The Impact of User-Generated Interfaces on the Participation of Users with a Disability in Virtual Environments: Blizzard Entertainment's World of Warcraft Model

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THE IMPACT OF USER-GENERATED INTERFACES ON THE PARTICIPATION OF
USERS WITH A DISABILITY IN VIRTUAL ENVIRONMENTS:
BLIZZARD ENTERTAINMENT’S WORLD OF WARCRAFT MODEL

by

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A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Texts and Technology
in the College of Arts and Humanities
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Major Professor: Rudy McDaniel
ABSTRACT

When discussing games and the experience of gamers those with disabilities are often overlooked. This has left a gap in our understanding of the experience of players with disabilities in virtual game worlds. However there are examples of players with disabilities being very successful in the virtual world video game World of Warcraft, suggesting that there is an opportunity to study the game for usability insight in creating other virtual world environments. This study surveyed World of Warcraft players with disabilities online for insight into how they used interface addons to manage their experience and identity performance in the game. A rubric was also created to study a selection of addons for evidence of the principles of Universal Design for Learning (UDL). The study found that World of Warcraft players with disabilities do not use addons more than able-bodied players, but some of the most popular addons do exhibit many or most of the principles of UDL. UDL principles appear to have emerged organically from addon iterations over time. The study concludes by suggesting that the same approach to user-generated content for the game interface taken by the creators of World of Warcraft, as well as high user investment in the environment, can lead to more accessible virtual world learning environments in the future.
This is dedicated to gamers of all abilities, regardless of what or how you play.
Game on!
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF FIGURES</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>ix</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>LITERATURE REVIEW</td>
<td>13</td>
</tr>
<tr>
<td>User Interfaces and Virtual Environments</td>
<td>33</td>
</tr>
<tr>
<td>New Media and Modularity – Opportunities to Influence Identity</td>
<td>39</td>
</tr>
<tr>
<td>The World (of Warcraft) in Theory</td>
<td>54</td>
</tr>
<tr>
<td>Identity in World of Warcraft</td>
<td>60</td>
</tr>
<tr>
<td>Disability and Identity</td>
<td>69</td>
</tr>
<tr>
<td>Universal Design for Learning (UDL)</td>
<td>80</td>
</tr>
<tr>
<td>Principle I. Provide Multiple Means of Representation:</td>
<td>82</td>
</tr>
<tr>
<td>Principle II. Provide Multiple Means of Action and Expression:</td>
<td>84</td>
</tr>
<tr>
<td>Principle III. Provide Multiple Means of Engagement:</td>
<td>85</td>
</tr>
<tr>
<td>METHOD</td>
<td>87</td>
</tr>
<tr>
<td>Instrument and Measures</td>
<td>87</td>
</tr>
<tr>
<td>Sample</td>
<td>89</td>
</tr>
<tr>
<td>Design</td>
<td>91</td>
</tr>
<tr>
<td>Procedure</td>
<td>92</td>
</tr>
</tbody>
</table>
RESULTS AND OBSERVATIONS ........................................................................................................ 94

The Players ......................................................................................................................................... 94

Disability Distribution ....................................................................................................................... 95

Age and Gender ................................................................................................................................. 96

Game-Specific Demographics .......................................................................................................... 98

Addon Usage and Impact .................................................................................................................. 103

Deadly Boss Mods (DBM) ................................................................................................................. 107

_NPCScan ......................................................................................................................................... 109

Players with Disabilities and Their Play Styles ................................................................................ 112

Study Challenges and Limitations .................................................................................................... 123

CONCLUSIONS .................................................................................................................................. 127

Extending theory ................................................................................................................................. 128

Lessons for UI designers .................................................................................................................... 130

Avenues for Future Research ............................................................................................................. 131

Disability subtypes and identities as gamers ..................................................................................... 131

Addons created specifically by or for gamers with disabilities ......................................................... 132

Choice of server type (PvP or PvE) among players with a disability ................................................. 133

Closing Remarks ................................................................................................................................. 133

APPENDIX A – IRB APPROVAL OF EXEMPT HUMAN RESEARCH ............................................. 135
LIST OF FIGURES

Figure 1 - World of Warcraft Default UI ................................................................. 7
Figure 2 - World of Warcraft UI with elements reformatted via addons ............ 8
Figure 3 - World of Warcraft™ logo .................................................................... 14
Figure 4 - UI during a raid encounter.................................................................. 82
Figure 5 - Participants’ Self-Identified Disability (n=410) .................................... 96
Figure 6 - Age distribution of non-disabled players (n=196) ............................... 97
Figure 7 - Age distribution of players with a disability (n=408) ............................ 97
Figure 8 - Gender of Respondents with Disabilities (n=411) .............................. 98
Figure 9 - Years Played, Players with a Disability (n=411) ................................. 99
LIST OF TABLES

Table 1 - Alliance and Horde races ................................................................. 42
Table 2 - UDL Principles and subgroups ......................................................... 81
Table 3 - Frequency of respondents who identify as disabled ....................... 95
Table 4 - Frequency of server type ................................................................. 101
Table 5 - Frequency of faction choice ............................................................ 101
Table 6 - Frequency of race choice ............................................................... 102
Table 7 - Addon usage by disability category ............................................... 103
Table 8 - Importance of addons by disability category ................................. 104
Table 9 - Addons ranked by no. of UDL principles identified in their usage ...... 106
Table 10 - Importance of addon usage to players with a disability ............... 112
Table 11 - Role-playing inventory items ......................................................... 114
Table 12 - Customization inventory items ..................................................... 115
Table 13 - Escapism inventory items .............................................................. 116
Table 14 - Discovery inventory item responses .............................................. 118
Table 15 - Principal Component Analysis of Inventory Responses ................ 121
Table 16 - Full matrix of UDL principles identified in the addons ................. 169
Table 17 - Faction, race, and class options ................................................... 177
INTRODUCTION

“Who am I?”

What seems like a simple question has become complicated by technology and the way we integrate that technology into our lives. Computers have evolved from room-sized calculators to multi-purposed devices that can fit in the palm of your hand. The Internet is now a major force in American commerce and is rapidly becoming an integral part of our everyday lives. As the presence of both of these technologies has grown, so too has their influence over how we relate to others and even how we see ourselves. However this work will not concentrate on the discussion of identity in the same ways as theorists like Turkle, though they will influence the discussion. Instead I’m going to look at the interface mechanics required to perform identity within a virtual space.

When combined with the Internet, computers allow games to take on an entirely new dimension. Players can now compete and play with others from next door, across the country or even across the world. As consumer access to both high-bandwidth connections and more powerful computers increase, so too do the opportunities for more intense and interactive game play, especially in those games that exist within virtual worlds. We have seen the computer game market’s offerings grow to products that count millions of players across continents. Gartner Research predicts the gaming industry to be a $111 billion dollar business by 2015¹. For comparison, Statista.com

¹ http://www.gartner.com/resId=2606315
predicts annual, global movie ticket sales to only reach $94.3 billion in 2015\(^2\). The revenue potential and increasing business competition in games as a category is driving intense creative development as new gaming systems and titles come to market. As a result, games and our interactions with them have become more involved and present us with new opportunities for identity creation and maintenance.

This manner of identity creation and maintenance is a multithreaded process involving the technology used to create and interact with the virtual world; the narrative of and within the virtual world; and in the manner in which users / players come to, interact with, and relate to the virtual world and its inhabitants. It is especially important to note that none of these drivers are static. Each changes with the evolution of the computer technology upon which the environment is built, whether it is faster processors creating richer worlds or mobile technologies allowing for interaction in non-traditional ways. As virtual worlds are increasingly used for non-gaming purposes such as training or all levels of education, it is important that we continuously examine these environments to ensure that novel implementations of virtual worlds that may be culturally (or otherwise) useful can reasonably be achieved.

At the 2013 Educause annual conference in Anaheim, CA, one of the keynote speakers was Jane McGonigal. Educause is an international association devoted to promoting the use of information technology to improve education and the outcomes of students. McGonigal is a noted games researcher (Johnson, 2010; McGonigal, 2011, [http://www.statista.com/statistics/259985/global-filmed-entertainment-revenue/](http://www.statista.com/statistics/259985/global-filmed-entertainment-revenue/))
2012) and lecturer and is invited to speak at events around the globe. I attended and sat in the third row from the stage, close enough to have a good view without needing to look to the large video monitors to either side of the stage.

I was excited, as was the crowd. McGonigal is very interested in the intersection of games and education and Educause is the largest educational technology conference in the country. Most in the room knew her work or had at least heard of her, and we were not disappointed. She was engaging and dynamic, and her thoughts on games and the potential for education resonated with many in the crowd.

As part of her discussion she had us play a game, the thousands of us in this cavernous hall of the Anaheim Convention Center who were unaware that the talk would be interactive. It was to be an event, the largest unbroken chain of people playing a “thumb war” ever! Everyone clasped hands with their neighbor and began to spar away, thumbs flailing, playing with two other people at the same time.

Everyone except me.

I am an amputee. I do not have a right hand. I could only play with one person, the person on my left where I have a whole hand, and the person on my right could only play with the person on their right. I broke the chain. I and the player to my right didn’t point out the flaw in the game design, though. We ignored it and tried to play as best we could. And no one was the wiser.
I do not share this experience as a negative reflection on McGonigal or her work. Rather, I share it to remind the reader than when we speak about games, and especially video games and virtual world games, we usually do so from the privileged point of view of an able-bodied gamer. I also share it to remind you that many of the marginalized gamers do not speak up to bring attention to their challenges, though newer groups such as The Ablegamers Foundation are beginning to bring voice to these concerns. Most games are designed from this privileged point of view because the game designer is an able-bodied person. Indeed console games, with their specialized controllers requiring 10 fingers to manage, are mostly beyond players like me. The lack of attention to players with disabilities has even been lampooned by cartoonists and commentators\(^3\). The experience of the player with a disability is rarely openly considered or discussed outside of those remedial games designed for the cognitively or emotionally impacted.

However, as I will show with this work, there are video game players with a wide assortment of disabilities who recognize themselves as gamers and experience games in a way comparable to the able-bodied. They do so through a computer video game that, through its user interface, has enabled engagement beyond the obvious gamer and with no disadvantage to them. It is without question economically successful and culturally impactful, and it was made accessible accidentally through the actions of the user community so well that the blind play, a counterintuitive result for a visually-based

system. Their identity within this virtual game world is performed in the same manner as an able-bodied player.

In order to create or manage an identity within a virtual world, one must first interact with that world. In this work I will explore player configurability options of the user interface for games within virtual environments and the impact that configurability has on the involvement and identity of players with disabilities. I suggest that by granting this configurability to the player, some virtual game world creators have empowered these players and have enabled user interfaces to meet the particular needs of all individuals, not just classes of users. I will argue that this approach has allowed these players to better assume the identity of the “player” in this environment, comparable to and without detracting from the experience of other user-players.

Specifically, I will explore the use of “addons” for the user interface (UI) by players with disabilities as well as their reported enjoyment of the game as compared to other players. Addons are user-created software additions to the World of Warcraft client that allow the player to manipulate the game UI in some specific way not otherwise possible through the game client. The particular implementations of UI technology within World of Warcraft® present an opportunity to explore this element of user relationships to the environment. The UI of World of Warcraft is so malleable and

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4 Though “add-ons” would be grammatically correct, the World of Warcraft community uses the term without a hyphen or with both the “A” and “O” capitalized (AddOns). I will use “addons” in this work.
extensible by the user that a wider range of relationships is enabled with the environment and other players within the game.

For example, note the difference between Figure 1 and Figure 2. Figure 1 is an example of the default UI. Figure 2 is an interface modified with addons. Note that in Figure 1, the default user interface has information elements distributed all across the screen. There are also non-informational, artistic flairs, such as the stone griffons to either side of the bottom-center abilities bars, which add flavor to the interface but serve no functional purpose. Contrast this with Figure 2, where the user interface has been considerably simplified by removing the publisher’s artistic flairs and resizing and moving other elements either into a more focused field of view or, for the non-essential items, to the periphery where they will be less distracting. This change was accomplished through the use of addons.
Figure 1 - World of Warcraft Default U
Figure 2 - World of Warcraft UI with elements reformatted via addons
The options enabled by this approach differ from those specifically programmed by the creators and therefore offer a greater than originally envisioned degree of identity expression and management within the system. This suggests that by studying how *World of Warcraft* grants a user greater and more flexible options in approaching the environment, we can learn to create more social and meaningful interfaces in future virtual world environments.

I pose three questions that I will investigate with this research:

1) How do players with disabilities use interface addons in *World of Warcraft* to manage their game experience?
2) Do addons address specific disabilities of players?
3) Do players with disabilities who manage their experience with addons have a “deeper” identity immersion experience with the game than players with disabilities who do not?

I’ll test my questions by detailing the configurability of the interface, examining the reported enjoyment and the play styles of a selected group of players with different disabilities, and analyzing the user-generated UI content creation within *World of Warcraft*.

The study results consist of two parts:

Part 1 – Profiling Disabled Players of *Warcraft*

Part 2 – Exploring Addon Usage and Impact

While the game’s narrative and play factors have changed significantly since its inception, so too have the tools the company has made available to users in order to
create addons. The literature review will include a technical overview of World of Warcraft primarily concentrating on the user interface but also discussing other aspects related to game play and some in-game narrative context. This will include a discussion of the mechanics of the game, necessary to understand how and why addons may be used during play by players regardless of disability status, and an overview of the company’s policies and actions in regard to addon creators.

Part 1 will be a discussion of the playing styles and demographics of the respondents to this research. The assessment was conducted online from March through May of 2014. The survey instrument was made available through several websites related to the World of Warcraft, disabled video game players, or a combination of both audiences. The survey instrument was aimed at World of Warcraft players who self-identified as having a disability and collected basic demographic information about them as well as an inventory of their experience with the game. The instrument asked each player to identify his or her type or types of disability which will be used to examine the way different subgroups may interact with the game.

Part 2 of the study involves an assessment of abled and disabled World of Warcraft players and their use (or not) of addons in the game. Included in the instrument are play-immersion inventory questions aimed at better understanding players’ relationship with the game and whether addon use impacts that relationship. The inventory is based on the Daedalus Project (Yee, 2006a, 2006b), a longitudinal research study conducted on World of Warcraft players and their experience with the
game. Using the inventory created by this previous work gives us a broader base of users with which to compare disabled users’ experiences. The survey also sought to gather information on disabled players’ use of addons within the game. This data, combined with those who identified their types of disability, will be mined for pointers to specific addons that meet specific user needs related to their disabilities.

This second part of the research also includes a cataloging and analysis of the addons available for World of Warcraft. The addons will be analyzed using the Principles of Universal Design for Learning (UDL). The Principles are well established in education and cover a wide range of potential disability challenges for students and remedies or accommodations for those challenges. They also offer a model for discussing how individuals should be able to access digital materials in general. These Principles are used by instructional designers and educators when creating online learning materials to ensure that students with a wide variety of disabilities can readily access and benefit from the materials. By using the Principles I can connect the needs of World of Warcraft players with disabilities with well-established practices of accessibility in educational digital content.

There are currently many different online forums regarding addons for World of Warcraft. Some of these are for-profit enterprises (including Blizzard Entertainment itself), some are libraries of addons for many different games, and some are user-generated and maintained forums for individual addons or communities of “modders.” Many of these sites are also the source for where a user would go to download the
addons themselves. In order to keep the scope of the analysis reasonable, this study will focus on one of the most popular addon sites for American users, Curse.com.

In all, the result of the analysis shall be a better understanding of the most common interface elements modified by players and which of the three Principles of UDL each addon addresses. While the Principles of UDL offer guidelines for understanding the role and usefulness of addons, it should be understood that the majority of addons were created without the creator having a formal knowledge of said principles. It is therefore informative how the user community reacted organically to the needs addressed in UDL and how this collective behavior might be harnessed for future development projects.
LITERATURE REVIEW

Games, and particularly computer video games, have long been the subject of study. Sometimes the focus of study is on the game design. Sometimes it is the player experience, or the political ideology enacted within the rules of the game. Cultural representation is sometimes a concern for authors and, in the context of schools and learning, so is the ability of games to enhance (or detract!) from the educational experience.

McLuhan considers every medium to be the accumulation and assimilation of all before it. This “means that the ‘content’ of any medium is always another medium” (1965, p. 8). Video games, then, must be the accumulation of any medium that came before them, including video (film, television, and photography), radio, the phonograph, speech, writing, etc. This suggests the video game as a medium embodies all of the positive and negative effects of those that came before it, too. McLuhan calls media the extension of man, or putting it another way, a prosthetic of the mind. Each medium enables our species to extend our reach beyond our own heads to tell stories, to teach, to create and transmit culture. “Like our vernacular tongues, all games are media of interpersonal communication, and they could have neither existence nor meaning except as extensions of our immediate inner lives” (237-238). Not all games are designed to be played the same way, though, and not all players can approach games on an equal footing. It is this group of players, the players with disabilities, many of
whom are more familiar with the idea of contemporary physical prosthetics than others in the population, which is often overlooked in the study of games.

Figure 3 - World of Warcraft™ logo

In order to understand the situation of players with disabilities within a game and why some might want to change their method of interaction with the game environment it is necessary to first understand how the game is played. The World of Warcraft (or simply ‘WoW’ to the player base) was chosen for analysis because of its sustained worldwide user base in the millions after ten years of activity. The game is a subscription-based massively multiplayer online role-playing game. Massively multiplayer online role-playing games, MMORPGs or MMOs for short, are a category of games in which large numbers of people play together either cooperatively or competitively. “What constitutes ‘massively’ has never been standardized… Perhaps the best way to understand ‘massively’ is that it differentiated the genre from other multiplayer online games” (Yee 2014, 15-16).
World of Warcraft is not the first MMORPG, but it is arguably the most successful to date. As of June 2006, two years after its launch, World of Warcraft commanded nearly 53% of the MMORPG market. No MMORPG title since has commanded that large of a market share. Its success has been international, multigenerational and includes a significant number of female players in a genre dominated by males. Most significantly, World of Warcraft players currently number nearly 10,000,000, which is greater than the number of all players of all MMORPGs combined before it came to market.

