellowship and Submission. *JumpStart*: Challenge, Narrative and Discovery.

In this regard, JumpStart Kindergarten World establishes itself as a game world that might appeal to players who enjoy discovering a game through impersonating as a character in a story that is coached through challenges in educational and character games. The player should identify as an Achiever and an Explorer to be fully immersed in the game.

6.5. Game structure

6.5.1. Navigation

Illustration 19: JumpStart Map

The player navigates in the world using the keyboard arrows, and accesses areas with the mouse. The player can only enter a place if he/she is guided to it by the info-bot in a precise stage of the game for the first time. An overview of the game world geography, accessible areas and info-bots positions is given visually in a map that becomes available after several guided discoveries have been fulfilled. The map is a

shortcut for entry in the already opened areas of the world as well as an indicator of the areas to be discovered. The map is updating online in the case when a player becomes a member and finishes the missions on the primary level. In this case more areas are available and the world map grows. The Cabin also functions in the manner of a gateway to other areas and as an overview point to upgrades in the learning games section. Moving around in the world is liberal in terms of observing the game world, while access to interactive areas is regarded as a grant for a mission. Intuitive navigation is recognizable in locating the map and the player-bots, while the free exploration of various parts of the world is not underlined.

6.5.2. Interaction

Dutton and Consalvo's (2006) have proposed guidelines in determining interactivity in games and online worlds, according to which JumpStart belongs at the lower end on the scale of interactivity.

"*Interactivity means the ability to intervene in a meaningful way within the representation itself, not to read it differently. Thus interactivity in music would mean the ability to change the sound, interactivity in painting to change colors, or make marks, interactivity in film… the ability to change the way the movie comes out."*

In this regard interaction in JumpStart World Kindergarten occurs between the player VS games, player VS activities and player VS player-bots. It is quite limited, as it offers the player only one or two options of response in a player-initiated interaction. The variety of the responses is quite predictable and offers no possibility of surprise itself because the types of responsiveness do not change during the progress of the game. JWK playability is a competition of skill and motor expertise where the interaction can be seen as a greater motivation element. As for elements that are interactive – " *reciprocally active; acting upon or influencing each other; allowing a two-way flow of*

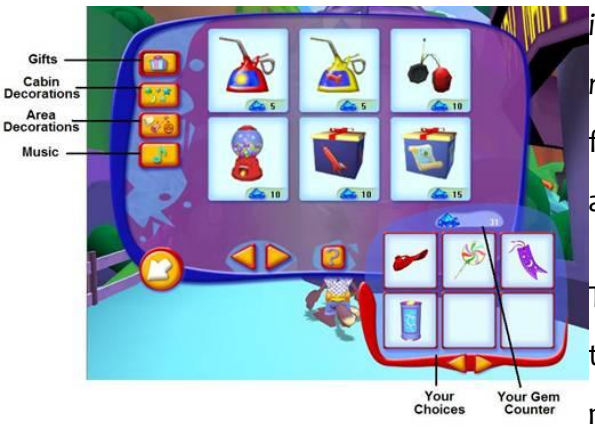


Illustration 20: JumpStart's Zippy Mart

information between a device and a user, responding to the user's input[24], they can be found in the training, character, tournament and learning games.

The main catalyst in all of the interactions is the player-bot or info-bot. Every action that is meaningful in terms of alteration of the state of the player's achievement is dictated for initiation by the player/info-bot thus leaving very little space for an individual approach of the player with the tasks and games. To the info-bots or the characters in the game that act as guides, the player cannot respond challengingly. His/her game-play action can act as a reply to the advice or request of the player/info-bot. Because this sort of player-player interaction is illusionary, it can be seen as passive informing or passive triggering of action. With the player-bots, in the tournament and character games, the interaction is only noticeable on a competitive level.

6.5.3. Objects and object inventory

The objects in the world that are interactive can be divided in two categories: rewards in the Treasure Tracker and items from the *Zippy Mart*. As mentioned earlier, the rewards are gems that mark accomplishments in the learning games and can be Blue Gems rewards of a single game or Super Gems rewards of finalization of a unit and are located in the Treasure Tracker. The items from the *Zippy Mart* are displayed in the window to buy and in a window of possessed items. They can be manipulated from here and given as presents to the player bots on their request.