Arguably, then, World of Warcraft has had a significant influence on the direction of the development of MMORPGs as a business category and a genre and persistent virtual environments generally. For instance for the past ten years, since its debut, newly-released games have been compared to World of Warcraft, either by their producers or advocates. Many of those have been touted as “WoW killers,” meaning they are believed to be the game(s) that will displace World of Warcraft as a fan and sales favorite. As early as 2005, Rising Force Online (or RF Online) was being heralded as a WoW killer, as was Dungeons and Dragons Online, a game based on the paper-based table-top game many consider to be the prototype for all MMORPG video games. A 2012 article on Gamebreaker.tv listed these games and several more

5 www.mmogchart.com
7 http://rfonline.gamescampus.com/guide/introduction/
8 http://www.ddo.com/en
that have failed to live up to the “killer” reputation their publishers and/or fans gave them. So, while *World of Warcraft* has been on the market for many years and its popularity is not as strong as its peak, it maintains its relevance and influence on the gaming industry amid fierce competition.

Since *Understanding Media*, we have begun to develop more sophisticated ways of talking about and understanding games. Zimmerman & Salen (2004) note that, “it is not possible to fully anticipate play in advance. It is never possible to completely predict the experience of a game” (Kindle Locations 416-417). They make this statement as part of their reasoning for early and frequent iterative design in the game-making process. It is important for this work because it is a reminder that when game designers add the element of user-generated content what predictability was possible during design becomes even smaller as the players iterate their own experience with the game through the creation of their own content.

Zimmerman and Salen offer a three-part framework of schemas for understanding games: rules, play, and culture. The user interface of a game fits within all three of these primary schemas for understanding games. In discussing the rules of games, we talk about the system involved, the rules and parts and pieces that make up the cultural object we call “the game.” In video games, this includes the rules of the game, the objectives and how to achieve them, but in virtual world games it also must encompass the user interface, the human-computer connection rules that allow interactivity with the game space. Cheating or hacking the game system aside, one
cannot play the game except through the interface and it is through the options available to us in the interface we come to understand the rules of the game. I cannot make my avatar run, or sit, or perform any other action the “rules” allow in a virtual world except through the interface. Since the game cannot be played except through the rules of the interface, identity performance also cannot take place except within these rules.

In a virtual world, the rules of the environment are often modeled to be familiar to the player in order to help facilitate interaction. For instance, many virtual worlds embody rules systems that move objects on the screen in relation to each other within what we would consider “normal” physics, where virtual objects “fall” and “collide” and move in ways we would consider predicable if they were actually physical objects. However these rules are for the convenience of the player only – there is (generally) no technical reason the rules of physics cannot be virtually broken and in virtual world games they often are. Players can fly, virtual magicians can transform objects into different things, etc. Each of these acts is performed through the user interface and if an option isn’t available through the interface then it (typically) isn’t an action the player can perform. In this work I focus on a particular category of World of Warcraft users, those with physical limitations for whom the rules of the standard interface may not provide adequate opportunity to interact with the game or other players (i.e. visual impairment, aural impairment, or other types of physical challenges that influence how these users come to the computer). For instance, a user with a mobility-limiting condition may have trouble using a keyboard and mouse, severely limiting their interactions within a virtual...
world, while someone with a visual disability such as blindness may not be able to interact meaningfully with the virtual environment at all.

The interface also relays information about the world to the player, again within the rules of the game. If my virtual warrior attacks a virtual monster, for instance, the interface will usually tell me not only how I can attack but the results of that attack. How much life do I have left? How much does the monster? When I use a sword how much damage do I do compared to when I use a mace? The rules are performed for the player within the interface on-screen either through textual representation (85% health; 600 hit points left) or through graphical representations (a bar graph, for instance). Generally the method of this representational performance is chosen by the game designer. The interface and the elements that comprise it as a graphical representation of the game is usually consistent with the artistic direction and aesthetic of the entire game system. Those designer choices can constrain the experience of the player in purposeful or unexpected ways. A game designer can chose difficult-to-understand elements for the user interface to make the game harder, or they can make elements smaller or larger to aid or hinder comprehension.

The interface rules for World of Warcraft allow users access to the raw data used by the default interface in external addons they can create for the game. Addons are user-created software additions to the World of Warcraft client that allow the player to manipulate the game UI in some specific way not otherwise possible through the game client. One can use these addons to recreate the entire user interface but not the
representations within the game world. So for example I can change the way information is presented to me (a bar graph for avatar health instead of a textual representation) but not how other objects in the world appear (such as changing what a monster looks like). These addons also only change my user interface, not the interface for other players. This would appear to allow players the flexibility and freedom of deeper access to the rules of the game so as to play it on their own terms. I argue in this work that *World of Warcraft* players with disabilities use addons in just this way, to gain access to the virtual game world in ways they might not otherwise have.

However Galloway (2006) would remind us that we are still just playing the algorithm of the game, that flexibility and freedoms are illusions because games work within informatic controls. “Flexibility is one of the core political principles of informatics control, described both by Deleuze in his theorization of ‘control society’ and by computer scientists like Crocker… It is to the control society what discipline was to a previous one” (100). Here we mean that flexible systems, in this case the *World of Warcraft* user interface, incorporate more possibilities for behavior within them and therefore give the creators of the system more control over the system of play. By this argument creating flexibility for player interaction through the addon system allows Blizzard Entertainment to keep people within the game system, discouraging (intentionally or nor) alternative methods of interaction with the game world and therefore protecting the integrity of the virtual environment. “You have so many choices already,” the thought could go, “why hack our system?”
For the regular player with a disability, the frustration with the game interface does not outweigh their attraction to the game. While summarizing Convergence Culture, Jenkins (2006) makes a simple observation that helps to explain why players, and particularly players with a disability, would work through their frustrations to rewrite more useful interfaces for the game: they’re simply fans of the game:

As a utopian, I want to identify possibilities within our culture that might lead toward a better, more just society. My experiences as a fan have changed how I think about media politic, helping me to look for and promote unrealized potentials rather than reject out of hand anything that doesn’t rise to my standards. Fandom, after all, is born of a balance between fascination and frustration: if media content didn’t fascinate us, there would be no desire to engage with it; but if it didn’t frustrate us on some level, there would be no drive to rewrite or remake it. (Jenkins, 247)

Jenkins also reminds us that media literacy shouldn’t be defined by the ability to consume media but rather by the ability to also be able to write it, or to express oneself through the medium (170-171). Unlike Galloway’s more dystopian view that “flexibility” is just an illusion used as a means of control, then, Jenkins gives us a more positive outlook on managing the user interface in that by “rewriting” the interface players become active and expressive participants in the communication around and within the game. It returns agency to the player and allows for a remaking of meaning for the individual regardless of the system of rules. “This is my game,” the player might say,
“because I have had a hand in creating it, game designers be damned. I will play my way.”

Play is the second schema Zimmerman and Salen use in their thinking about games. “Rather than being focused on the formal qualities of the game object itself, PLAY schemas are experiential schemas, directly focused on the actual experience of the game players” (Kindle Locations 2699-2700). Play schemas cover the space between the game and the player and help to explain how the rules can impact the experience of the player. Their conceptual definition of play as an element of a game is the most relevant for this work. Play isn’t possible without access to the game, therefore access helps to define who can and cannot play World of Warcraft.

Despite the potential challenges there is anecdotal evidence of very successful players with disabilities within virtual world games and World of Warcraft in particular. The website Wow Insider has featured a number of World of Warcraft players with disabilities over the years10. Wow Insider features have covered “Shorty,” the player behind the website Ability Powered Gaming11, and Hexu and Davidian, a completely-blind player and his “guide dog guildie” assisting him through Azeroth and its raids12. It also recently featured Kephas13, a player with very limited vision who has put together a

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10 http://wow.joystiq.com/tag/disabled/
13 http://wow.joystiq.com/2014/03/02/kephas-demonstrates-how-to-play-wow-blind/
YouTube video\textsuperscript{14} that explains how he uses add-ons to reconfigure his UI to make it more useful to him.

Addons allow differentiated access to the core mechanics of the game world UI and therefore have a direct and meaningful impact on play within the world. Addons allow the player to manipulate the game UI in some specific ways not otherwise possible through the game client. Textures and colors of UI elements can be substituted for those easier to see; font sizes can be adjusted larger or smaller; even the built-in UI elements that come with the game can be rearranged on the screen. None of these changes are possible without the use of addons shared by other players or created by the player themselves. There is a large and well-established addon developer community and a deep pool of available addons built up over \textit{World of Warcraft}'s nearly decade-long run. They can be downloaded from sites for specific addons, like CT Mod (ctmod.net), or from sites that host lots of different addons, like Curse.com or WowInterface.com.

Despite the potential for increased access there is also the possibility of abuse that can take away from the play experience of other users. At various points throughout the game's history some addons and other player-generated material have made it possible to completely automate play through what are called "bots". Bots (short for robots) are scripts or other such software that automate some action of the computer of the player. While this may sound like a boon for the player, especially a disabled one, it

\textsuperscript{14} http://youtu.be/101ZEJF5z_8?list=UU0_EEH4gmK42pGSPvPSTN4g
also negatively impacted the virtual economy of the game, the experience of other players, and was contrary to the goals of the designers. The company has fought a few legal battles against this type of use of technology within their environment.

In one such example, MDY Industries, LLC v. Blizzard Entertainment (2008/2010/2011), Michael Donnelly created a bot called “Glider” that:

…moves the mouse around and pushes keys on the keyboard. You tell it about your character, where you want to kill things, and when you want to kill. Then it kills for you, automatically. You can do something else, like eat dinner or go to a movie, and when you return, you’ll have a lot more experience and loot. (2666)

Using Glider, then, players could start the bot, walk away, and get “rich” in the virtual economy without actually playing the game themselves. Donnelly asserted this as a positive during trial, stating among other things that Glider “facilitated disabled players’ access to WoW by auto-playing the game for them” (p2666). The appeals court agreed that the evidence presented that “Glider allows players with limited motor skills to continue to play WoW,” (p. 2705), among other factors, were a genuine issue of material fact significant enough to remand some parts of the case back to the district court.

At issue for Blizzard here were several items, including copyright protection (on which Blizzard lost, and was the most significant and widely discussed part of the case at the time). However another contention Blizzard made to the court was a responsibility to provide a particular experience to its customers within the rules of the game. That
specifically included the ability to play without competing for resources against the bots other players used. It was this overarching responsibility to all players that, for Blizzard, made full automation of the user client unacceptable. Blizzard’s argument was that it was a caretaker of the experience, and their behavior towards addons since then has been in line with that stance.

Zimmerman and Salen’s third schema, culture, reminds us that games are played within a greater social context and embody a rhetoric. “Applied to games, the organizing principle of cultural rhetoric reveals how games represent broad patterns of ideological value. The design of a game, in other words, is a representation of ideas and values of a particular time and place (Kindle Locations 13006-13008). These values may not be universal, however, and not everyone’s understanding of the game designer’s situational point of view will be the same. This tension between a game’s intent and the public’s perception of it can greatly influence its success and application across other disciplines, especially education.

MMOs such as World of Warcraft are the computerized descendants of paper-based role-playing games such as Dungeons and Dragons. MMORPGs allow players to create an alternate identity, a character within a virtual world populated by other real-life players’ characters and characters programmed by the game designers to behave in certain ways under particular circumstances. As a category of games, role-playing games have historically come under intense scrutiny and suffered from negative popular
impressions, both for the fantastical narrative settings and tendency towards violent themes.

Some of the negativity around role-playing games has been grounded, some has not. Lancaster (1994) surveyed reports of negative social characteristics of role playing gamers, specifically players of the game *Dungeons and Dragons*. Although his survey found fears and concerns that role playing games cause their players to commit more crimes and exhibit other anti-social behavior, he concludes that the evidence for these concerns is at best fallacious. “To believe that some role-playing games promote Satanism is comparable to believing that one ‘worships’ Satan by reading Dante’s *Inferno* or Milton’s *Paradise Lost*” (77-78). Eastin (2006) finds that games with a violent theme may affect female players more negatively than male players, increasing their aggressiveness, though this aggression is dependent on the character the player assumes during the game. Sherry’s (2001) meta-analysis of research into violence and video games reaches the conclusion that there is a small effect on video games and aggressive behavior, though this effect is likely smaller than the effect of violent television programming.

Virtual worlds are not immune to these tendencies of fantasy and violence. MMOs allow players to create an alternate identity, a character within a virtual world populated by other real-life players’ characters and characters programmed by the game designers. Characters controlled by real-life players are often called avatars or “toons.” Players can have more than one character per server on which they play, up to
a maximum of 11 per server or 50 in total. However most players have a primary avatar, or “main,” that they play on most of the time. Other, less frequently played characters of the player are called “alts,” short for alternates. Each character has a “class” that determines the abilities of that avatar. Each class has different capabilities and play styles that require different skills from the player in order to be effective within the world. Some classes are “healers”, capable of tending to the wounds of others, but the majority are damage dealers of some type – warriors or fire-ball throwing mages. Characters or creatures controlled by the computer are called non-player characters, NPCs, or “mobs.” Non-interactive “monsters” or villains the players will fight are almost always referred to as “mobs.” This can be confusing for those unfamiliar with the game world semiotics as the word “mob” can refer to a single NPC, contrary to its regular English meaning.

Blizzard Entertainment’s fantasy world of Azeroth is home to *World of Warcraft* and many other software titles from the company. Azeroth is home to a number of races, mostly fantastic like elves and trolls but also more mundane humans, each with slightly different abilities that impact play in the game environment. The game world currently consists of four “continents,” a number of islands, and a small “distant planet” connected to Azeroth where players can meet one another, explore friendly and hostile territories, and develop their skills as players. Over time, as new game content is introduced, the landscape changes revealing new territories, islands and NPCs for players to meet, discover and explore.
When discussing the mix of education and games, the introduction of new technologies and their accompanying pedagogies into the curricula has traditionally met with criticism. Postman (1986) is noted for his warnings of the use of television in the curriculum. He was concerned that television was degenerating the process of education, creating a hollow “edutainment” pedagogy that failed to meet the needs of students. Kim, Lee, & Thomas (2012) found ample evidence of an interest from researchers in the application of virtual worlds, including virtual world games, in the curriculum but “that research has been conducted as a way for suggesting ideas of various environments in a new educational setting, not as a way of proving existing hypotheses” (15). Their survey of the literature suggests there is ample opportunity to better understand the learning impact of virtual world games, and they specifically reference research that questions the accessibility of environments chosen for use in educational contexts (15), though it is unclear if they mean general accessibility or specifically access by students with particular disabilities.

Leaning more in favor of video games in education, Gee (2003) argues that computer games provide educators an opportunity to enhance our understanding of learners and the learning process. He argues that many computer games are crafted to teach players how to play the game and that successful games do so well enough to ensure their popularity. By studying successful computer games and how gamers learn to play them or are taught by the game, we have an opportunity to refine our delivery of educational materials and further develop our understanding of the student. We will return to Gee later in the review.
A broad survey of the literature finds games, and role-play-type games, widely used in several educational settings. For instance, games and computer simulations are intrinsic to many medical school curricula. Pacala, Boult, & Hepburn (2006) describe and evaluate the University of Minnesota Medical School’s use of the Aging Game as part of the curriculum in a required clinical clerkship. The Aging Game is a role-playing game where clinical students take the part of aging clients. Disabilities associated with age are simulated with the use of arm slings and earplugs and the experience of the participants is reviewed at the end with a debriefing to discuss the impressions of aging clients clinical works receive from being placed in similar situations. Pacala finds that the role-playing game meets the School’s desired goals of “raising awareness of the field of geriatrics through the use of arresting educational techniques” and “enhancing student understanding and contemplation of the aging experience and geriatric care” (147). In this case, as the students assume the identity of a potential patient through the role-playing of the game, they become more effective learners.

Lane, Slavin, & Ziv (2001) further examine the use of role-playing and computer simulation in medical education at the undergraduate, postgraduate and continuing education levels. Although the study does not cover recent computer advances it does illustrate a historical timeline for inclusion of role-playing and simulation methodologies in medical curricula. Lane et al. argue that the reasonable inclusion of role-play and simulation into the curricula can help to manage educational costs and increase continuing educational opportunities, but that “the value of instruction and learning at the bedside is still critically important” (309). Virtual world role-playing environments,
while promising, have not yet completely replaced more traditional teaching modalities in medical education.

The teaching of math is a common goal for MMOs though the particular needs of students with non-cognitive disabilities are not frequently the focus of these efforts. Traditional, paper-based role-playing games incorporated the idea of mathematical chance as central to their methodology. Paper-based role-playing games like Dungeons & Dragons used dice as a means of generating random numbers to determine the probabilities of a game event, indicating an element of chance in the games. *World of Warcraft* and other MMOs still use this mathematical underpinning as part of their logic, presenting the possibility of using these types of games in math education. Discussions of pedagogical tools in mathematics education reveal a number of games of chance used in the classroom. Norton (2001) describes games of chance using dice that can facilitate students’ understanding of probability and “enhance their probability intuition” (79). Braude & Corey (2006) developed a dice game to improve students’ “understanding of likelihood and probability” (40) through experience with the concepts. Meel (2000) used a dice game called Sumgo to illustrate how games could be used in the classroom to draw “connections in mathematics, particularly concepts related to probability, while practicing elementary mathematical skills” (239).

More recently McGraw-Hill has tried to bridge the gap between traditional games for math instruction with the potential they see in virtual. The website for McGraw-Hill’s
learning virtual world “Planet Turtle” exclaims “Serious Math. Intensely Fun!15” While simplistic by the standards of *World of Warcraft*, Planet Turtle’s virtual world has students create avatars (turtles, of course) that they then use to explore the world and discover a number of learning games distributed throughout the environment. McGraw-Hill claims that “students stay involved with learning through a contemporary gaming experience they enjoy” since the system “uses the latest massively-multiplayer technology to create a rich learning environment.”16 However nowhere on the site are students with disabilities of any type discussed, nor are we made aware of how the game interface design includes the needs of these students.

Mathematics education and research has also included other types of games that do address students with disabilities. Markey, Power, & Booker (2003) discuss the efficacy of using games to teach deaf and hearing impaired students about fractions. While studying how parent-child interactions influence the cognitive development of kindergarten students, Bjorklund, Hubertz, & Reubens (2004) used a modified version of the board game Chutes and Ladders as part of their methodology. Their research had parents working with their children to learn to count the sum of thrown dice in order to calculate how to move their game pieces. Ascher (2001) discusses the possibilities and potentialities of using a Mongolian board game in the mathematics classroom. The game is played by placing a series of markers on a board, where lines drawn on the board intersect, and then moving those markers to available spaces once all have been

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15 http://www.mhecdi.com/pt_about.html  
placed. While the game offers an instructor the opportunity to discuss geometry and polygons, there is also the opportunity to discuss the origin of the game, introducing history and a multicultural element to the classroom. However, these types of studies consider the mechanics of the game in the application of pedagogy and do not consider the identity of the student, as a gamer or, in the case of Markey et al., as a student with a disability.

Van Eck (2006) focused on the combined impact of pedagogical agents and games on the anxiety of 7th and 8th grade students towards math. He created a computer game that asked students to play the role of a niece or nephew assisting their aunt and uncle in painting a room in a house. The game incorporated competition and contextual pedagogical agents that students could turn to for content assistance in playing or winning the game. Van Eck found that seeking assistance in the game seems to mitigate math anxiety when that assistance is presented in a social context. That is, those students who did not get a virtual “aunt and uncle” when they sought assistance in the game but instead had access to a virtual book of math formulas were slightly more anxious than those who had the virtual relatives for help. Additionally, while research suggests that competition may increase the anxiety of learners, the students who were exposed to both competition and the social pedagogical agents scored the lowest on Van Eck’s anxiety instrument.

Despite all this research there has been a dearth of material regarding players with disabilities in some of these environments. Virtual worlds, and virtual world games
in particular, are ripe for analysis targeted at understanding how disabled users approach these systems. Stendal’s multi-disciplinary literature review highlighted the research gaps in understanding the relationships between virtual worlds and those users who are disabled (Stendal, 2012). Among the gaps found were a lack of research regarding universal design standards and principles within virtual worlds and in understanding how people with different types of disabilities use and interact with virtual worlds. “An important factor when considering people with disability is the variety of challenges this group encounters, depending on the disability” (11). For instance, a user with a mobility-limiting disability may have trouble using a keyboard and mouse, which could severely limit their interactions within a virtual world, while someone with a visual disability such as blindness may not be able to interact at all without any help. Within the player community of the *World of Warcraft* there are blind players, a substantial disability to overcome given that the nature of video games is primarily video, suggesting that there are opportunities within this particular user interface for expanding the reach of other virtual worlds and game to those with disabilities.

Krueger and Stineman, in their paper on accessibility and virtual worlds, suggest four main areas that impact access for those with disabilities to virtual worlds: keyboard / mouse; print (text); hearing / speech; and cognitive (Krueger & Stineman, 2011). The purpose of their writing was to illustrate potential interoperability challenges between virtual worlds and assistive technology commonly employed by those with disabilities. They also call for better guidelines for designers and publishers regarding access to virtual environments for those with disabilities. This research will follow these same four
areas of disability, classified as visual, auditory, mobility or manual dexterity, and cognitive, and how players of the *World of Warcraft* who identify as having one or more of these conditions either adapt the user interface, use adaptive technologies to interact with the game, or both.

**User Interfaces and Virtual Environments**

The user interface (UI) is most often simply described as the means by which humans interact with a computer (Sherman & Craig, 2003, p. 283). This definition is broad enough to encompass both the hardware and software necessary to allow interaction with the virtual environment. Several studies (Krippendorff, 2004; Stoney & Wild, 1998; Sutcliffe & Kaur, 2000) suggest this flexibility is useful because as virtual environments become more complex it becomes increasingly necessary to keep as many elements of the user interface (both hardware and software elements as necessary) as simple as possible.

The term virtual reality (VR) is often used with or instead of other similar terms such as virtual environment or online environment. As such the definition of what defines these environments in the literature varies slightly though there are some common elements. Virtual reality has been described from a physical point of view in favoring the technology used to integrate the participant into the environment, such as when it is described as a medium composed of interactive computer simulations that sense the participant’s position and replace or augment the feedback to one or more senses, giving the feeling of being mentally immersed (or present) in the simulation
(virtual world) (Sherman & Craig). This differs slightly from definitions that favor the user interface as the central element. Such definitions describe a human-computer interface in which the computer creates a sensory-immersing environment that interactively responds to and is controlled by the behavior of the user\textsuperscript{17}. Yet a third system of descriptions focuses on the human element of the virtual environment system. Such definitions tend to focus on the sensory interactions of the technology and user and therefore pay special attention to the sensorial modalities of visual, auditory, tactile, smell and taste (Burdea & Coiffet, 1994, p. 3).

Presence can most simply be defined as the degree to which a user is immersed in a virtual world (Burdea & Coiffet, 250). This emphasis on the user’s mental state is often the core of definitions of presence. Such states can be differentiated between physical immersion and mental immersion with mental immersion probably being the goal of most media creators (Sherman & Craig, p. 9). Alternately, presence can be described as the state of the user when several of their senses are isolated from the real world and fed information (such as images and sound though tactile and olfactory input is possible with some systems) coming from a computer or other artificial device\textsuperscript{18}.

There is a great deal of confusion and interest in virtual environments, and games within virtual environments, and their associated technologies. Television and movies sometimes situate themselves in or around such systems. The popularity of video games such as \textit{World of Warcraft} and \textit{The Sims} has introduced a large number of

\textsuperscript{17} Encyclopedia of Virtual Environments, http://www.hitl.washington.edu/scivw/EVE/IV.Definitions.html

laypersons to these environments. In 2007 the popular television show South Park won a technical Oscar for its use of *World of Warcraft* video within an episode. More significantly, CNN used what they termed a “hologram” of a reporter during their coverage of the 2008 Presidential Election. This is significant because the technology used was not holographic yet the term was used anyway and introduced incorrectly as such to an audience of millions.

These misuses and misunderstandings of the nature of virtual environments can cause difficulty for developers and users. Schools and businesses in particular increasingly seek ways to offer their services to larger audiences while reducing costs. Sandbox environments such as Second Life, where anyone is free to create content and interact with the creations of others, serve as test beds for such offerings. Unless these developers and users approach the creation of such content with a clear understanding of the possibilities as well as the limits of the technology, then advancement of such environments will be hindered.

Additionally, Whalen et al. (2003) argue that since avatars (representations of people in virtual environments) are subject to human control, it is impractical for a person to directly control each joint in a complex avatar. The user must instead be allowed through the user interface to specify complex behaviors with simple instructions. It is incumbent on the hardware and the software to permit the user to select the correct movements in sequence to execute the instruction (537). If users must spend a large amount of cognitive resources to control the avatar in the
environment, then their experience with the environment will be less immersive. The perceptual wall will remain between them because of the distractions created by conscious control, lessening their experience.

One area of research and design seeking to naturalize the UI experience is in multi-modal designs. Oviatt et al. (2000, p. 265) argue that these interfaces are expected to support a wider range of diverse applications, be usable by a broader spectrum of the average population, and function more reliably under realistic and challenging usage conditions. These modes include pen and speech-based hardware interface devices as well as the software systems that support them. Advances are made through a combination of research and development of both the hardware and software elements of the UI. However consumers and marketers often focus on one or the other, creating demands on the elements that cannot be achieved without development of both.

The definition of presence is important to design because of the difficulties of determining the mental state of real-world users. The desired mental state (and accompanying sense of presence) varies depending on the particular purpose of the virtual environment (Anderson, Ashraf, Douther, & Jack, 2001; Fjeld, 2003; Regenbrecht, Schubert, & Friedmann, 1998; Suh & Chang, 2006; Tung & Deng, 2006). Regenbrecht et al. distinguish between presence and immersion in that they reserve immersion “to describe all hardware and software elements that are needed to present stimuli to the user’s senses” (234). This could be considered the physical-ness of the
experience and how comfortable it is for the user. For a player with a disability, a handheld controller designed for an able-bodied player may be uncomfortable or extremely difficult to physically manage, similar to Regenbrecht’s example of the heavy head or body-mounted gear necessary for some virtual reality environments, and distract the user from fully engaging in the virtual environment. They see presence, then, as a shared space created between the virtual environment and the user that emerges from a sense of “being there” for the user (235). Therefore any physical condition that serves as a distraction takes the user out of the experience. For our purposes, any discomfort experienced by a World of Warcraft player with a disability, whether that comfort is physical or cognitive, servers to distance them from the full game experience and in educational virtual worlds, the learning experience.

Tan (2007) argues that haptic devices can increase a user’s sense of presence in a virtual environment. Systems for haptic virtual environments strive to provide a realistic perceptual experience to enable a user to interact with virtual objects in a natural and intuitive manner (265). While haptic devices have improved considerably over the years, Tan argues that there are still significant advances yet to be achieved. Consumer electronics sometimes takes haptic input into account (the Nintendo Wii videogame system being a popular example) but most devices and systems instead concentrate on the graphical or aural elements of the experience. Kyung, Kwon, & Yang (2006) have even offered a design for a haptic mouse that incorporates many of the features of some of these hand-held portable interfaces. There have been some efforts by players to create specialized physical interfaces for World of Warcraft, including
haptic controllers and full-body monitoring systems, but they have not caught on with players with a disability nor with the greater player population.

The interplay of consumer terminology and practitioner terminology is mediated by a number of systems over which the practitioner often has little control. These systems include the manufacturers of consumer systems, advertisers and marketers, technology pundits and popular culture and mass media. However, a clear understanding and usage of terminology is essential for the practitioner since misunderstandings can present themselves even in the systems with which we commonly interact. This is exacerbated by the increasingly interdisciplinary nature of the development of virtual environments. Such misunderstandings could affect opportunities for funding, advancement and evaluation of systems in progress.

Here we’ve established the importance of the user interface to the experience of immersion in a virtual environment, including virtual environment games like World of Warcraft. It is necessary to be explicit in discussing the benefits to be gained by a flexible interface option in order to understand the impact such a flexible system can have on a player with a disability. Without the ability to interact with the environment comfortably, physically and emotionally, a player cannot enact or perform any type of identity within a virtual environment.
Manovich (2002) argues that new media are inherently modular in their design and composition. He offers five principles of new media: numerical representation, modularity, automation, variability, and transcoding. If we take Manovich's argument that “graphics, moving images, sounds, shapes, spaces and texts that have become computable” are new media (20) and that *World of Warcraft* consists of all of these elements, then we can examine *World of Warcraft* in terms of its modularity. At a basic level, the game itself is modular – landscapes and creatures are created by combining polygons and probability tables to represent hills, mountains, trees, limbs, fur – everything visual within the game world. Textures and shapes can all be reduced to their components, unidentifiable alone but combined to create images our brains can process and recognize.

The game mechanics can also be said to be modular. The skills of the characters can be reduced to components that, when combined, can create the impression of a warrior or a mage. Magical spells are learned by ranks of magnitude; a warrior’s skill with a sword develops from that of a novice to an expert. Each of those skills are measured and advanced numerically, based upon the player's ability to play their character and the interactions of that character with Azeroth. As an avatar gains experience the numerical value of each of the avatar’s skills are increased. Many abilities are only available once those skills reach a certain value, meaning a character must advance before having access to all possible skills available to her. Therefore new
players’ characters will have fewer or less advanced skills than those of more experienced players.

The game interface is intentionally modular as well. The computer screen is divided into sections where players can initiate skills or manipulate their character, communicate with other players or NPCs, see a virtual map of their surroundings, etc. But the design and programming of the game allows players to design their own interface elements (UI visuals or even auditory cues) or to modify elements already present. These modifications are called “addons” and are shared via the Internet, on fan websites or commercial sites devoted to players of the game. There are addons to track auctions on the game’s internal auction site; there are addons to change the size, shape and number of buttons on the screen; there are addons that deliver information in-game about mobs encountered so that the player can quickly devise a strategy for dealing with them, etc.

There are arguably several identity management tools found in the interface for *World of Warcraft*. By tool I mean some aspect of the game over which players have at least some control. I am less interested in this research in the specific types of identities created than I am in concentrating on one specific tool, addons to the user interface, that allow the identity of the player to be managed and expressed. The process of identity expression can be complicated by the (again modular) conditions of the game but these tools are the same across those conditions. By conditions of the game I
specifically mean several things: the type of server chosen for play, the player’s choice of faction, the player’s choice of race, professional class and choice of gender.

There are many factors a new player has to consider when starting to play World of Warcraft and Blizzard Entertainment has an entire section of the game’s website dedicated to bringing new players up to speed\(^\text{19}\). In order to understand how a player interacts with the world throughout their gameplay it is first important to understand the interaction options available to players, and these options are based on the choices they make when they first start to play the game.

Gender determines the way in which the avatar is drawn, how it moves, the sounds it makes, and so on. However, gender does not give an advantage or disadvantage within the rules of the game – skills, classes and attributes are gender-neutral. There are players who have chosen the gender of their avatar based on the way they want to be treated in the game, suggesting that for some players even though gender is neutral as to the abilities of the avatar, there are social and psychological dynamics involved in the choice. While avatar gender may impact relationships within the game, I argue against its definition as a tool for my purposes because it is an aspect of the avatar that, once chosen, cannot be changed without the intervention of Blizzard Entertainment itself.

There are two player factions among the races within Azeroth: the Alliance and the Horde. The two factions are hostile to each other in the narrative of the game and

\(^\text{19}\) \url{http://us.battle.net/wow/en/game/guide/}
this hostility has gameplay implications. The factions are important for three gameplay reasons: because players can only fully peacefully interact with races from their respective faction; each race has certain minor beneficial racial traits within the game mechanics that are not available to other races; and because each race is limited to the types of character classes (see Table 1) they can choose to become. An Alliance player cannot use the in-game chat to talk to a player from the Horde, for example, and the two factions cannot trade currency or items directly with each other. One also cannot attack a player from the same faction except in certain well-defined instances, such as during player-initiated duels, even on PVP servers (explained below).

Table 1 - Alliance and Horde races

<table>
<thead>
<tr>
<th>Alliance</th>
<th>Horde</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>Orc</td>
</tr>
<tr>
<td>Night Elf</td>
<td>Troll</td>
</tr>
<tr>
<td>Dwarf</td>
<td>Tauren</td>
</tr>
<tr>
<td>Gnome</td>
<td>Forsaken (Undead)</td>
</tr>
<tr>
<td>Draenei</td>
<td>Blood Elf</td>
</tr>
<tr>
<td>Worgen</td>
<td>Goblin</td>
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<tr>
<td>Pandaren</td>
<td>Pandaren</td>
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</tbody>
</table>

When creating a character, the player has a choice of 4 different types of servers from which to choose, each defining different conditions applied to character interactions on that server. Those are Player-versus-Environment (PvE), where avatars cannot be attacked by members of the opposite faction (explained above) unless under exceptional circumstances; Player-versus-Player (PvP), where avatars may be attacked by members of the opposite faction under almost all circumstances; Player-versus-Environment Role-Playing (PvE-RP, or just RP), similar to PvE except that all players
on that server have agreed to interact with one another within and in the manner
prescribed by the narrative; and Player-versus-Player: Role Playing (PvP-RP), a
combination of the two previously mentioned types.

While it could be said that the type of server and therefore the play styles
possible on it impacts one’s identity, I do not consider the server a tool of identity
creation – it is only the environment within which that process takes place. This element
of the environment does pose an ongoing challenge for the player throughout their
entire time playing the game, though. For a player with a disability, the choice of server
may require closely managing every action during game time.

The choice of race a player makes carries with it narrative, visual, game
mechanic and potentially self-representational and player self-cognitive differences. For
example the Alliance is made up of humans and (roughly) human-like races: Night
Elves, Dwarves, Gnomes and the less-human Worgen (werewolf-like creatures who are
a group of cursed humans) and Draenei. Draenei seem somewhat out of place in a
fantasy narrative and have been called the “blue goat people” by some players because
they have hooves for feet and are blue skinned.

The choice of class is significant because each class requires a significantly
different play style to master. There are three basic types of roles that players take on
when playing in a group: tank, damage (often referred to as DPS, which is short for
damage per second), and healer. Tanks are the protectors of the group. They can
withstand a lot of damage and, through specific game mechanics, demand the attention
of monsters so that the monsters attack them and not their companions. Healers are as they sound – they heal and otherwise provide support for the other members of the group. The DPS category is subdivided into two distinct type of fighters and play styles – melee and ranged DPS. For more discussion of the races and professional classes of World of Warcraft players see Appendix J.

The modular nature of the user interface of World of Warcraft, then, allows the user to accentuate their abilities with the game with targeted addons, enabling greater mastery of the game or at least giving the appearance of greater mastery and perhaps allowing the user to demand greater “respect” from the other users than their inherent abilities might grant. Each addon can affect the personal skill needed by a player to manipulate their avatar – automating some functions and requiring less direct input from the player, for example – and can therefore greatly enhance or influence the player’s relationship with the game and other players’ avatars. By that I mean using addons in this manner players can attain a level of proficiency or present themselves as more experienced or more skilled than they might otherwise be able to accomplish, influencing their standing in the community and defining their identity as created through their avatar. We can examine this process by looking at both the addons used by disabled players and their self-reported experience within the game world.

However, Manovich cautions against assuming that following pre-defined choices automatically grants an identity, just as Galloway has warned against the illusion of choice as freedom. “Paradoxically, by following an interactive path, one does not
construct a unique self but instead adopts already pre-established identities” (Manovich, 129). It is not customizing the interface that creates and performs identity, then, but the actions within the environment enabled by that interface. Our focus here should be on those things that allow the interface to become transparent to the user instead of dissecting the individual elements of the interface itself.

Turkle’s assertion that the computer functions as a perfect mirror for the individual presents us with problems and possibilities when deciphering the function and meaning of computer interfaces today (1997, p. 511). By “perfect mirror,” Turkle means that the computer (or in her more specific example, video games) reflect “perfectly” the abilities and knowledge of the user. The computer cannot do more or less than the user tells it to do within the boundaries of the program or game. There are set rules against which the same person can consistently measure their ability again and again, giving an accurate measure of their changing ability to manipulate that program or play that game.

Since computer programs and interfaces are new media (as Manovich defines them) they become more modular and therefore more customizable. By modular I mean users have the ability to modify the interface in some way, in the form of “mini-apps” that add functionality additional to the inherent functionality of the interface, or changing the appearance or behavior of particular parts of the interface itself. I suggest that addons and the ability to customize the interface re-emphasize the mirror metaphor. Turkle’s examination of video games looked at fixed machines that the user could not change.
There were fixed rules hardwired to the computer's memory. While some aspects could change according to the user's input (remembering high scores, for instance), the basic rules of the games did not change within the machine nor between machines - Pac Man was the same at the arcade down the street and in the arcade across the country. The only difference was that one machine had different initials on its high score screen than the other.