With all of these objects no meaningful interaction is noticeable, in terms of content alteration and personalization of the exchange of action. The only rewarding

[24] http://www.dictionary.com.

interaction of humanistic value can be seen in the Pet training area, where in a playful experience the player is involved in active manipulation of its pet character and outlook.

6.5.4. Learning games in JWK

The highest level of meaningful interaction of the player in the game world happens with the educational games. There, the player relates and learns from the content by playing puzzle type of games. Their educational content is similar to the one in a primary grade curriculum, consisting of arithmetic, geometry, vocabulary and grammar. Depending on the subject of study, they can be divided in games for Letter Recognition, Shape Recognition, Reading Games, Math and Puzzle Games.

Letter recognition

In this group of games, the player's actions are guided by a phonetic reproduction of a letter that should be recognized and matched to one visual symbol of the alphabet in the game. The player can seek help from the visual question mark, or repeat the sound as many times as needed with the sound button. The game-structure depends on the unit as well as the level of difficulty. Starting from easiest to more difficult, the player can have infinite attempts to complete the goal, can be pressured by a time limit, attempt limit or additionally avoid obstacles. The games visual topology is characteristic for typical 2D platform games. The play field interface consists of two layers: background static scenery that is projected from a profile perspective or from the top, depending on the game and active elements that are distinguishable in color or movement. Depending on the level, the game can have basic guide signs (help, sound, return) or can also have multiple indicative signs of the progress of the mission (number of gems, health, collected items or attempts left). As it is intended for young children, the shapes and textures are simple without many details. The discourse is shaped by the background image design and the active moving objects positioned in a

static 2d platform that can be compared to a board-game format. The themes of the game design are reflecting landscapes, animal life, circus, railway traffic and a home environment. The style of the representation of objects and environments is quite geometrical and simple in terms of realistic details.

Shape *recognition*

The goal in this group of games is visual recognition of shapes in a static background image. The instructions for the goal are given in a vocal narrative form, and can be accessed as many times as needed. The level of difficulty determines the form of the given clues that might be parallel identical images, voiced description of the object, or compatible shapes. These games are intended for basic level player, and the fictional content is based on the same themes as in the letter recognition games.

Reading games

Once the player has advanced to a unit where he/she can recognize shapes and letters, he/she is ready to compile words with voiced description, visual clues, ideograms and memory games in the reading category. Additional actions in the higher levels include dynamic play such as quick answering, recording correct pronunciation, crosswords and sequenced story of clues to be compiled. The graphic design in this level of games stands on a higher scale of detail and aesthetic. Presence of characters with a human and animal outlook is an important content upgrade as well, portrayed in a more realistic cartoon style. Depending on the game, the play field can include a more accented perspective in space, can be successive and can involve two or more stages of objectives. The fictional background content is based on children's learning culture with compiled inventory from classroom settings, science lab, sport, and cargo transport and sea life.

Counting

The simple math games revolve around number recognition. In one game the player is required to visually relate the number with equal quantity of objects, in another he/she should comprehend an audio-narration of the number and select the appropriate visual symbol, or in the more advanced games a simple puzzle of successively ordered numbers should be solved. The dynamic can be of a memory type of game or in the higher levels, the player is required to calculate numbers and assemble appropriate adding and subtracting formulas. The length of the mission is time-wise unrestricted in the lower levels contrary to a higher unit game. The fictional content is based on a story in urban settings, classroom and animal life. The virtual player-bot characters in the games are presented as insects or other animals.

Puzzle *games*

The puzzle games can be divided into basic Memory type of games and puzzles. The different approaches can be seen for example in the mini-game *Highrise*, where the player needs to pair two images that stand behind closed doors. In each attempt there is a possibility to open two doors. A vocal expression of the ideogram can be of help in the process of pairing. In more complex levels, such as in the mini-game *Jungle Masks,* the player needs to assemble a strategy unveil clues and accomplish the goal.

6.6. Curriculum

The curriculum is organized in twelve units, each of them consisting of game activities in three categories: games from the *Reading House*, *Math House* and games from *My cabin*. A combination of presence of games from the three houses in each unit, form the unit's curriculum in an appropriate level. The *Reading house* has the biggest amount of games in one unit 50%, followed by games in the Math House which takes 30% activity. Both of their educational contents advance with the unit's levels. The games from *My Cabin* take 20% of each unit and are practical implementation of the

learned content in the other two categories. In all unit levels the goal of these games is the same - mastering counting, calendar use and reading through exercise.