Today on our personal computers we can change the background of our desktop, set specific sounds to play when certain actions are taken, arrange our information in whatever way we choose – there are a myriad ways to add “personality” to one’s desktop. Yet those choices are again reflections of our abilities to manipulate the machine. While they give the appearance of variability, there are only a set number of possible combinations. The average non-programmer user can neither change the machine nor the interface any more than they have been allowed by the parameters of the interface itself. Like a game, they may try more complicated "strategies" for organization, presentation and personalization, but the limits are still inherent in the perfect mirror -- the machine cannot (yet) give us more than we ask of it.

However, technological changes since Turkle’s *Life on the Screen* have influenced how we interact with computers and virtual environments and also how we communicate with one another. Consider the “home page” as Turkle describes it in 1995. “One constructs a home page by composing or “pasting” on it words, images, and sounds, and by making connections between it and other sites on the Internet or the
Web. Like the agents in emergent AI, one's identity emerges from whom one knows, one's associations and connections.”

Landow (2006) gives us a framework within which we can view these associations and connections as a system of connected lexia. Therefore one’s “identity” as seen through the home page is a projected amalgamation of these lexia within the page. However in 1995 creating a web page was not an easy, mundane task. One had to know some HTML coding or have access to people who did and you had to have a “space” somewhere on the web where that page could live. These were sometimes provided by the internet service provider, sometimes for free and sometimes at a cost. If we continue this home page thread we can look at the evolution of social media websites and the permissions they grant users in managing the user experience beyond their two-dimensional text interface to the richer interface experience of virtual worlds.

In the years since Turkle, we have seen the development and increased availability of more sophisticated tools for web page development and easier access to space for the individual webpage. For a time, one of the most successful of these services was MySpace. MySpace allowed the individual to create an account on their servers where you could post photos, text, even embed music to play in the background when someone visits your page and it did so with a low threshold for the user's technical and coding ability. It did so by offering a template upon which you could simply add your own content, no additional coding and no user-provided web hosting required. For many, though, one of the goals of joining MySpace was to become friends with
others who shared similar interests or backgrounds. You could link the MySpace page of these friends to your own page and create a personal network of friends online. Sometimes these were people you knew in the “real world,” sometimes they were friends you only knew through the virtual environment. Regardless, one’s choice in photos, music and other lexia posted to your MySpace page was meant to project a particular identity to this circle of friends and for anyone else who may stumble upon your page.

For a time, MySpace was the pinnacle of what we now call the social media spaces. It was not the only social site but it was by far the largest. It allowed millions to express and connect. It did so by simplifying the coding process and offering free storage for your materials. One did not have to know how to code HTML in order to use MySpace but if you did you could further customize your space beyond the templates offered by the service. This was incredibly liberating for non-technical audiences. It gave them an entrance into the virtual society and for many was the first overt projection of their identity into the new communication space.

However, its strengths could also be seen as weaknesses. For all of its simplicity, MySpace became a complicated environment. Each person’s page could be wildly different from the next. One could still see the outline of the template, the columns and the boxes for particular content, but backgrounds, image sizes, music, text size and color – all of these could be customized by the individual. All of this customization created a cacophony that gave more of a “wild-west” feel to most of MySpace than that
of a sophisticated, serious environment. As such there were still many who dismissed it as a fad. We might also see this as the early emergence of a new type of literacy, the literacy of social media. Like early mass media theories that overestimated the power of the medium, it was assumed that the “message” of one’s identity would get out simply because of the power of MySpace. Little was understood about the nuance of message or the impact of “noise” (irrelevant information that interferes with the transmission of a message) in this new social environment. Others saw the potential of this new mode of communication and expression, however, and worked to cut through the noise, refine the environment and evolve the literacy. While many have come and gone, without a doubt the most successful of these next-generation environments is Facebook, a social media site where the sharing of the details of one’s daily life work to project a specific (though sometimes unintentional) identity.

This ability to modify the user experience of a social media website continues to evolve with World of Warcraft in that it gives its players access to modify, or “mod”, the user interface of the virtual world by way of XML and Lua. While there is a standard UI shipped with the game, those with more technical skills can take it upon themselves to modify or even completely change that interface. Like MySpace, the reasons may be cosmetic – a player dislikes the standard font or the colors for a particular UI element. However, unlike the social media space the changes made to the virtual world user interface can also have a more impact on the player’s performance and relationships with other players in the virtual world. For instance, by making gameplay information (avatar health, environmental factors, etc.) more clearly visible, the player can react
more quickly and successfully. In a game, and in particular a game where a player will often play with others in real time, “success” in a particular situation can be interpreted by others as skill or mastery of the game. This impression can have a direct effect on the behavior of others towards that player.

In addition to these conceptual evolutions of computer-mediated identity were technological developments that broadened the access of computers. Current mobile technologies like smartphones and tablets rival the desktop computers of Life on the Screen’s day in power and cost. More sophisticated wireless technologies in our homes and across the nation allow for access to the internet in places never before possible. This means that our interactions with our virtual identities now happen with a multitude of our non-virtual identities. We don’t just sit at the computer and post online; we can do so from work, at school, at church or at the mall – even from our motor vehicles. These changes are not unique to the western world either. According to Facebook, 82% of their monthly active users at the end of 2012 – over 800 million people out of one billion users – came outside of the U.S. and Canada. Nearly 700 million users accessed Facebook from a mobile device.

Another hardware advance is the increased sophistication of video processors that have allowed for the creation of more immersive, 3D virtual environments. Though companies like Linden Labs have built non-commercial virtual environments like Second Life, the majority of these new visual spaces are games. Games have evolved from Turkle’s MUDs to media-rich environments like Azeroth, the virtual world in World of
*Warcraft.* These games, like the social media sites, have evolved from relatively “free-wheeling” environments where players create most of the content (Fantasoft’s *Realmz* being an example from the 1990s) to a highly managed, well produced virtual environment within which a player may influence the environment but have a limited ability to significantly change it. However, again like the social media sites, I argue that these constraints did not limit players’ ability to create and express identity, but rather enhanced their ability to do so. As these environments have persisted, a more nuanced understanding of identity expression within them has developed, creating personal and social opportunities for players and business opportunities for the companies that manage them. For disabled players, or those with physical challenges to interacting with the environment, the relative stability of that environment has allowed them to create tools and adapt play-styles to participate at levels otherwise unachievable from a new environment or one that significantly varied from content addition to content addition. “We must... come to the absolutely necessary recognition that the physical, material conditions of the computer devices we use affect our experience of the virtual text” (Landow, 36) – in this case, the virtual identity.

*World of Warcraft* offers us an opportunity to discuss how some of these constraints have worked to enhance computer-mediated identity. One such constraint is the fact that the virtual environment is only fully accessible from the desktop computer. Unlike other virtual worlds, Azeroth is a computer-based environment and cannot be (easily) accessed from another type of system such as a dedicated game system (Xbox, PlayStation, etc.). There are some users who have hacked their game system to run
World of Warcraft, even using Microsoft’s Kinect interface, which is essentially a camera attached to a computer that can interpret the movements of a user as a way of interacting with the virtual environment, but these are rare exceptions. Blizzard does allow some information sharing through a mobile app called World of Warcraft Mobile Armory but it only allows the player to see their characters, check their in-game mail, and chat with other guild members.

Arguably, one group that has benefitted from this full-access constraint more than others are users with a disability. Constraining the game interface to a desktop computer does two things – it makes the primary interface a keyboard and mouse, and it offers the opportunity for the end user to more easily modify that interface through peripheral devices and the aforementioned XML and Lua programming options. Adaptive technologies have existed for years for those with physical limitations in using a mouse and keyboard. Replacement technologies and techniques exist for a variety of physical limitations making this constraint less impactful to this group.

However, the second and perhaps more influential part of this constraint is the ability to modify that interface. Addons can be written by players with a disability themselves or by other users. The addons run with the game client and can change the way the interface works or displays information. One can find a rich list of these types of addons on curse.com and other sites dedicated to “modders”. Curse.com contains addons for World of Warcraft and many other games. The power of this technological advance is that while there is a standard interface anyone can use, those with special

52
needs can adapt that standard to meet their needs. In fact any user can modify the interface, giving even less-experienced (or less MMO-literate) players a way to experience the environment in a manner friendlier to them. This gives everyone more opportunity to enjoy and interact with the virtual environment and its players, developing masters out of those who might not otherwise participate in the environment. The interface can be relegated to the cognitive background because it has been adapted to the user. The play, and the socialization around the play, can be center.

World of Warcraft’s environment’s longevity (over 10 years) and low threshold for mastery has allowed for a nuanced literacy to emerge among its players. What a character wears or where they are seen in the world conveys significant information to the fluent player, as can who players are seen to interact with. Groups of like-minded players can and often organize into “guilds” within the virtual world to play together, but also to project a group identity to others within the game. This can be seen in guild names such as “Ask Me How” or “Azeroth’s Most Deadly” where the guild name suggests players of greater than average skill. These guild names, though, can also enable a type of identity politics within the virtual world. “The Spreading Taint” and “Stonewall Warriors” are large LGBTQ guilds in World of Warcraft that expressly target LGBTQ players, a group often marginalized in discussions about video games, in order that these players may enjoy the game world with others with backgrounds similar to their own. Similarly, the players in the guild Durus Veritas “consists of a mixture of deaf, hard of hearing, and hearing players and is open to everyone who enjoys the
community focused on Vent-less (voice-over-internet chat) raiding\textsuperscript{20}. They also challenge other players to see them as players and not less-capable or otherwise disadvantaged within the game environment.

\textbf{The World (of Warcraft) in Theory}

In order to situate the \textit{World of Warcraft} within the game and business space and understand its affordances for virtual identity creation we can contrast it with similar games. Constant additions to the game world continue to evolve the fantasy narrative within which the game takes place as well as the technical underpinnings of the game, and therefore many aspects of gameplay. These additions come in “patches,” what one might compare to a chapter in a book, and “expansions,” compared to the next novel in a series. To continue the metaphor, patches can contain either episodic advances to the game world narrative (“content patches”) or relatively minor tweaks to game play (including bug fixes). Expansions, on the other hand, make more sweeping changes to the game world and game play. New races and worlds are introduced in expansions, and each are considered to have their own story arc. Similarly, game mechanic changes can be substantial, with complete overhauls to the system that may significantly change game play. There have been 5 expansions of the \textit{World of Warcraft} since its release with the most recent in November of 2014, the game’s 10\textsuperscript{th} anniversary.

\textsuperscript{20} \url{http://wow.joystiq.com/2013/07/11/deaf-ventless-raiding-guild-slices-silently-through-heroic-tot/#continued}
As a subscription-based game the WoW user base is one that chooses to continue to pay a fee per month for the ability to play the game, with the expectation that the game continue to expand and evolve during the time of their subscription. This differs from many video games in that the majority are one-time purchases for a finite product. It is also an “always on” game and virtual environment – the world continues to run with other players even after the player logs out or shuts down their computer. As such, an Internet connections is required for play – World of Warcraft is designed with the expectation that the player will interact with other players.

Blizzard Entertainment charges a monthly fee of $14.99 to play World of Warcraft, though occasional special sales can lower the monthly price. This recurring fee presents a barrier to sustained participation in the game that must be overcome by the publisher by creating interesting and thus valuable-to-the-player content and otherwise maintaining a high level of player interest in the game and the virtual world. Therefore a product life of over 10 years represents a significant sustained interest in a committed player base and by a publisher willing to invest significant resources into its maintenance. This extended lifespan also represents a user population well-versed with the physical and narrative environment of the game and a mature technology base upon which those users have built their online identities and play styles. The longevity of the game also provides the opportunity for a historical review of the evolution of the virtual world technology and user reactions and relationships to those changes.
Another popular online virtual game world is “The Sims,” from Electronic Arts (EA). Both The Sims and *World of Warcraft* are personal computer-based games that contain virtual worlds populated by avatars of the game’s real-life players. However each company has approached the framework within which the avatars interact with the world differently. For “The Sims,” the contents (places, characters, even items) of the virtual world are created by the players using various tools and methodologies provided by the user’s software. In Azeroth, Blizzard’s virtual world, there is an existing narrative framework (based on the company’s previous game titles and other narrative works published) within which the users can situate themselves and within which the characters, places and items that exist outside of the real-life players are created.

In Heim’s view, the user’s knowledge that someone else knows everything about the virtual world (the Central System Monad, or CSM) deprives the user of the “freedom to search and discover” (1993, p. 84). Granted, the technology that allows these virtual worlds to exist requires some sort of hierarchical and omniscient administration. The framework, narrative and servers alike, must be maintained. “Remove the hidden recesses, the lure of the unknown, and you also destroy the erotic urge to uncover and reach further; you destroy the source of yearning… Knowing that the computer God already knows every nook and cranny deprives you of your freedom to search and discover.” (84). Heim concerns himself with an apparent paradox of the promise and potential of online existence.
However, I would argue that the approach each company has taken in the creation of their world takes this negative possibility into account. EA has taken the approach that content is generated by the user, meaning that the speed with which new content is created is dependent on the number of users online and the sum of their individual productivities. No one human being (especially one tasked with maintaining the physical infrastructure) could possibly know (experience) all new content instantaneously.

Blizzard Entertainment, though it has a less-flexible narrative structure, has designed a world where the game players influence the virtual environment in some knowable and measurable ways. This framework, the actions within it and the structure that supports it must be maintained by Blizzard Entertainment employees. In Heim’s view, the player’s knowledge that someone knows everything about the virtual world deprives the player of the freedom to search and discover. Granted, the technology that allows Azeroth to exist requires some sort of hierarchical and fairly omniscient administration. The framework, narrative and servers alike, must be maintained. While Blizzard Entertainment may be able to keep some record of every interaction between every player and to run analytics on that data, it is impossible for one person to comprehend all conversations between every character on every server at any given time. Blizzard Entertainment has also allowed users to participate in the narrative by interacting with each other and the environment in a considerable variety of ways. This individual narrative participation means that the experience of the virtual world (and therefore their identity presentation in it) is unique for each player.
Many theorists have built upon the idea of multiple identities within the individual and have argued that those identities can be leveraged within computerized virtual environments for significant personal and social betterment. Gee, for instance, argues that video games build upon new multimodal literacies created by the modern world. “Literacy is multiple… in the sense that the legal literacy needed for reading law books is not the same as the literacy needed for reading physics texts or superhero comic books” (Gee, 14). Games enable a deeper understanding of ourselves and our multiple identities through playing them.

Video games, then, give us the opportunity to teach, learn, experiment with and strengthen these new literacies and to reflect on our identities. They do this by enabling different identities in specific semiotic domains. Semiotic domains are “any set of practices that recruits one or more modalities… to communicate distinctive types of meanings” (Gee, 18). For Gee, these domains can encompass specific types of games, such as first-person shooters or role-playing games, but are not limited to games. Semiotic domains can also be certain real-world practices, such as chemistry, teaching, medicine, law, etc. Each domain requires a particular set of practices to master. In order to master a game, a player must identify with the domain it embodies and many games encompass multiple domains. So in a game where you play a spy on a particular mission, you internalize the role of the spy as expressed through the procedural rhetoric of the game and create a “spy identity” who perhaps is a problem solver extraordinaire. The skills you acquire as part of this internalized identity – problem solving, etc. – can be recalled in the real world by accessing that identity.
These semiotic domains require a certain approach, a certain identity often different from our “day-to-day” persona, to navigate them. In the example of games and *World of Warcraft* in particular, one needs to take on the “real-world identity” of a PC gamer, separate from one's in-game persona, in order to navigate the controls for movement and action within the world. This identity is different than the identify of a person playing pinball or even a first-person shooter game on a gaming console in that the knowledge and skill sets, specifically hand-eye coordination, are different. There are specific motor skills required by each identity that are different from the others, as well as different understandings of how the environment within which one is playing works.

Gee supports the argument that games create or encourage specific identities in their players that exist outside of the game and can be used for constructive purposes. For example, a player who does not believe they are good at a particular skill or in a particular domain can “try out” the identity of someone who is good at that skill within a game environment. “Good computer games are designed so that they adjust to different levels of play and reward each sort of player, if the player is putting in effort, with some appropriate degree of success” (64). So a game well-designed to teach the fundamentals of behavior in a chemistry lab (how to handle materials, manipulate objects, safety considerations, etc.) could allow a student who did not see themselves as a “chemist” or even “a science person” to start out with very simple tasks. Over time and replay more complex tasks and objectives can be added to the players experience in the game, slowly bringing them from the projective identity of a chemist in the game to a chemist in the real world.
Identity in *World of Warcraft*

In “The *Warcraft Civilization*” Bainbridge (2010) explores the *World of Warcraft* through a combination of a narrative account of his experiences as a player within the game and a somewhat deeper discussion of those experiences from a more research-based approach. Bainbridge relies heavily on his description of the game world as told from the perspective of his in-game characters and less so on the theoretical background of virtual worlds and identity theory. Regardless, Bainbridge’s approach does offer some insight into the performance of identity within the game. From a first-person account of being within the in-game identity, described through the narrative sections of the book in the voice of the particular character he is focused on, and real-world discussions where he makes references to his “actual” self and relationships, we see a clear delineation of multiple identities within the virtual world experience. “Some writers about avatars assume that users consider them to be very direct representatives of themselves in a virtual world, but my observation suggests the widest possible range of connections between the biological person and the electronic person, only occasionally fulfilling the definition of [Turkle’s] second self” (Bainbridge, p. 187).

Additionally relevant to this research is his conceptualization of Cooley’s (1974) social self.

The social self is the set of ideas individuals have about themselves, which are derived from communication with other people. An important part of the social self is our impression of how other people view us. Since we cannot see into
others’ minds directly, we learn about their picture of us by observing how they respond to us, almost as a mirror might reflect our image back to us. (Bainbridge, 174)

I would suggest that this set of ideas individuals have about themselves can be subverted by manipulating how other people view us. Within a virtual game world this could include managing our performance within the game. The more “successful” a player is within the game, whether success is measured in the “level” of the player’s virtual character or some other in-world attribute, the more positively other players of the game who only interact with the player within the game environment see that player. In a game where interaction with other players is essential to successful “play,” for instance in *World of Warcraft* being asked to join a guild or participate in a raid run, it is imperative that the player operate or be seen to operate at the highest level of skill they can muster.

This need to be seen as masterful provides an opportunity to investigate the motivations of the *World of Warcraft* player and for this work the impact of the user interface on achieving the desired outcomes. Yee (2007) provides a framework within which we can explore questions regarding player motivations. Yee identified 10 motivational factors that were then grouped into three overarching categories: Achievement, Social, and Immersion. For the purposes of this research we are interested in the Immersion category, which includes such concepts as roleplaying and escapism. Elements of roleplaying included “interacting with other players to create an
improvised story” and “being immersed in a fantasy world.” Escapism encompassed “escaping from the real world” and playing to avoid “thinking about… real-life problems or worries.” Yee was specifically interested in investigating differences in age and gender among the population he was studying but we will use his approach towards players with disabilities.

It is also possible to use a framework of empathic experiences to explore identity within World of Warcraft. Building upon film studies and previous game research, Tronstad (2008) describes how the aesthetic experience of the player can lead to a state of mind where their interaction with the game is so intense that they become completely absorbed in what they are doing, a state described as “flow”.

For flow to be experienced, there must be a perfect balance between the challenges posed and the player’s ability to overcome them. The challenges have to be experienced as genuine challenges, not easy to accomplish, but not quite impossible either. In meeting such challenges, the player enters a state of trance-like concentration in which the body seems to perform and react automatically as well as perfectly, without the conscious mind interfering. …

When, in World of Warcraft, gameplay is experienced as flow, the capacities of the character and those of the player are experienced as being in perfect balance. The player and the character here are perfectly connected, which requires that the player has internalized the controls and game mechanics
to such a degree that the medium between himself and the gameworld becomes transparent. (253-254)

The suggestion here, then, is that mastery of the user interface and a background knowledge of how the game works is required for full immersion in the game. Tronstad identifies those situations where flow may occur in World of Warcraft as within “instances” (dungeons) or “raids”, both being situations where the pace and intensity of the encounter are high and mastery of the player’s character essential to the successful completion of the goal (usually the defeat of a monster). These situations are also highly social in that instances and raids require multiple players to complete – instances require 5 players and raids as many as 25 – and usually require the close coordination of effort among the present players. The game designers have created these encounters specifically with groups and just such cooperation in mind. Some encounters might even require specific types of characters (warriors or rogues, for instance) to be successful. Tronstad therefore argues that there is a difference between a player’s character’s “capacity” and “appearance”.

Capacity is defined by Tronstad as “the sum of capabilities available for the character, while “appearance” designates its representational qualities” (p. 249). Capacity refers to the skills and power of the avatar – their class (mage, warrior, druid, etc.), their level (the higher their level the more powerful their abilities), their talents (abilities and passive effects chosen by the player), and their gear or equipment, also referred to as item level or “ilvl” in World of Warcraft (better, higher level gear improves
abilities in potentially significant ways). Item level “has two main functions — to reflect the item’s usefulness and at the same time determine the minimum level a character must have in order to use it.” Item level serves as a rough indicator of the power and usefulness of an item, designed to reflect the overall benefit of using the item. Gear and levels change the most throughout a player’s experience within the game. A player increases her character level by defeating enemies, completing quests, and other in-game activities. She acquires better gear by defeating more powerful enemies or other, more onerous objectives such as complicated quests or multi-day events.

Given that some game content is gated to only be available to characters of a particular level or higher, capacity is a significant factor in the experiences available to the player within the game and other players’ perception of that character. The more powerful one is or appears the more opportunities for play that are available. For instance, once one reaches the maximum character level, ilvl becomes a factor. End-game content is called “raid” level content, tiered content available only to the highest level characters at the time the content is introduced and access to each tier is often gated by ilvl, with higher ilvl equipment available within each tier that will allow access to the next tier. Since this gear is not awarded if the goals of that raid are not met (usually defeating the “bosses” or primary monsters of the encounter), and without the gear from that raid subsequent raid content cannot be experienced, only those who are capable of

21 http://wowpedia.org/Item_level
success are desirable companions for that content. A lack of capacity or the appearance of capacity has a negative impact on the opportunities for participation.

This takes us to Tronstad’s definition of “appearance” as the representational qualities of the character. Appearance and perceptions are closely related in that how others perceive a character is how that character, and the player, appears to them. In other words, appearance helps to create perception. A character “appears” powerful because of level, ilvl, etc. and through the character’s appearance the player is perceived as powerful or skilled as well. More powerful and more skilled players are more often invited to participate in group content in the game. Therefore, achieving higher levels or acquiring rare or powerful gear isn’t just done for the enjoyment of the player, but also to signal a specific identity to other players, that of a competent player.

The skills, competence, and therefore desirability to game with that player, is embodied in that appearance. For players with a disability, managing this appearance may be crucial to their ability to experience end-game content, since some players may see those with a disability as being less-skilled and therefore less desirable in a group. As will be discussed later, addons provide players with the capability to modify the user interface in ways that enable them to play in a way more comfortable or effective for them, therefore increasing their capacity and appearance in the game.

Let us step back for a moment, though, and consider what is required from the player in order to increase their capacity as a participant within the game. To the uninitiated, there is information in the image that is at least somewhat recognizable and
understandable, such as text and the representation of the floors and walls of the room and perhaps the humanoid figures as avatars of the players (though not any specifics about those avatars). To the uninitiated, though, many other elements may be difficult to parse, such as the meanings of the bars and icons or the purpose of the colors and other visual effects. This says nothing of understanding the narrative environment within which the encounter takes place.

How, then, does the experienced player understand the meanings within this image and therefore this interaction within the game space? In discussing avant-garde cinema, Peterson (1996) provides a potential answer and a potential explanation for a user’s desire to manipulate the information on the screen. In describing how new viewers of avant-garde cinema become experienced, Peterson proposes the idea that the viewers become knowledgeable by acquiring “both procedural knowledge, what we might call knowing how, and declarative knowledge, what we might call knowing that” (110). Procedural knowledge encompasses the heuristics of problem solving, information that enables a particular type of strategy of analysis (the how) of the information by the viewer. Declarative knowledge, however, might be said to be the system of codes used to transmit information within the image, the underlying semiotic conceptual (signified) information necessary to understand the signifiers.

Peterson resists this straightforward connection to traditional semiotics, however, and argues that “[i]n so far as the meaning of a ‘text’ is derived through conventional codes, signification is comprehensible only to the extent that its ‘readers’ have already
learned those codes. Semiotics is most at home, then, in what the semioticians like to call the realm of the ‘always already’ said.” (112) For video games and World of Warcraft in particular, this would be the understanding of the basic mechanics and expectations of the game – that some symbols represent player health or power, that some visual effects represent the activation of certain abilities by the player or the monster, that clicking an icon on the screen activates a certain ability, etc. It is this effect at work that allows an experienced player to make sense of all the cues in Figure 2, many of which aren’t even apparent to the uninitiated.

Like avant-garde cinema, games and gamers value novelty in new titles and their approaches to narrative and mechanics. Titles that challenge the current popular approach to game design and semiotic systems are often critically celebrated and are frequently financially successful. This can be seen in games such as those for Apple’s iOS like Monument Valley. “Finding your way to the end of each level often means manually spinning platforms to connect paths in a way that defies logic, but in the end makes perfect sense. This mechanic is made even more challenging once path-blocking "Crow People" are added a few levels into the adventure, adding an aspect of timing to each puzzle solution.”22 Another notable title is Journey23, created by thatgamecompany for the Sony Playstation platform. Wikipedia gives some details as to how the game is played.

22 http://www.tuaw.com/2014/04/03/monument-valley-is-proof-that-games-can-be-art/
23 http://thatgamecompany.com/games/journey/
In *Journey*, the player controls a robed figure in a vast desert, traveling towards a mountain in the distance. Other players on the same journey can be discovered, and two players can meet and assist each other, but they cannot communicate via speech or text and cannot see each other's names. The only form of communication between the two is a musical chime. This chime also transforms dull, stiff pieces of cloth found throughout the levels into vibrant red, affecting the game world and allowing the player to progress through the levels. The robed figure wears a trailing scarf, which when charged by approaching floating pieces of cloth, briefly allows the player to float through the air.24

*Journey* has seen considerable critical success and won several awards because of its use of non-lingual sound as a method of communication between players. In *Journey*'s world words are not used so the player has to work through the interface and experience of the game to decode the semiotic systems and complete the narrative.

The user interface of *World of Warcraft* can be modified and transformed in a considerable number of ways. What is textual information can be translated into graphical or even aural signs, and vice-versa. It’s even technically possible to create haptic feedback cues instead of aural or visual. In this environment, the message / meaning / signified remains the same but the sign changes based on the choices of the player. For a player with a disability that might preclude the ability to perceive or process one of these “prepackaged” signs, then, the flexibility of the user interface

allows them to construct meaning within the UI that may be confusing or completely nonsensical to an uninitiated viewer but create meaning for those familiar with the process. It might be that the flexibility of the addon system has allowed an interactive environment that only makes sense to that one player – the complete democratization of communication within the video game system.

Disability and Identity

The questions being investigated here are not about World of Warcraft players generally, but of players with a disability specifically. My questions cannot be answered without speaking to that population. One of the challenges for this research was identifying World of Warcraft players with disabilities, and then finding those who would be willing to share information about both their disability and how they play the game. Within World of Warcraft, there is sometimes the attitude that not playing the game using the “pure”, unmodified interface – that is, playing without using addons – amounts to “cheating” or otherwise diminishing the quality of one’s play. There is a certain adolescent bravado to such attitudes, but for players with disabilities, the modification of the interface can be seen on a spectrum from either as simply a way to more enjoyably play the game or critical to their ability to play the game at all. In order to better understand how players with disabilities may see the virtual world, it would be beneficial to first discuss how they situate within the real world and United States culture through a discussion of disability discourse.
The disabilities community is an increasingly challenged cultural system. The very term “disability” is a challenged one. These challenges are occurring within the disability community but also within the legal structure of the American system. With the passage of The Americans With Disabilities Act (ADA) in 1990, the word “disabled” became more than a cultural demarcation but a systemic title that granted those who were as so defined by the law to certain rights and entitlements.

Not only has the law needed to debate the meaning of the term so as to include those who should be “protected” but the culture has also had to contend with an evolving concept of disability itself. Whereas one would, before passage of the ADA, informally define a disabled person as one with a striking and likely noticeable physical difference, new applications and understandings of the term applied by the legal system have challenged this popular internalization of the meaning. In the process, not only have less visible or more uncommon physical disabilities achieved higher social recognition (if not understanding) so too have less-obvious “disabilities” such as alcoholism or learning disabilities been brought to the fore of American social consciousness and had their situational meaning within the culture changed and challenged.

These evolving understandings and definitions of disability have created subcultures within the disability subculture itself. Each subgroup has developed or redefined terms relevant and specific to its own characteristics. While some of the meanings can be determined easily because the meaning has not diverged dramatically
from the popular, some can only be understood from within the semiotic system of the particular subgroup.

Here we will outline many of the key terms in the disability conversation and pay particular emphasis to one of the “traditional” disability groups, those with physical limb differences. This group is chosen for several reasons: because of its recognition before passage of the ADA; for reasons of familiarity by the author; and because this particular type of disability can be significantly impactful to a videogame player required to possess high hand to eye coordination to be successful. The loss of limbs is also a common physical result of injured military personnel and, with the current military projects of the American armed services and the resulting casualties returning home from the war theatre, this area of discourse will likely see an increase in activity and evolution over the coming years.

According to *A Guide to Disability Rights Laws* (2000), published by the Justice Department:

To be protected by the ADA, one must have a disability or have a relationship or association with an individual with a disability. An individual with a disability is defined by the ADA as a person who has a physical or mental impairment that substantially limits one or more major life activities, a person who has a history or record of such an impairment, or a person who is perceived by others as having such an impairment. The ADA does not specifically name all of the impairments that are covered.
This wording demonstrates the contested nature of the term disabled. The vagueness of the area covered by the law – “a physical or mental impairment that substantially limits one or more major life activities” – could be applied to a very broad group of people. Indeed, since the passage of the ADA in 1990 there have been several court cases including some high-profile cases decided by the US Supreme Court where the applicability of the law to different groups has been challenged (PGA Tour, Inc. v. Martin; US Airways, Inc. v. Barnett; Barnhart v. Thomas; et al.). According to the Justice Department, “The definition of ‘individual with a disability’ is fraught with conditions and must be applied on a case-by-case basis. …There are people with severe depression or people with a history of alcoholism who are judged by their employers, not on the basis of their abilities, but rather upon stereotypes and fears that employers associate with their conditions.”

Indeed, within the disability community the term finds challenges to its use because of the social connotations and stereotyping the word enables. For instance, it is not uncommon to hear someone with a disability refer to themselves as “differently-abled” rather than disabled. This is a direct challenge to the social construction of the meaning of the word and those who support the disability community also use it. It is an attempt at distancing from the stereotype of the disabled person as one who is less capable in many regards. Another example of this process of distancing would be “handi-capable” instead of “handicapped,” though parodies in the popular media of this

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term on shows such as “South Park,” “MAD TV,” and other comedies have reduced its use by the disability community.

How a person with a disability identifies herself depends on several factors and all of these factors play a part in the “disability identity.” These factors could have a significant impact on the reporting of disability status for the population studied for this research. For example, “congenital” refers to the condition of disability since birth. “Congenital amputees” are born without parts of their limbs, where “amputees” can be either congenital or those who have lost their limbs later in life. There is some amount of status conferred with congenital though the “level” of that status depends on the particular situation of the person who uses it. For instance, congenital amputees can see themselves as “higher” status because they have lived with their condition longer than others (relative to their age). Those who lose limbs later in life sometimes point to the often-distinct difference in abilities and adjustments between congenital amputees and other types of amputees. Because there is no physical “adjustment” period for congenital amputees, they are sometimes seen as privileged in that there was never a relearning of physical behaviors – their behaviors are developed as part of their childhood learning process just as they would be for a non-amputee. Congenital amputees also do not typically suffer a period of trauma associated with the loss of the limb. In the view of the traumatic amputee, this means congenital amputees cannot understand or fully empathize with their situation, creating tension among a group that non-members may consider an integrated group.
“AE” or “BE” refers to amputees who are missing parts of their arms either above the elbow or below the elbow. “L” or “R,” as in RBE or LAE, to indicate right or left limb, will often precede them. The specificity of the location of the amputation is important because different amputations allow for different levels of activity.

However the terms “above” and “below” leave much room for interpretation. “Above” refers to the part of the arm between the elbow and shoulder while “below” covers the arm from the elbow to the fingers. For instance an RBE (right limb, below-elbow amputee) could be missing part of the right hand or the entire limb except for a few inches past the elbow – the term itself does not convey this meaning. What is significant in this terminology is the “A” or “B” because of the difference in physical functionality between the two. An “A” will have less vestigial limb available to them so are less capable at some tasks than a “B” with perhaps a great deal of vestigial limb may be in the same situation. This differentiation is significant for this work because of the potential impact the limb difference could have on a player’s ability to interact with the game world through the keyboard. An AE could be significantly more limited in the keystrokes available to them, especially simultaneous keystrokes, than a BE due to the limited reach of their amputated limb. This difference poses obvious obstacles to interacting with the virtual world through the keyboard.

While these terms are frequently used in writing they may also be used verbally. One would say each letter of the acronym instead of the entire phrase – for instance, “r-b-e” instead of “right above elbow.” This not only allows for the transmission of meaning
but also serves as a means of identification for others within or affiliated with the subgroup’s semiotic system. A non-member or non-associate would not understand the sequence of letters because the letters do not have specific meaning outside the subculture. They therefore serve to identify the “initiated” and to create and maintain an “insider” versus “outsider” mentality.

While not directly an impact on gaming in World of Warcraft, there is still an identity discussion similar to arm amputees with those with leg amputations since this group of players could still identify as “disabled” and therefore appear in the data of this research. As with “AE” and “BE” previously, “AK” and “BK” refer to a specific amputation location, this time relative to the knee. “Above” here is the part of the leg between knee and hip while “below” is the leg from knee to the foot. “L” and “R” may also be used with these terms to indicate right or left leg. Also as with “AE” and “BE” before, the importance of the term is its indication of the potential functionality of the individual being so described.

One could also make the argument that “above” or “below” refer (either consciously or subconsciously) to wholeness or completeness of the person. Someone with vestigial limb below the knee may have more functionality without a prosthesis but they may also be considered “more complete.” There is “more” to them physically than someone with an above-knee amputation. The differences in the nature of the amputations also help to further subgroup those identified as one type or the other, creating community by means of their categorization.
The able-bodied do not all have a negative view of disabled identities, though that does not mean the disability group looks favorably upon these people. For instance, there are those who try to be sensitive to the situations of those with a disability but come across as patronizing. There are many in the disability community who avoid such interactions because of the perception, correct or not, that this discourse sees them as “less” in some way than the person as a disability sees themselves. You see this type of discourse embodied in the news reporter talking about the little boy with a new prosthetic hand, for instance. While not meaning to be patronizing, a sense of pity for the individual and happiness at their “normalization” can creep into their language and demeanor.

There are other types of non-group members that those with a disability can see as predatory and dangerous, though, and for those who have had negative interactions with these types of non-group members, avoiding them may be done at the expense of otherwise positive experiences. This desire to avoid the predatory can lead to a person with a disability not willingly identifying themselves as such in a virtual environment or taking pains to prevent someone else from identifying them. Two examples of these types of non-group members that are often considered dangerous, predatory, or otherwise undesirable for interaction are “wannabes” and “devotees”. A wannabe is a person who desires to be an amputee, often for reasons of sexual stimulation or obsession, though not exclusively. Wannabe is a play on the words “want to be.” The term wannabe can be found in many social groups – wannabe part of a famous television show, for instance – and is often used by those within a social group who see
the desire to be something "other" as an aberration of the social group's norms. In this case it is the reverse – it is the desire to become a part of the social group that is seen as the aberration by those within the group. The reasoning goes like this – “because “disabled” is seen by the non-disabled as a secondary subgroup in need of protection by the government (hence the need for and passage of the ADA), why would one voluntarily want to become a part of that group?” Similar questions of voluntary participation in a social subgroup are raised in queer studies in relation to passing, the “ability” of some homosexuals to “pass” or pretend to be heterosexuals and therefore avoid the stigma associated with social stereotypes and discrimination.