In the first unit, *The Reading House* has three games for visual discrimination, three for matching lower case-upper case letters, one for rhyme identification and one for reading. *The Math House* has two games for identifying numbers, three for identifying shape and color. The second unit has similar games and almost an equal level of complexity in the educational content. The *Reading House* has three games for matching upper-lower case letters, two for letter identification, one sequence of upper-lower case letters and a reading game. The *Math House* has three for comparing objects to color, vocabulary and numbers, two for identifying measurement tools, color, shapes, one for sequencing of ordinal numbers and one for correspondence of numbers. The third to sixth unit of games in the *Reading House* are more or less same goals but enriched by logical thinking processes such as classification of objects in groups, matching sound to picture and listening comprehension. The games form the *Math House* have games for relating time of day to common events as a novelty, comparing heavier and lighter, comparing sums and numbers to each other as well as addition and subtraction. The sixth to tenth units have games with have much more advanced missions and multiple objectives. The difference is noticeable in the aesthetics as well as and mechanics of the games. The player is required to practice problem solving skills while reading or calculating. Some of the games require blending sounds to make a word, making sentences and identifying concepts from a written text while actively playing a game that requires motor efficiency. The math games already introduce equations, percentage in forms of currency, time units, capacity and recognition of patterns much more than games for adding, counting and subtraction. The last two units have advanced games on creating sentences, reading, recognizing cause-effect relationships and spelling in *Reading house*. In *Math House*, counting to 30 is the highest achievement, followed by games where the player is finding equivalent equations, subtraction and time management.

*I*n the official survey made by Knowledge Adventure in October 2009 (Bergett, 2009), cumulative percentage of all players that have mastered the twelve units in JWK was taken in consideration for calculating results for one session per game play. An average rate of 86.54% of success in mastering the assignment has been confirmed in the Reading House in the twelve units, 82.99% in the Math houses in the twelve units and an average of 59,64% in My Cabin games (note that one of the 3 games in retelling a story has not been mastered). However, since a completed game requires the player to master a lesson at 80% to get the checkmark on the Treasure Tracker and move forward, these percentages may not accurately reflect their true competency. If a player struggles with a certain lesson and a parent or older sibling will assist or play it for them, the player can move forward in the game. (Bergett, 2009). Out of all the 198 learning lessons, 62 of them had an average score of above 90%.

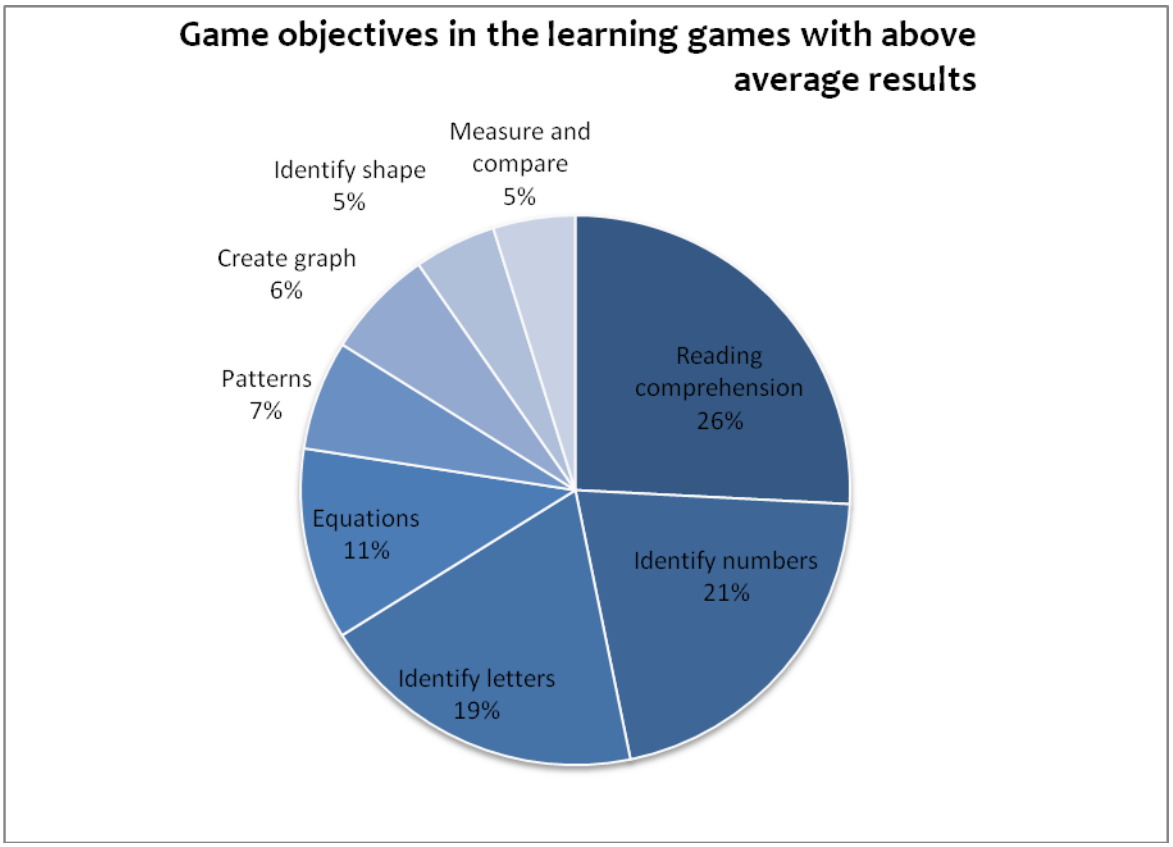
Table 2: Learning games with above average scores