This line of reasoning does not mention the psychological conditions necessary to create a desire to amputate a part of one’s own body. Since a whole-bodied person (“whole-bodied” seen as a desirable condition by most if not all of the disability community) wants to become “less whole,” their mental and emotional condition can be questioned, especially by those in the disability community. Despite this negative connotation, there are open communities of wannabes and even support groups for them, especially on the web.26

Wannabe functions as representative of the concept of and desire for wholeness by the disability community. Not only is it representative of the concept of desire for belonging to a preferred social group other than one’s own (to be disabled, to be whole-

26 Yahoo Groups (http://groups.yahoo.com/search?query=wannabe+amputee&Submit=Search) lists a few such communities, though because of the negative connotations it can be assumed more exist and do not self-identify.
bodied) and deviation from that group (purposefully straying from one’s current social system) but also the anger inherent in the system created by those tensions. An illustration of those tensions comes from the No_Boundaries group on Yahoo Groups:

This is a place for anyone with disabilities and amputations ages 18+ to get together and discuss life. Your type disability or amputation doesn't matter. All that matters is that you want a place to discuss your victories, your battles, your good days and your (sic) bad. [W]e are here to support each other and give each other a shoulder to lean on or a WAY TO GO! I am going to be strict about membership so that hopefully we can weed out devotees, wannabe’s and fakers. I will not tolerate them in my group.

(http://groups.yahoo.com/group/No_Boundaries/, accessed April 30, 2007)

A devotee is a person who is sexually attracted to and has a fetish for amputees. Those who identify as devotees often make those with amputation-type disabilities uncomfortable and are sometimes listed as a reason why identifying as an amputee is an uncomfortable proposition. A devotee in other semiotic systems usually refers to someone who is an enthusiast or advocate of something. In the disability system, devotee is always sexual. The psychological term for the “condition” is acrotomophilia:

[A] paraphilia of the stigmatic / eligbilic (sic) type in which the sexuerotic (sic) arousal and facilitation or attainment of orgasm are responsive to, and dependent upon, a partner who is an amputee (from Greek, Akron, extremity + tome'. a
cutting = - philia). An acrotomophile is erotically excited by the stump(s) of the amputee partner. (http://www.amputee-online.com/amputee/acrotomophile.html)

Acrotomophilia has had some limited discussion in mainstream conversation but most references are specific to the sexuality and/or disability communities. Hustler magazine ran an article in February 1997 called “Humping Stumps: The Limbless and the People Who Love Them,” written by an amputee, that describes in graphic detail the devotee condition. During that same year the Journal of Sexuality and Disability featured an article by Richard Bruno, PhD, then-Director of The Post-Polio Institute at Englewood Hospital and Medical Center in Englewood, New Jersey, titled “Devotees, Pretenders and Wannabes: Two Cases of Factitious Disability Disorder” where the impact of the Internet on the ability of devotees to find amputees, and vice-versa, is discussed (Bruno, 1997).

There are differing viewpoints regarding those who identify as devotees. There are devotee websites and websites by amputees geared towards a devotee audience. There are also sites devoted to amputees that discourage or even ban devotee participation or access. The reasons for the negative associations vary, as do the reasons for the positive associations. However, this sign demonstrates better than others the evolution and contesting of meaning that takes place in semiotic systems. This is particularly true of the extra-signification of some terms, here either the positive or negative connotation of the word. Until there is a clearer meaning or new signs are introduced to the system, we are likely to see the connotation continue to fluctuate.
Finally, the concept of temporarily able-bodied should be mentioned, or “TAB”. Many in the disability community are not congenitally different but have become disabled later in life. “TAB” is meant as a reminder that the “condition” of the “able-bodied” is a fragile one. This term is not often used outside of the disability community nor is it common with groups other than those with limb differences. It is sometimes used to reinforce an idea that “what happened to me can happen to anyone.” This is particularly true for those who have traumatic amputations. The meaning of the term can be both pejorative and simply descriptive. This is the semantic work of the term – to signify not only those without limb differences but a philosophical understanding of the vagrancies of fate (put kindly). “Temporarily” becomes a focus of anger for some, resonating with their understanding (now) of just how fragile the human body really is and the limits to not only the ability to heal but also medicine’s ability to make up for biology’s physical limitations.

**Universal Design for Learning (UDL)**

In addition to understanding *World of Warcraft* addons as an example of modularity, we need to discuss them within a framework of accessible technology in order to understand their impact on players with a disability. “Universal Design for Learning” (UDL) is a set of principles for curriculum development that are intended to give all individuals equal opportunities to learn from educational materials. UDL “provides a blueprint for creating instructional goals, methods, materials, and assessments that work for everyone—not a single, one-size-fits-all solution but rather
flexible approaches that can be customized and adjusted for individual needs.” UDL is broken into 3 Principles:

I. Provide Multiple Means of Representation

II. Provide Multiple Means of Action and Expression

III. Provide Multiple Means of Engagement

Each of the three Principles of Universal Design for Learning can be broken down into additional subgroups with further explanations for each.

Table 2 - UDL Principles and subgroups

<table>
<thead>
<tr>
<th>I. Provide Multiple Means of Representation</th>
<th>II. Provide Multiple Means of Action and Expression</th>
<th>III. Provide Multiple Means of Engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Perception</td>
<td>4. Physical action</td>
<td>7. Recruiting interest</td>
</tr>
<tr>
<td>2. Language, expressions, and symbols</td>
<td>5. Expression and communication</td>
<td>8. Sustaining effort and persistence</td>
</tr>
</tbody>
</table>

These subgroups will be used later in the discussion and categorization of addons and the specific functions they perform. Part of the work of this research will be to determine if UDL principles can be effectively used to discuss the interface of a virtual world game. Let’s discuss these subgroups in terms of the World of Warcraft interface. For reference, Figure 4 is a screenshot of the default UI during a boss encounter. As you can see there is a lot of potential information that can be managed for the individual player.
Figure 4 - UI during a raid encounter

Principle I. Provide Multiple Means of Representation:

1. Provide options for perception: (1.1) options that customize the display of information; (1.2) options that provide alternatives for auditory information; (1.3) options that provide alternatives for visual information.

2. Provide options for language and symbols: (2.1) options that define vocabulary and symbols; (2.2) options that clarify syntax and structure; (2.3) options for decoding text or mathematical notation; (2.4) options that promote cross-linguistic understanding; (2.5) options that illustrate key concepts non-linguistically.

3. Provide options for comprehension: (3.1) options that provide or activate background knowledge; (3.2) options that highlight critical features, big ideas,
and relationships; (3.3) options that guide information processing; (3.4) options that support memory and transfer.

The first Principle recognizes that people differ in the way that they perceive the world and comprehend information. Where one person may easily make sense of textual data, another may make better sense if the same information is presented in a chart or graph. As you can see from Figure 4 there is a great deal of textual information shared on screen UI at any given time by default. There is additional information available to the player that is not shared by default but can be activated by some means (clicking on a different chat window tab, for instance). Additional data and functionality is available for access by addons that are not provided within the UI (for instance, automatically responding to a chat request when in the middle of an encounter). Some of this textual data relates to the performance of the player; some, to the activity of the monster both in terms of the amount of damage they are doing to the player’s character and in dialogue that occurs during the encounter. Some textual and numerical data refers to other players participating in the encounter and gives an indication of their current condition or actions. There are also audio cues happening at the same time as the textual cues, sometimes tied to a textual cue and sometimes a separate cue in and of itself.

The designers of the game often incorporate the abilities of these boss monsters into lesser-powered monsters that the player will defeat through normal and often solo play of the game. Therefore the boss encounter is execution of the summation of
strategies learned through play of the game. The relationship of the boss mechanics (their abilities and powers) to these previous instances is often connected through visual cues (a colored aura around the monster, for instance) or through the name of an ability.

This principle also covers differences in perception that arise from certain physical disabilities, such as blindness or deafness, or cognitive / learning disabilities such as dyslexia. Addons that address this principle, then, may allow the player to transform the game information in some way as to make it more easily perceived by the player, such as changing the data related to avatar health from a bar graph to text, or creating audio cues for what are otherwise video-only cues or vice-versa.

Principle II. Provide Multiple Means of Action and Expression:

4. Provide options for physical action: (4.1) options in the mode of physical response; (4.2) options in the means of navigation; (4.3) options for accessing tools and assistive technologies.

5. Provide options for expressive skills and fluency: (5.1) options in the media for communication; (5.2) options in the tools for composition and problem solving; (5.3) options in the scaffolds for practice and performance.

6. Provide options for executive functions: (6.1) options that guide effective goal-setting; (6.2) options that support planning and strategy development; (6.3)
options that facilitate managing information and resources; (6.4) options that enhance capacity for monitoring progress.

The second Principle recognizes that people differ in the way that they engage with the world around them. For the purpose of this study, we will take this to mean those addons that change the manner in which players interact with the virtual world. For example, this could be remapping the input commands for specialized devices, or allowing communication via voice instead of through the internal text chat system. Referring again to Figure 4, the graphical elements on the screen that indicate the player’s status (health and power) and that of the creature they’re fighting could be rearranged so as to move them to the center of the screen where they may be more readily viewable, or the bars at the bottom of the screen that activate player skills and powers rearranged to make moving the mouse between them quicker and more fluid. Where the first Principle deals with the way information is presented, the second deals with how the interaction with that information is conducted.

**Principle III. Provide Multiple Means of Engagement:**

7. Provide options for recruiting interest: (7.1) options that increase individual choice and autonomy; (7.2) options that enhance relevance, value, and authenticity; (7.3) options that reduce threats and distractions.

8. Provide options for sustaining effort and persistence: (8.1) options that heighten salience of goals and objectives; (8.2) options that vary levels of challenge and
support; (8.3) options that foster collaboration and communication; (8.4) options that increase mastery-oriented feedback.

9. Provide options for self-regulation: (9.1) options that guide personal goal-setting and expectations; (9.2) options that scaffold coping skills and strategies; (9.3) options that develop self-assessment and reflection.

The third Principle deals with sustaining effort and persistence and self-regulation. This relationship of principle with a single addon is more difficult to determine since it is the individual user who determines what will maintain persistence. It is assumed that all addons at least partially fall into this category since, by definition, the addon is meant to customize the user interface in such a way as to make the interactions with the world more enjoyable. However, we expect specific addons to be indicated in the data from player usage as better meeting this need than others.

For this research, a matrix was created that allows for the identification of each of these subgroups by addon. The subgroup number of each principle is noted on the matrix and checked if it is determined that behavior or outcome is enabled by that addon. Since these principles were created for use in an educational setting, not every subgroup will be a comfortable match with the purpose of any given addon. Therefore these criteria will be read liberally, with the intent of the criteria sought within the description or behavior of the addon. It is possible that some addons will meet multiple criteria, while some may meet none. Those addons that are actually function libraries for other addons are obvious candidates of the latter category.
METHOD

As explained in my introduction, I pose three questions that I will investigate with this research:

1) How do players with disabilities use interface addons in World of Warcraft to manage their game experience?
2) Do “addons” address specific disabilities of players?
3) Do players with disabilities who manage their experience with addons have a “deeper” identity immersion experience with the game than players with disabilities who do not?

Data for analysis in this research was collected from World of Warcraft players with self-identified disabilities through an online survey instrument and also by collecting usage data from Curse.com, an online addon distribution website. The data collected through the instrument provided both quantitative and qualitative data regarding the characteristics of World of Warcraft players with disabilities and their usage of addons.

Instrument and Measures

The survey instrument was created in and distributed through Qualtrics27, an online data gathering and survey tool research software suite purchased for use by faculty, staff, and students at the University of Central Florida. I received UCF IRB initial approval for my research on March 28, 2014 (see Appendix A). The entire instrument is available in Appendix B. The survey was available from March 30 through May 26, 2014 and consisted of 32 demographic and play-style inventory questions. The operations of

27 www.qualtrics.com
Qualtrics are such that there were six informational “questions” in the instrument that did not collect data but were used to provide information to the survey respondents, such as directions or explanations. Most of the demographic measure were typical of similar population research (age, gender, etc.) but also included measures meant to gain insight into potential subpopulations among players (type of character played in *World of Warcraft*, number of years played, and so on). The play-style inventory questions are taken directly from Yee’s (2007) Daedalus Project work in order to provide consistency of comparison between that earlier work and this one.

Given that the target population for this research was *World of Warcraft* players with disabilities, and that those disabilities may also negatively affect their ability to respond to some types of survey tools and strategies, some survey protections available within Qualtrics were not used for this research. For instance, recipients were given the ability to save their responses for up to a month and still continue taking the survey. There was also no time limit for how long one could stay on a particular question of within a particular set of questions in the survey.

One final question asked respondents if they would be willing to be re-contacted to provide additional information on how they use addons. Of those that replied affirmatively, a random sample of 20 were selected and sent an email question to the address they provided (see Appendix C for the full email text). Only one response to that email was received.
In March 2014, a survey was distributed online aimed at *World of Warcraft* players with disabilities through Twitter, blogs, and websites of *World of Warcraft* players in the disability community. The websites contacted for recruitment included popular *World of Warcraft* discussion sites, such as WoW Insider, and websites dedicated to *World of Warcraft* players with disabilities such as abilitypowered.com. I also reached out to individual players and the Able Gamers Foundation, an organization that “aims to improve the overall quality of life for those with disabilities through the power of video games.” The only site that reprinted the invitation was abilitypowered.com. The invitation to take the survey was also distributed through my personal Twitter account and was re-shared by Twitter user @AbilityPowered, the owner of the abilitypowered.com website, as well as several of her followers. Most respondents came through the Twitter announcements.

The survey produced 621 responses, 609 of which were valid for this research. By valid I mean the responses contained data relevant to the research. The 12 invalid responses only contained email addresses for redeeming the instrument incentive and did not answer any other relevant questions.

As discussed earlier in the literature review, there are a lot of ways a player may identify as disabled. The complexity of the semiotics and culture of the amputee

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28 [http://www.ablegamers.com/about-us](http://www.ablegamers.com/about-us)
community can also be seen among other types of disabilities groups, and could further be complicated by an individual who identifies as having more than one disability. An example of the former would be among those with any type of visual disability or anomaly. Total blindness would be an obvious visual disability, but would everyone who was colorblind consider himself or herself similarly disabled? Would someone with tinnitus or slight hearing loss consider themselves disabled in the same was as someone who is completely deaf?

Such questions were beyond the scope of this research. To simplify things for respondents of the survey and for later data analysis I suggested in the instrument four general categories of disability (and one “Other,” catch-all option) and asked respondents who identified as having a disability into which ones they believed they fit. The four categories (plus Other) were:

- Visual (blindness, color blindness, etc.)
- Auditory (deafness, tinnitus, etc.)
- Manual dexterity (amputations, limited arm mobility, paraplegic, etc.)
- Cognitive (dyslexic, PTSD, etc.)
- Other

The categories were not mutually exclusive and some respondents indicated their personal situation fit into more than one category. Only one respondent chose Other as their response and indicated autism as their disability.
Design

Currently, Curse.com (Curse for short) maintains a library of addons for several different games, and had 6,744 addons for *World of Warcraft* alone as of February 17, 2014. Curse also tracks and published how frequently an addon is downloaded, giving a clear indication of the more popular (and possibly more interesting) of the addons. Their library also tracks changes to many addons and covers several different iterations of the *World of Warcraft* client, allowing for a historical perspective of addon evolution.

Because of the sizes of the data set, it is necessary to identify a subset of addons in order to maintain a reasonable scope of work. To that extent, only the most popular downloaded mods and those identified by respondents to the research survey will be analyzed. This should provide a robust volume for analysis and diminish the impact of any particularly successful and profligate individual modders.

Appendix D has a list of the top 100 *World of Warcraft* addons or addon libraries downloaded from Curse.com as of February 19, 2014. This data set serves as a reference group for comparison to the addons used by the players with disabilities in this research. It is assumed that, given the popularity of the site, the addons from Curse closely represent the most popular addons by the *World of Warcraft* population at large. The addons on this list are also expected to be well represented within the responses of the surveyed population.

The survey instrument returned a large number of results for the addons used by players with disabilities in the response group. Not every respondent indicated they
used addons and some did not list which addons they used. Still, there were 932 addon names returned through the instrument, though many were duplicates. Appendix E reduces these responses to 165 unique addons used by the surveyed community.

The Curse top-100 list includes items that would not be considered stand-alone addons but rather are themselves libraries or other such reference works for addons, or are modules that add functionality to a parent addon. Those that therefore could not be analyzed using the UDL principles were not included in the final results.

The survey instrument invited comments from submitters about how and why they used addons. Where applicable those comments will also be included in the results discussion. The instrument also gave respondents the opportunity to volunteer to provide additional, more detailed information about their addon usage after the survey closed. Of those who volunteered, a subset was selected at random and emailed questions about their addon usage and its impact. As noted previously, only one response was received. Those comments are incorporated where appropriate.

**Procedure**

The quantitative data has been analyzed using the software package SPSS and its embedded statistical methods. The qualitative data has been reviewed using word counts and textual analysis. The data collected from Curse.com provides detailed information on the common addons used by *World of Warcraft* players and will be used for context and comparison for those addons used by players with disabilities.
The addons identified through the method described previously were selected and a Universal Design for Learning categorization matrix that includes them can be found in Appendix H. This matrix will be discussed in detail in the Results section of this research. This final list is comprised of the top addons found in the full Curse list from Appendix D with the addon libraries and otherwise non-direct reference materials removed, down to 20 selected addons. Thirteen of these twenty were identified in the survey instrument as being used by players with disabilities and are identified as such in the matrix.

The matrix allows us to sort and rank the addons according to which ones present the most UDL principles according to my analysis. The topmost and least of the so-ranked addons and the explanation of how they fall within a UDL category will be discussed in detail in the results.
RESULTS AND OBSERVATIONS

The Players

Since the invitation to participate in the research was shared on websites and through social media, it is impossible to be sure how many people saw the invitation. Therefore there is no way to determine an overall response rate. Out of 621 responses to the survey, only 609 were valid (the rest were submitted forms but contained no usable data, or only contained an email address to be eligible for the gift card incentive). One respondent did not identify as being a player as a disability and did not choose a disability category and is included with the group who replied negatively to the identify question. Those who did not identify as a player with a disability are included in some of the discussion, though they are not included in all analyses (I assume they only filled out the survey to get the gift card). When they are included, they will be mentioned specifically and the comments will refer to the entire player population that responded to this research. Two respondents did not identify as being players with a disability, but did later select at least one disability category. They are treated as responding positively to the disability question and the rest of their responses will be included with that group. There were 19 responses that did indicate a disability status but did not select a disability category.
Disability Distribution

Of the valid responses, 67.5% (411) identified as a player with a disability while 32.5% did not identify as having any disability (Table 4). Of the disability categories respondents could choose, the majority (57.7%) identified as having an auditory-related disability (Figure 5). This was followed by visual disabilities (30.7%), manual dexterity (12.2%), and cognitive disabilities (1.7%). Only one respondent (0.2%) chose “Other” as an option and they subsequently identified autism as their disability in the provided text box. The percentages for Table 5 do not add up to 100% because respondents had the option to choose more than one disability category.