House and Unit	Lesson name	Achieved objective %
Reading House 4	Identify shapes that are the same 4	98.09%
Math House 9	Tell time to the hour	97.14%
Math House 8	Introduce fractions as part of a set	96.61%
Math House 6	Subtraction facts - differences from 10	96.60%
Math House 7	Tell time to the hour	96.51%
Math House 5	Identify numbers from 21 to 30	96.39%
Math House 11	Recognize and extend patterns - AAB, ABB	95.71%
Reading House 3	Match upper- to lowercase letters 3	95.26%
Math House 10	Recognize and extend patterns - AAB, ABB	95.18%
Reading House 10	Match initial sounds to words 3	95.10%
Math House 9	Compare capacity	94.76%
Math House 7	Compare longer to shorter	94.72%
Reading House 8	Match initial sounds to words 1	94.59%
Math House 12	Tell time to the hour	94.48%
Reading House 4	Match initial sounds to letters 1	94.48%
Reading House 12	Identify sight words	94.43%
Math House 10	Tell time to the hour	94.38%
My Cabin 11	Use a calendar	94.28%
Reading House 9	Match initial sounds to words 2	94.25%
My Cabin 12	Use a calendar	94.17%
Reading House 11	Spell words	93.98%
Reading House 11	Identify sight words	93.90%

My Cabin 6	Create and read a simple graph	93.89%
Reading House 3	Recognize that letters make sounds 3	93.77%
Math House 6	Recognize and extend patterns - AB, ABC	93.75%
Reading House 5	Match initial sounds to letters 2	93.73%
Reading House 12	Read "Two of Everything"	93.73%
My Cabin 5	Create and read a simple graph	93.72%
My Cabin 10	Use a calendar	93.68%
Math House 12	Count to 30	93.56%
Reading House 12	Spell words	93.51%
Reading House 6	Match initial sounds to letters 3	93.48%
Reading House 11	Decode words	93.46%
My Cabin 9	Use a calendar	93.30%
Math House 7	Recognize and extend patterns - AB, ABC	93.28%
Reading House 3	Match uppercase letters 3	93.24%
Reading House 2	Match upper- to lowercase letters 2	93.10%
My Cabin 4	Create and read a simple graph	93.00%
Math House 4	Subtraction facts - differences from 8	92.84%
Math House 5	Addition facts - sums to 10	92.83%
My Cabin 8	Use a calendar	92.70%
Math House 6	Compare heavier and lighter	92.56%
Reading House 2	Match uppercase letters 2	92.40%
Math House 11	Recognize and identify 3D solid figures	91.96%
My Cabin 7	Use a calendar	91.65%
My Cabin 3	Create and read a simple graph	91.60%
Reading House 10	Read "A Letter From Camp"	91.59%
Reading House 10	Identify sight words	91.59%
My Cabin 6	Use a calendar	91.54%
Reading House 11	Identify pictures that rhyme	91.53%
Reading House 10	Decode words	91.34%
Reading House 9	Read "Many Ways to Count to Ten"	91.33%
Reading House 10	Identify the main idea	91.12%
Reading House 1	Match lowercase letters 1	91.11%
Reading House 10	Spell words	91.08%
Reading House 1	Match upper- to lowercase letters 1	90.71%
Reading House 6	Read "Camping in the Country"	90.62%
My Cabin 5	Use a calendar	90.54%
Math House 9	Count by 5s to 30	90.32%
Reading House 2	Recognize that letters make sounds 2	90.31%
Math House 4	Compare numbers to 10 - smaller than	90.22%
Math House 6	Compare numbers from 10 to 30	90.02%

The achievement results in these games were taken in consideration in categorizing the type of games that have had highest success rate among the players.

Graph 1: Game objectives in the learning games with above average results



The majority of the learning games with high scores - 45% belong to the houses in the highest units (9-12th), while 32% of them belong to the medium units (5-8th) and 22% to the basic units (4-1$^{st)}$. This implies mastery when the player has already finished most of the learning games, thus mastering the motor, dynamics and most of all logic of the learning game platforms. Once the player is familiar and comfortable in the entertaining skillful activity, he/she quickly masters the learning objectives.

In all of these games the pedagogical method is based on dynamical analogies, where the player is actively involved in matching sound to letter, word or image and vice versa in the *Reading House* and numbers to shape, sound and image in the games from the *Math House*. This can be seen as sort of a translation or remediation of an idea about a word, number or shape to sound, image or sequence.

"Modern educational [computer video] games are thought to be effective tools for teaching hard and complex procedures because they (a) use action instead of

explanation, (b) create personal motivation and satisfaction, (c) accommodate multiple learning styles and skills, (d) reinforce mastery skills, and (e) provide interactive and decision making context " (Charles & McAlister, 2004) .

6.7. Critical review

The relationships between what an environment offers or provides for an organism, says Gibson (1979), gives results for its affordances. Since these relationships can be positive or negative, their consideration is valuable in determining the quality of an educational virtual world. JumpStart Kindergarten world's design concept is an example of a virtual game world for pre-school children that uses a learning by doing pedagogical practice through a skill-centered concrete experience. This method doesn't offer a personalized active experimentation of the player with the subject of discovery, but exercising of a concrete experience in a narrative. Thus, the virtual world acts as a game to be mastered with a single strategy – following instructions. This problem has been noted in a substantial amount of virtual worlds that replicate pre-existing, 'real life' learning experiences instead of using the technology for improvement in the pedagogical method (De Lucia, Francese, Passero, & Tortora, 2009) On the other hand, the presence of a combination of multiple learning styles in one unit is an advantage, keeping the child's enthusiasm high. This sort of pedagogical model has been proven to be effective in educational games for children.

The role of the user is one of a player-achiever who is coached throughout the game world to succeed in learning games, character games and creative expression. In these activities the reward system for the learning accomplishments promotes the profile of the player to an achiever by certifying his/her success with a reward (gems) used as means for achieving another goal. In this process, where the player must shop for an item to be able to fulfill the goal, implicit message of consumerist values are insinuated.

The learning games are interactive games of objects which remediate numbers, letters, words, shapes, equations that activate learning by analogizing and metaphor. Many agree that the effective use of metaphors and analogies is an important educational strategy (Bowers, 1993; Glynn & Takahashi, 1998). By using analogy or metaphor the player can relate ideas from a familiar concept to one that is less familiar or unknown. In JWS the same is proven: the games that are based on analogical and metaphorical discovery have proven to be the most successful ones. A sound metaphorical selection can assist a student in absorbing and assimilating information and vivid metaphors have the capability to teach in a way that is not always available with the use of words alone (Williams, 1986). The use of analogy and metaphor is in the core of human thinking, therefore the use of it in pedagogy is innate (Bowers, 1993).
The games that are for character building are coached in the way that the player doesn't have an option to promote one activity or another more, as a discovery of her/her own interests. On the other hand, constructionist theory promotes exactly the opposite - learning through personalizing a method and using the capacity of the individual to create its own values and meanings. Examples have shown (Girvan & Savage, 2010) that an application of constructionist learning method is very effective when applied in virtual learning environment.

In the virtual world in general, the interactivity with the environment, players and objects is not meaningful in the sense that it cannot provoke a reaction or alteration to it. Thus, a participatory culture of the world is not present. From all the activities in the virtual game world, meaningful interaction can be found in the educational learning, tournament and character games, where the player builds his/her knowledge base, skills and ethical values.