Table 3- Frequency of respondents who identify as disabled

<table>
<thead>
<tr>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>198</td>
</tr>
<tr>
<td>Yes</td>
<td>411</td>
</tr>
<tr>
<td>Total</td>
<td>609</td>
</tr>
</tbody>
</table>
Age and Gender

The median age for both the non-disabled players and players with a disability groups was the same at 26 years old though histograms of the age distribution of the two groups shows clumping among players with a disability. Interestingly, players with disabilities are younger as a group than the players who did not identify as having a disability. Among players with a disability in the sample, 88.5% of players report they are 30 or younger with the youngest reporting at 20 years old, while 78.6% of non-disabled players report they are 30 or younger. The oldest reported respondent, at 58, identified as a player with a disability.
Figure 6 - Age distribution of non-disabled players (n=196)

Figure 7 - Age distribution of players with a disability (n=408)
The gender breakdown is also nearly identical between the two groups. Most are male with the players with disabilities group only slightly less so (85.9% male) than the total respondent population (88% male).

The median number of years played for both groups was identical at 5, but the players with disabilities have not been playing as long as a group than the total respondent population has been playing. The majority of players with disabilities, 90.4%, have been playing for 5 years or less. This suggests that players with disabilities came to World of Warcraft much later than the general population, which would be expected as the addon resources grew and matured with the existence of the game.
Both groups have the same median number of avatars within the game at 3, though players with disabilities account for 57.08% of the reported avatars. While there were more people in the population in the players with disabilities category, we don’t see an oversized representation of the number of avatars comparable to the difference in population between the two groups. Individually, the group with disabilities play fewer avatars per player. Players without disabilities are more likely to play with multiple avatars in the game.

There is a notable difference between the levels of the players’ main avatars between the two groups. The total population represents a wide range of avatar levels, from starter characters at level 1 up to the maximum character level as of the time of

99
this research, 90. One respondent listed their main avatar at level 100, though that will
not be possible until the next expansion to the game and is likely an error or
misunderstanding of the question. Both groups have a cluster of responses indicating
main avatars at lower levels, which would be unusual for a regular player of the game.
As some of these respondents do go on later in the survey to talk about addons and
how they use them, we make the assumption that this anomaly is a result of a
misunderstanding of the survey question.

The second largest cluster of avatar level responses however is at 90, the
maximum level obtainable at the time of the survey. There were 68 level 90
respondents in the population as a whole, and 61 of those identified as players with
disabilities. This suggests that the survey did indeed reach players with disabilities who
are very familiar with the game environment and suggests that further research on this
demographic could benefit from identifying similar disability-specific channels (Twitter
handles, websites, etc.) when distributing instruments.

Most of the players with disabilities reported playing on PvP servers while PvE
servers were preferred by non-disabled players. As discussed in The Warcraft
Environment section of the introduction, if players with disabilities were especially
concerned with their ability to manage their avatar in the virtual world, one would
assume they would avoid PvP servers because of the increased opportunity for grieving
on these types of servers. The specific reason for this cannot be determined from this
research. However this could be yet more evidence suggesting that at least in World of
*Warcraft*, players with disabilities do not see themselves at a particular disadvantage when playing with the able-bodied in the virtual world.

**Table 4 - Frequency of server type**

<table>
<thead>
<tr>
<th></th>
<th>Non-disabled</th>
<th>Players with a disability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>%</td>
</tr>
<tr>
<td>PVE</td>
<td>68</td>
<td>34.3</td>
</tr>
<tr>
<td>PVP</td>
<td>60</td>
<td>30.3</td>
</tr>
<tr>
<td>RP</td>
<td>18</td>
<td>9.1</td>
</tr>
<tr>
<td>RP-PVP</td>
<td>40</td>
<td>20.2</td>
</tr>
<tr>
<td>Missing</td>
<td>12</td>
<td>6.1</td>
</tr>
</tbody>
</table>

198 100.0 411 100.0

While the majority of both populations reported whether their main avatar was Horde or Alliance, many then did not go on to report their main avatar’s race and gender and fewer reported their avatar’s class and specialization. This is likely due to the particular formatting of the survey instrument, discussed later. However we can see that there is a noticeable difference in faction choice between the two groups with non-disabled players heavily favoring Alliance avatars.

**Table 5 - Frequency of faction choice**

<table>
<thead>
<tr>
<th></th>
<th>Non-disabled</th>
<th>Players with a disability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>%</td>
</tr>
<tr>
<td>Alliance</td>
<td>119</td>
<td>60.1</td>
</tr>
<tr>
<td>Horde</td>
<td>58</td>
<td>29.3</td>
</tr>
<tr>
<td>Subtotal</td>
<td>177</td>
<td>89.4</td>
</tr>
<tr>
<td>Missing</td>
<td>21</td>
<td>10.6</td>
</tr>
</tbody>
</table>

198 100.0 411 100.0

There appears to be an anomaly in the data that cannot be explained regarding what race players choose to play where Blood Elves are disproportionately represented.
in the players with a disability sample (Table 9). The data shows that these are not all identical responses though some duplication cannot be ruled out. Regardless, the answers do provide interesting insight. Of the Horde races, male Blood Elves are played the most by players with disabilities (53.3%), followed distantly by Orcs (10.6%), Trolls (2.0%), Tauren and Goblins (both 1.2%), Pandaren (0.8%), and finally Forsaken (0.4%).

The reasons players with disabilities should choose their player races at these ratios is beyond the scope of this research, but it should be noted that Blood Elves are visually the most human-like of the Horde while the Forsaken are visually, essentially, undead humans.

Table 6 - Frequency of race choice

<table>
<thead>
<tr>
<th>Race</th>
<th>Non-disabled Frequency</th>
<th>Non-disabled %</th>
<th>Players with a disability Frequency</th>
<th>Players with a disability %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>14</td>
<td>7.1</td>
<td>10</td>
<td>2.4</td>
</tr>
<tr>
<td>Dwarf</td>
<td>32</td>
<td>16.2</td>
<td>22</td>
<td>5.4</td>
</tr>
<tr>
<td>Draenei</td>
<td>18</td>
<td>9.1</td>
<td>10</td>
<td>2.4</td>
</tr>
<tr>
<td>Gnome</td>
<td>14</td>
<td>7.1</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>Night Elf</td>
<td>4</td>
<td>2.0</td>
<td>8</td>
<td>1.9</td>
</tr>
<tr>
<td>Worgen</td>
<td>1</td>
<td>.5</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>Pandaren (Alliance)</td>
<td>36</td>
<td>18.2</td>
<td>15</td>
<td>3.6</td>
</tr>
<tr>
<td>Pandaren (Horde)</td>
<td>1</td>
<td>.5</td>
<td>2</td>
<td>.5</td>
</tr>
<tr>
<td>Orc</td>
<td>9</td>
<td>4.5</td>
<td>26</td>
<td>6.3</td>
</tr>
<tr>
<td>Blood Elf</td>
<td>21</td>
<td>10.6</td>
<td>131</td>
<td>31.9</td>
</tr>
<tr>
<td>Troll</td>
<td>7</td>
<td>3.5</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>Undead</td>
<td>7</td>
<td>3.5</td>
<td>1</td>
<td>.2</td>
</tr>
<tr>
<td>Tauren</td>
<td>4</td>
<td>2.0</td>
<td>3</td>
<td>.7</td>
</tr>
<tr>
<td>Goblin</td>
<td>8</td>
<td>4.0</td>
<td>3</td>
<td>.7</td>
</tr>
<tr>
<td>Missing</td>
<td>22</td>
<td>11.1</td>
<td>165</td>
<td>40.1</td>
</tr>
<tr>
<td>Total</td>
<td>198</td>
<td>100.0</td>
<td>411</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Addon Usage and Impact

Before we can explore Q3, whether players with disabilities have a deeper immersion experience within the game, I must first address Q2, do addons address specific abilities of players. In this section, I will look at how players report their usage of addons and whether they see them as important to their gameplay or not. I will also look closely at addons themselves and how they might address particular disability needs.

Some respondents (n=11) did not answer whether they used addons or not nor did they answer any subsequent questions about addon usage and are counted as answering “NO” to the addon usage question. Addon usage was higher among the population as a whole than it was in the subset of players with a disability, suggesting that addon use enhances the play of all players and not just those with disabilities. Among all players, 50.3% reported using addons, while 46.7% of players with disabilities reported using them. Of the players with disabilities, those who identified manual dexterity challenges are by far the largest percentage of addon users at 92%, followed by cognitive (71.4%), auditory (45.6%), and visual (31.7%). The “Other” category comes in at 100% but there is only one member of that group.

Table 7 - Addon usage by disability category

<table>
<thead>
<tr>
<th></th>
<th>Visual</th>
<th>Auditory</th>
<th>Manual dexterity</th>
<th>Cognitive</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>86</td>
<td>129</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>221</td>
</tr>
<tr>
<td></td>
<td>68.3%</td>
<td>54.4%</td>
<td>8.0%</td>
<td>28.6%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>40</td>
<td>108</td>
<td>46</td>
<td>5</td>
<td>1</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>31.7%</td>
<td>45.6%</td>
<td>92.0%</td>
<td>71.4%</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>
The slight minority of players with disabilities who do use addons (48.6%) report that addon usage is Very or Extremely Important to their gameplay. Only two respondents indicated addons were not important at all to their gameplay. The majority of players who reported visual, cognitive, or other disabilities found addons to be Very or Extremely Important while most players who reported auditory or manual dexterity disabilities did not feel addons were very important.

Table 8 - Importance of addons by disability category

<table>
<thead>
<tr>
<th></th>
<th>Not at all Important</th>
<th>Very Important</th>
<th>Neither Important nor Unimportant</th>
<th>Very Important</th>
<th>Extremely Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>0</td>
<td>2</td>
<td>9</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Auditory</td>
<td>1</td>
<td>20</td>
<td>36</td>
<td>38</td>
<td>11</td>
</tr>
<tr>
<td>Manual Dexterity</td>
<td>1</td>
<td>11</td>
<td>17</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Cognitive</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>34</td>
<td>63</td>
<td>65</td>
<td>31</td>
</tr>
</tbody>
</table>

When asked why they used addons, most players with disabilities indicated that managing the UI played an important role in how they were able to interact with the game (see Appendix G for a full list of responses). Oftentimes that management was simply changing the placement of things on the screen, but several explained that addons that assisted in planning or explaining the world played a key role for them. As with some other questions on the instrument, there are responses to this question that appear to misunderstand what was being asked (for instance by complaining that a specific addon wasn’t working for them at the time they took the survey), though the majority of the responses are applicable to the research.
A dominant theme among the responses was the ability to save time, though most did not elaborate on what that specifically means to them. The responses also included some comments regarding the use of addons to overcome specific issues related to their reported disability (ability to move the mouse, etc.). Another theme was convenience, and here we get more details from some of the respondents, such as the following:

- “Because they allow me to manage my gaming time more efficiently, which is very important as I can't play for very long, perform or automate routine actions with less clicks/keybinds, and also play better, such as in raids when they give me advance warning about mechanics so I can prepare myself to move.”

- “I find the icons and layout of the default UI hard to interpret, I can use addons to make a cleaner and more streamlined display that only shows what I need to see.”

- “Addons make mouse only gaming easier. Changes to UI scales, placement, lowered mouse movement, etc. all make clicking faster & more efficient.”

- “To make the screen more visually clear; To reduce distracting UI elements; To locate resources between characters; To explain boss fights; To communicate with other players (both chat-mods and DBM)”

An analysis according to the principles of Universal Design for Learning of those addons identified earlier through the method of this research gives us a tool with which we may unpack some of these themes. There are 32 potential identifiable actions within the three UDL principles on which each addon could be rated. The process of identifying these principles within the addons created a scale based on how many of the principles were found within each addon. This scale suggests some addons are “more UDL” than others in that they meet more UDL criteria than other addons. One addon exhibited all UDL principles but one.
Let’s look in depth at two of the addons on opposite side of the scale: Deadly Boss Mods (31 of 32 UDL principles identified) and _NPCScan (9 UDL principles identified).
Deadly Boss Mods (DBM)

Deadly Boss Mods is an addon that provides alerts and information during raid boss fights and other special encounters. It is meant as a supplement to the information already provided by the default *World of Warcraft* UI and is customizable by the player to suit their particular needs. Supplements to the addon exist for other types of encounters, such as PVP and Pet Battles. The addon is described on Curse.com using some of the following points:

- Colored raid warnings (players will be colored according to their class) with icons - so you will know what's going on without even reading the message
- Auto-respond during boss fights. DBM will inform anyone who whispers you during a boss fight that you are busy. These messages contain the name and health of the boss as well as the raid’s status
- Bars can be enlarged with decent effects when they are about to expire
- Crash recovery: you had a disconnect or crash during a boss fight? No problem for DBM! It will request the timer and combat status information from other DBM users in your raid group and you get your timers back
- Synchronization system for accurate timers
- Modular design - all boss mods are plugins and can be exchanged, removed or updated separately
- Special effects like the screen flash effect, huge warning messages and sounds will draw your attention to critical events
- Bars can change their color over time and flash before they expire
- There are many bar designs to choose from, all designs are are customizable: you can change the color, size, icon position etc.
- Support for SharedMedia, so you can use any texture for your bars
- Option to create custom timers, so-called "Pizza Timers" for your pizza or whatever you prefer to eat while raiding. You can also send those timers to your raid group (Curse.com)

At the level of play that includes regular raiding it is expected that players will spend time learning the special abilities of the bosses and the mechanics of the boss fights. This often includes understanding the sequence of events that are programmed
to occur during that encounter so that the player can be prepared for when to fight and when to take some sort of defensive action. Deadly Boss Mod is meant to manipulate the feedback data presented during boss encounters from the game in a significant number of ways, many of which could be useful for players with disabilities. A number of significant key words and phrases can be spotted from the description alone. These include “bars can be enlarged,” “auto-respond,” “screen flash,” etc. The description makes explicit the addon’s ability and intent to manage information presented to the player and to assist with sharing information (timers) and communicating with other players (auto-respond).

Further, the addon description is explicit in describing its ability to provide options for alternatives to auditory and visual information. For instance, “special effects like the screen flash effect, huge warning messages and sounds will draw your attention to critical events” describes how auditory and visual information can be transposed depending on the needs or preferences of the user. This change in information delivery can also assist in comprehension of the default textual cues, of which there are many, within some of the boss encounters.

Another example of how comprehension and the ability to process language and symbols is aided is through the conditional recoloring of text and bars so that one can see by color the class of a different player instead of just reading the icon for them (defining symbols) and by flashing timer bars that are about to expire (guiding information processing). The timers and audio and visual cues could also be considered
memory and transfer aids. Timers are often essential to the effective execution of pre-
planned strategies and for the coordination of effort among players participating in the
encounter.

The only principle not found in Deadly Boss Mod is UDL Principle 2.4, options
that promote cross-linguistic understanding. While there may be addons that allow for
translation within the chat window they are typically not necessary for play since
Activison Blizzard creates localized (geographically and linguistically) servers for like
groups of players. For instance there are servers for North America and Asia
(geographic localization), and also European servers dedicated to the major languages
of the region (Spanish, French, German, English, etc., linguistic localization). None of
the addons reviewed as part of this research include this principle for this reason.

_NPCScan

_NPCScan (the underscore is an official part of the addon name) helps players
find rare NPCs and monsters in the game world. It works in the background and when it
detects a mob within its scanning range with the appropriate name, determined in the
preferences, it gives the player an alert. These mobs are usually rare or unique
creatures that provide special or significantly improved items when defeated, or that are
necessary to defeat for an in-game achievement of some sort. From the addon
description on Curse.com:

“Found” Alert
When a rare mob is found, _NPCScan alerts you by playing a loud and distinctive sound, making your screen pulse red, and displaying an animated Targeting Button.

**Targeting Button**

When clicked, the targeting button tries to target the most-recently-found mob. You can also bind a key to hit this button. If the default button position isn't to your liking, you can move it while holding your CTRL key…

**Search List**

The list of mobs that _NPCScan searches for can be modified easily through the Interface Options panel, however it comes pre-configured with most rare Outlands and Northrend mobs.; To access the mob list, type “/npcscan”. Grayed out NPCs in a list aren't being searched for, either because they're cached or not needed for their achievement… (Curse.com)

Unlike Deadly Boss Mod, _NPCScan provides feedback to the player only outside of combat. The purpose isn’t to assist in combat but rather to aid in achieving other goals, such as meeting the requirements of certain Achievements (an in-game badging system) or to gain better equipment once the monster is defeated, or to find specific NPCs for quests. The in-game UI has started to take on some of these tasks but _NPCScan gives the player greater flexibility in which targets they wish to track and
by tying the targets directly to Achievements so that they can, at a glance, see how much more work is required to accomplish their goal.

Functionally the intent of _NPCScan is much simpler than Deadly Boss Bod so it therefore meets fewer of the UDL principles. As with most of the addons reviewed it provides several options for perception, providing both audio and visual cues for the information it tracks. Language and symbol flexibility, however, are missing, as are most options for comprehension. However the addon does provide options that activate background knowledge tied to knowing what targets are required to meet certain goals.

Multiple means of action and expression are also missing with the exception of aiding in executive function. Here again we see the principles of goal-setting and planning and strategy development in achieving goals strongly represented within the purpose of the addon, and monitoring progress (in this case, of Achievements) is explicit in the description. While an argument might be made for _NPCScan’s ability to aid in problem solving for quest tracking purposes, it is tenuous enough to not be considered for this research.

Many of the criteria of Principle III, multiple means of engagement, are also missing from _NPCScan, though we do see goal-setting represented in the options. Here again we see some criteria that can be argued as represented, such as heightening the salience of goals and objectives or reducing threats and distractions. However I did not consider them so obvious as to be required to be counted and therefore did not. Had they been included the adherence to UDL principles for
_NPCScan would have been comparable to Postal, and addon that allows the player to significantly change the textual interaction within the game.