However, these objectives are pursued on the level of learning from playing a computer game, as opposed to learning by exploiting the possibilities that a virtual world can offer. This educational virtual world model can be improved if a constructionist theory would be applied, as concluded in chapter three, with the following configuration:

- interaction with the environment;
- active collaboration;
- engagement in knowledge construction
- publishing of knowledge;
- transfer of knowledge between groups;
- dynamic and adaptive course

To employ the configuration of this model, the JWK needs to develop the sociality system to a level of a pervasive world with multi-user playability and a developed communication system. Furthermore, the interactivity of the world should expand to an interactive environment, where meaningful interaction with objects and other players would be possible. Thus, a participatory culture would be created. The reasons why this hasn't been achieved in this case can be found in the level of technological development of the system, the undeveloped safety of the sociability for children users online as well as the lack of an appropriate pedagogical approach in the design of the virtual world.

7. Conclusion

The aim of this study has been to understand the design and pedagogical approach in the educational virtual worlds for children through the example of JumpStart World Kindergarten. To reach this aim I began this study by examining the history of educational virtual worlds, thus concretizing their nature as a blend between MOOs and virtual worlds. In addition, an overview of the presence of educational virtual worlds in today's digital culture was provided to clarify the importance of this emerging phenomenon and its future effects on education, entertainment, social networks, and research. By pointing out statistical information on the vast number of VW users nowadays and their growth rate in the past few years, I underlined the possible influences that VW might have on our lives.

The next step was to present the great possibilities that ICT through virtual worlds can offer to formal and informal education. First the culture of today's learners was examined, thus pointing out the characteristics of a student born in the information era, a student that contemporary educational virtual worlds are designed for. Subsequently, an overview of the ineffective implementation of ICT was given to clarify the reasons of the failure of previous use of ICT through games. I continued with a reminder to the traditional pedagogical methods in schools that have not been changed for more than a century, thus reminding the reader that if the learners and tools are different, the method should adapt as well. With these results, a base was formed so that another, more effective method can be proposed. Finally, the relation of constructionist theory to optimization of game-based/virtual world learning was presented.

In the following chapter I focused on elaborating the virtual world design principles, thus mapping educational virtual worlds between other genres of VW. I explained their technical functionality, genres, objectives and user types through a parallel of several popular virtual worlds for adults to several popular educational virtual worlds for

children. Next, I examined EVWC as a virtual society and its characteristics by looking at their culture, geography, economy and sociality. This was important to the overall research so that all of the aspects of the world can be considered when proposing a good design of an educational world for children.

Research suggests that technology, when used correctly, can enhance how a child learns by offering the child opportunities for: active engagement in the learning process, cooperative learning, frequent interaction and feedback, and a sense of connection to real-world contexts and applications (Roschelle, Pea, Hoadley, Gordin, & Means, 2000). As Squire *(2003)* reminds us:

> *..video games, as one of the first, best developed, and most popular truly digital mediums embody a wealth of knowledge about interface, aesthetic, and interactivity issues. Historically, video games have been on the technological cutting edge of technically of what is possible, whether it is building online communities on the Internet, creating rich worlds using 3D graphics cards, or allowing dynamic synchronous interaction play by streaming information over the Internet. Indeed, even a cursory glance at the latest games can leave the designer blown away by what is currently possible with technology and inspired by the sleek interface or production values games contain. In fact, the greatest benefit of studying games may not be as much in generating theoretical understandings of human experience in technology or guidelines for instructional design, but rather, in inspiring us to create new designs.*

For this reason I used the example of JumpStart World Kindergarten, to underline which elements of the design of popular virtual worlds for children are made accordingly to effective pedagogical practices and how they can be improved in the future.

While inspecting the world's characteristics I pointed out problematic pedagogical elements of the implementation of the learning by doing theory. The results proved that this model is not well adapted to the interactive method of learning where a player learns most efficiently by meaningful interaction and personal constructivist

experience. Finally I would like to conclude this study with a quote from Girvan & Savage (2010):

"*As early adopters recreate what has gone before in new technologies (Winn, 2005), there is a need to move beyond what a technology can replace and consider the unique characteristics and potential for learning that the technology can offer. Therefore, we posit that to make this move with learning in virtual worlds there is a need to consider the perceived educational affordances of virtual worlds and identify pedagogies that leverage the range and unique combination of these affordances.*"

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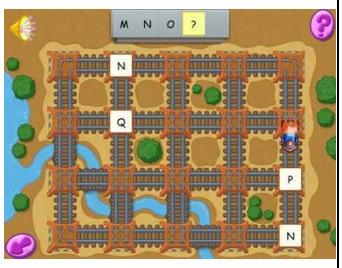
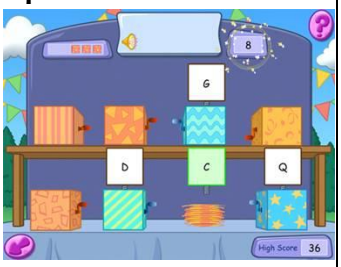
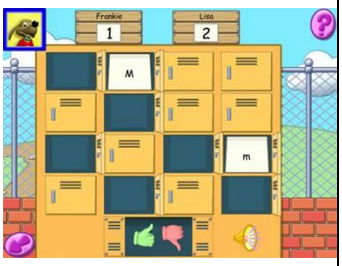
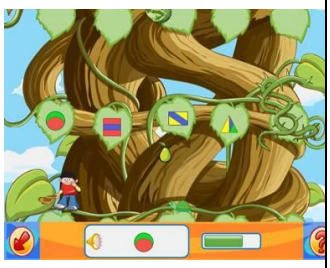
9. Appendix 1: Learning games

Letter recognition

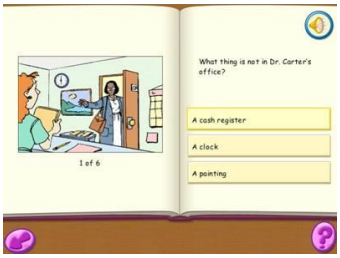
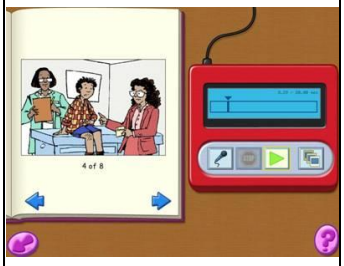
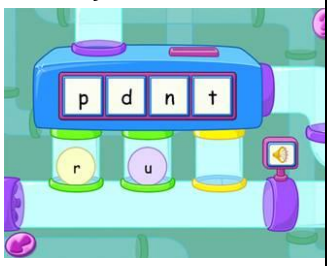
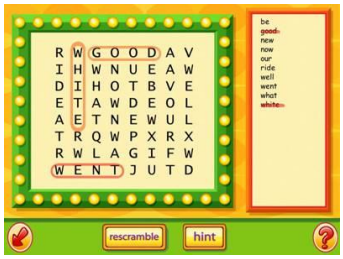
All Aboard! 	**Buzzy Bee** 	**Pop Up** 
Crazy Conga 	**Lockers** 	**Pie Fighter** 
Sequence Sea Hunt 	**Sequence Sea Hunt** 	**Sound box** 

Shape recognition

Beanstalker 	**Critter Creator** 
Shape Scanner 	**Icebreaker** 

Reading games

Book Boundin' 	**Bubbles** 	**Cargo Catch** 

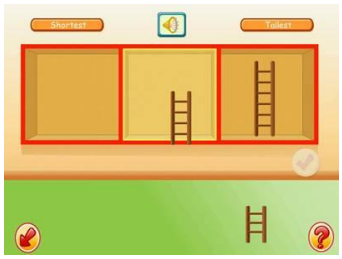
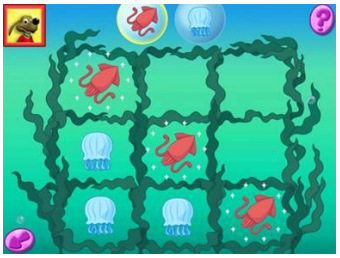
Prehistoric Postcards 	**Sentence Sea Hunt** 	**Story Time – Read and Recall** 
Story Time – Read and Recall 	**This-or-That and Bop 'n' Pop** 	**Whodunit** 
Word Factory 	**Word Search** 	

Counting games

Calendar 	**Bug Catcher** 	**Carnival and Bop 'n' Pop**

		
Math-O 	**Skyscraper Ape** 	**Highrise** 

Puzzle games

Bugs, bugs, bugs 	**Sort 'n' Stash** 	**Underwater fun** 

Snow Play 	**Jungle masks** 	**Picture sea hunt** 
Lockers 	**Highrise**