**Players with Disabilities and Their Play Styles**

As discussed earlier, the concept of flow can also be considered a result of a player’s immersion within the virtual game world environment. We have argued that the state of flow in a player demonstrates a deep identity relationship with the player’s character and its environment. Therefore those elements that measure immersion can also be used to discuss a player’s identity relationship with their character. Yee’s inventory calls out 4 subcategories related specifically to immersion and which were measured in our research population.

We will now look at the differences between two subgroups of players with a disability, addon users and non-users, on Yee’s immersion inventory. First, of those players that did use addons 55.1% regarded them as very or extremely important. Just under a third, at 29.4%, regarded them as neither important nor unimportant. The remainder, 15.5%, did not consider playing *World of Warcraft* with addons very important at all.

*Table 10 - Importance of addon usage to players with a disability*

<table>
<thead>
<tr>
<th>Importance</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all Important</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>Very Unimportant</td>
<td>27</td>
<td>14.4</td>
</tr>
<tr>
<td>Neither Important nor Unimportant</td>
<td>55</td>
<td>29.4</td>
</tr>
<tr>
<td>Very Important</td>
<td>61</td>
<td>32.6</td>
</tr>
<tr>
<td>Extremely Important</td>
<td>42</td>
<td>22.5</td>
</tr>
</tbody>
</table>
We find the groups to be similar when discussing role-playing. Just under half of players with a disability who use addons often or always role-play their character (49.7%) while 55.6% of those who don’t use addons do the same. These high percentages are not in line with the breakdown of players who play on roleplaying dedicated servers. This suggests that even on PVP or PVE servers, players with a disability find some outlet for roleplaying as part of their regular gaming experience. It also suggests that players with disabilities, regardless of their addon usage, feel connected enough to their avatars to wish to more fully immerse themselves in them through role-play.
Table 11 - Role-playing inventory items

How enjoyable is it trying out new roles and personalities with your characters?

<table>
<thead>
<tr>
<th></th>
<th>Addon Users</th>
<th></th>
<th>Non-Users</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Valid %</td>
<td>Frequency</td>
<td>Valid %</td>
</tr>
<tr>
<td>Not Enjoyable At All</td>
<td>3</td>
<td>1.6</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Slightly Enjoyable</td>
<td>23</td>
<td>12.3</td>
<td>7</td>
<td>3.3</td>
</tr>
<tr>
<td>Moderately Enjoyable</td>
<td>70</td>
<td>37.4</td>
<td>185</td>
<td>88.5</td>
</tr>
<tr>
<td>Very Enjoyable</td>
<td>56</td>
<td>29.9</td>
<td>12</td>
<td>5.7</td>
</tr>
<tr>
<td>Tremendously Enjoyable</td>
<td>35</td>
<td>18.7</td>
<td>5</td>
<td>2.4</td>
</tr>
</tbody>
</table>

How important is being immersed in a fantasy world to you in the game?

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Valid %</th>
<th>Frequency</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Important At All</td>
<td>3</td>
<td>1.6</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Slightly Important</td>
<td>16</td>
<td>8.5</td>
<td>4</td>
<td>2.0</td>
</tr>
<tr>
<td>Moderately Important</td>
<td>62</td>
<td>33.0</td>
<td>83</td>
<td>40.7</td>
</tr>
<tr>
<td>Very Important</td>
<td>67</td>
<td>35.6</td>
<td>115</td>
<td>56.4</td>
</tr>
<tr>
<td>Tremendously Important</td>
<td>40</td>
<td>21.3</td>
<td>2</td>
<td>1.0</td>
</tr>
</tbody>
</table>

How often do you make up stories and histories for your characters?

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Valid %</th>
<th>Frequency</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>3</td>
<td>1.6</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Seldom</td>
<td>13</td>
<td>7.0</td>
<td>4</td>
<td>2.0</td>
</tr>
<tr>
<td>Sometimes</td>
<td>74</td>
<td>39.8</td>
<td>84</td>
<td>41.2</td>
</tr>
<tr>
<td>Often</td>
<td>58</td>
<td>31.2</td>
<td>112</td>
<td>54.9</td>
</tr>
<tr>
<td>Always</td>
<td>38</td>
<td>20.4</td>
<td>4</td>
<td>2.0</td>
</tr>
</tbody>
</table>

How often do you role-play your character?

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Valid %</th>
<th>Frequency</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>5</td>
<td>2.7</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Seldom</td>
<td>11</td>
<td>5.9</td>
<td>63</td>
<td>30.7</td>
</tr>
<tr>
<td>Sometimes</td>
<td>78</td>
<td>41.7</td>
<td>28</td>
<td>13.7</td>
</tr>
<tr>
<td>Often</td>
<td>57</td>
<td>30.5</td>
<td>109</td>
<td>53.2</td>
</tr>
<tr>
<td>Always</td>
<td>36</td>
<td>19.3</td>
<td>5</td>
<td>2.4</td>
</tr>
</tbody>
</table>

The standout discrepancy among this inventory group is a player’s enjoyment in trying out new roles and personalities with their avatars. While a sizeable number, 48.7%, of addon users rate this as a very or highly enjoyable experience, only 8.1% of non-addon users rate the activity similarly highly. I cannot find any explanation for this difference in the collected data and suggest it may be an avenue of future research.
Table 12 - Customization inventory items

How much do you spend time customizing your character during character creation?

<table>
<thead>
<tr>
<th></th>
<th>Addon Users</th>
<th></th>
<th>Non-Users</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Valid %</td>
<td>Frequency</td>
<td>Valid %</td>
</tr>
<tr>
<td>A Little</td>
<td>14</td>
<td>7.4</td>
<td>7</td>
<td>3.3</td>
</tr>
<tr>
<td>Some</td>
<td>59</td>
<td>31.4</td>
<td>77</td>
<td>36.7</td>
</tr>
<tr>
<td>A Lot</td>
<td>71</td>
<td>37.8</td>
<td>121</td>
<td>57.6</td>
</tr>
<tr>
<td>A Great Deal</td>
<td>44</td>
<td>23.4</td>
<td>5</td>
<td>2.4</td>
</tr>
</tbody>
</table>

How important is it to you that your character’s armor / outfit matches in color and style?

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Valid %</th>
<th>Frequency</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Important At All</td>
<td>3</td>
<td>1.6</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Slightly Important</td>
<td>16</td>
<td>8.5</td>
<td>5</td>
<td>2.4</td>
</tr>
<tr>
<td>Somewhat Important</td>
<td>67</td>
<td>35.4</td>
<td>85</td>
<td>40.3</td>
</tr>
<tr>
<td>Very Important</td>
<td>67</td>
<td>35.4</td>
<td>117</td>
<td>55.5</td>
</tr>
<tr>
<td>Extremely Important</td>
<td>36</td>
<td>19.0</td>
<td>4</td>
<td>1.9</td>
</tr>
</tbody>
</table>

How important is it to you that your character looks different from other characters?

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Valid %</th>
<th>Frequency</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Important At All</td>
<td>4</td>
<td>2.1</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Slightly Important</td>
<td>33</td>
<td>17.5</td>
<td>6</td>
<td>2.8</td>
</tr>
<tr>
<td>Somewhat Important</td>
<td>59</td>
<td>31.2</td>
<td>86</td>
<td>40.8</td>
</tr>
<tr>
<td>Very Important</td>
<td>53</td>
<td>28.0</td>
<td>113</td>
<td>53.6</td>
</tr>
<tr>
<td>Extremely Important</td>
<td>40</td>
<td>21.2</td>
<td>6</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Like the role-playing inventory, we find little difference between the two groups when examining their preferences for customization of their avatar. A majority of both groups (61.2% of addon users, 60% of non-addon users) report spending a lot or a great deal of time customizing their avatar during the character creation process. There are also only marginal differences between the groups when reporting how important it is to them that their character’s outfit matches or that their avatar looks different from that of other players, though a slight majority of both report that these factors are very or somewhat important. This may be in line with the role-playing inventory findings where players with disabilities are very interested, as a group, in their avatar and may be
emotionally investing in it. Again we do not have enough data in this research to answer this question adequately and suggest it for future inquiry.

Table 13 - Escapism inventory items

How important is escaping from the real world to you in the game?

<table>
<thead>
<tr>
<th></th>
<th>Addon Users</th>
<th></th>
<th>Non-Users</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Valid %</td>
<td>Frequency</td>
<td>Valid %</td>
</tr>
<tr>
<td>Not Important At All</td>
<td>6</td>
<td>3.2</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Slightly Important</td>
<td>19</td>
<td>10.1</td>
<td>8</td>
<td>3.9</td>
</tr>
<tr>
<td>Moderately Important</td>
<td>61</td>
<td>32.4</td>
<td>83</td>
<td>40.1</td>
</tr>
<tr>
<td>Very Important</td>
<td>60</td>
<td>31.9</td>
<td>111</td>
<td>53.6</td>
</tr>
<tr>
<td>Tremendously Important</td>
<td>42</td>
<td>22.3</td>
<td>5</td>
<td>2.4</td>
</tr>
</tbody>
</table>

How often do you play so you can avoid thinking about some of your real-life problems or worries?

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Valid %</th>
<th>Frequency</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>1</td>
<td>0.5</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Seldom</td>
<td>15</td>
<td>8.0</td>
<td>62</td>
<td>30.2</td>
</tr>
<tr>
<td>Sometimes</td>
<td>74</td>
<td>39.6</td>
<td>26</td>
<td>12.7</td>
</tr>
<tr>
<td>Often</td>
<td>74</td>
<td>39.6</td>
<td>115</td>
<td>56.1</td>
</tr>
<tr>
<td>Always</td>
<td>23</td>
<td>12.3</td>
<td>2</td>
<td>1.0</td>
</tr>
</tbody>
</table>

How often do you play to relax from the day’s work?

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Valid %</th>
<th>Frequency</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>3</td>
<td>1.6</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Seldom</td>
<td>17</td>
<td>9.1</td>
<td>38</td>
<td>18.7</td>
</tr>
<tr>
<td>Sometimes</td>
<td>75</td>
<td>40.1</td>
<td>49</td>
<td>24.1</td>
</tr>
<tr>
<td>Often</td>
<td>57</td>
<td>30.5</td>
<td>110</td>
<td>54.2</td>
</tr>
<tr>
<td>Always</td>
<td>35</td>
<td>18.7</td>
<td>6</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Here again we find little noticeable difference between the two groups of players with a disability. Escapism ranks high for both groups, with those who do not use addons slightly higher when reporting play to relax from the day’s work (57.1% versus 49.2% of addon users). More non-addon users also report playing often or always to avoid thinking about real-life problems or worries (57.1% as opposed to 51.9% of non-addon users). The importance of escaping from the real world was very or tremendously
important to nearly the same majority between the two groups (54.3% of addon users, 56% of non-addon users).

Interestingly, while some identity immersion factors are higher in players with disabilities who use addons, this was not always the case. There were some distinct differences between components of immersion between the two groups. Generally, players with disabilities who did not use addons almost never responded completely with the negative on the inventory.
Table 14 - Discovery inventory item responses

How much do you enjoy exploring the world just for the sake of exploring it?

<table>
<thead>
<tr>
<th></th>
<th>Addon Users</th>
<th></th>
<th>Non-users</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Valid %</td>
<td>Frequency</td>
<td>Valid %</td>
</tr>
<tr>
<td>Not At All</td>
<td>1</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A Little</td>
<td>11</td>
<td>5.9</td>
<td>6</td>
<td>2.9</td>
</tr>
<tr>
<td>Some</td>
<td>75</td>
<td>39.9</td>
<td>186</td>
<td>89</td>
</tr>
<tr>
<td>A Lot</td>
<td>58</td>
<td>30.9</td>
<td>12</td>
<td>5.7</td>
</tr>
<tr>
<td>A Great Deal</td>
<td>43</td>
<td>22.9</td>
<td>5</td>
<td>2.4</td>
</tr>
</tbody>
</table>

How much do you enjoy finding quests, NPCs or locations that most people do not know about?

<table>
<thead>
<tr>
<th></th>
<th>Addon Users</th>
<th></th>
<th>Non-users</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Valid %</td>
<td>Frequency</td>
<td>Valid %</td>
</tr>
<tr>
<td>Not At All</td>
<td>1</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A Little</td>
<td>13</td>
<td>6.9</td>
<td>6</td>
<td>2.9</td>
</tr>
<tr>
<td>Some</td>
<td>77</td>
<td>41</td>
<td>183</td>
<td>88</td>
</tr>
<tr>
<td>A Lot</td>
<td>49</td>
<td>26.1</td>
<td>18</td>
<td>8.7</td>
</tr>
<tr>
<td>A Great Deal</td>
<td>48</td>
<td>25.5</td>
<td>1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

How much do you enjoy collecting distinctive objects or clothing that have no functional value in the game?

<table>
<thead>
<tr>
<th></th>
<th>Addon Users</th>
<th></th>
<th>Non-users</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Valid %</td>
<td>Frequency</td>
<td>Valid %</td>
</tr>
<tr>
<td>Not At All</td>
<td>1</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A Little</td>
<td>23</td>
<td>12.2</td>
<td>5</td>
<td>2.4</td>
</tr>
<tr>
<td>Some</td>
<td>74</td>
<td>39.4</td>
<td>189</td>
<td>90</td>
</tr>
<tr>
<td>A Lot</td>
<td>46</td>
<td>24.5</td>
<td>14</td>
<td>6.7</td>
</tr>
<tr>
<td>A Great Deal</td>
<td>44</td>
<td>23.4</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

How enjoyable is it for you exploring every map or zone in the world?

<table>
<thead>
<tr>
<th></th>
<th>Addon Users</th>
<th></th>
<th>Non-users</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Valid %</td>
<td>Frequency</td>
<td>Valid %</td>
</tr>
<tr>
<td>Not Enjoyable At All</td>
<td>1</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Slightly Enjoyable</td>
<td>11</td>
<td>5.9</td>
<td>3</td>
<td>1.4</td>
</tr>
<tr>
<td>Moderately Enjoyable</td>
<td>71</td>
<td>38</td>
<td>131</td>
<td>62.4</td>
</tr>
<tr>
<td>Very Enjoyable</td>
<td>53</td>
<td>28.3</td>
<td>73</td>
<td>34.8</td>
</tr>
<tr>
<td>Tremendously Enjoyable</td>
<td>51</td>
<td>27.3</td>
<td>3</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Generally the addon users in our population are explorers, more interested in discovery than non-addon users. The differences for this component are striking. For example, 55.6% of our addon users find it very to tremendously enjoyable to explore
every map or zone in the game world while only 36.2% of non-addon users are similarly stimulated. When asked a slightly different way the difference is even more striking.

53.7% of addon users enjoy exploring the world “a lot” or “a great deal” just for the sake of exploring it as opposed to only 8.1% of non-addon users. This is somewhat surprising in that in the course of exploring a zone or map a player is awarded an Achievement for discovering all of the sections of that particular map. If that were the only motivation at play here then one would expect the addon users’ reported enjoyment of exploration just for the sake of exploration to drop similar to that of the non-addon users. Since it does not, it may suggest that as a group the addon users are more inquisitive or at least interested in the details of and perhaps more invested in the virtual world.

The differences between the two groups is much more than expected when asked how much they enjoy finding quests, NPCs or locations that most people don’t know about. Just over half, 51.6%, of our addon users report at least a lot of enjoyment out of this activity, while only 9.3% of non-addon users similarly enjoy it. Given that _NPCScan was prominently mentioned by respondents and that addon assists in this type of gameplay the reporting of enjoyment by the addon users is not a surprise. Since these types of experiences (rare quests and NPCs) can provide unique though non-capacitive rewards for their discovery this may also explain the difference in responses between the two groups when asked whether they enjoy collecting these types of items or not (47.9% as opposed to 7.7%).
When a principal component analysis was completed on the inventory item responses for players with disabilities who use addons, two distinct dimensions were derived. With pattern component absolutely greater than .40 used for interpretation purposes no item in the inventory loaded on more than one component. All but two inventory produced loading above .74 and .63 component correlation. Component One includes the majority of the inventory items and completely encompasses the Escapism and Customization inventories. However Component Two is comprised completely of Discovery inventory items plus one element of the Roleplaying inventory.
Table 15 - Principal Component Analysis of Inventory Responses

<table>
<thead>
<tr>
<th>Inventory Item</th>
<th>One</th>
<th>Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance of Character looks compared to others</td>
<td>.787</td>
<td>.115</td>
</tr>
<tr>
<td>How often do you play to avoid real-life issues</td>
<td>.954</td>
<td>-.215</td>
</tr>
<tr>
<td>How important in the game is escaping from the real world</td>
<td>.826</td>
<td>.021</td>
</tr>
<tr>
<td>How often do you role-play your character</td>
<td>.879</td>
<td>-.010</td>
</tr>
<tr>
<td>How often do you play to relax from work</td>
<td>.740</td>
<td>.086</td>
</tr>
<tr>
<td>How important is that your characters outfit matches in color</td>
<td>.791</td>
<td>.005</td>
</tr>
<tr>
<td>How often do you make up stories/histories for your characters</td>
<td>.540</td>
<td>.300</td>
</tr>
<tr>
<td>How important is it to be immersed in the fantasy world</td>
<td>.776</td>
<td>.098</td>
</tr>
<tr>
<td>How much time do you spend customizing your character during creation</td>
<td>.772</td>
<td>-.047</td>
</tr>
<tr>
<td>How much do you enjoy finding quest, NPC’s or locations others do not know</td>
<td>.047</td>
<td>.873</td>
</tr>
<tr>
<td>How much do you enjoy collecting distinctive objects or clothing that have no functional value in the game</td>
<td>.092</td>
<td>.750</td>
</tr>
<tr>
<td>How much do you enjoy exploring the world – simply to explore the world</td>
<td>-.053</td>
<td>.884</td>
</tr>
<tr>
<td>How enjoyable is it to try out new roles and personalities with your characters</td>
<td>.257</td>
<td>.618</td>
</tr>
<tr>
<td>How enjoyable is it exploring every map or zone in the world</td>
<td>-.189</td>
<td>.954</td>
</tr>
<tr>
<td>Alpha Reliability</td>
<td>.93</td>
<td>.89</td>
</tr>
</tbody>
</table>

Component Correlation = .63

This solution demonstrates a marked distinction in the discovery element of participation for players with disabilities who use addons. For these players the immersion in the environment is strong enough that they feel a sense of agency that frees them to explore what the environment has to offer. This motivation does not
appear to be tied to specific game rewards. Rather, it suggests a feeling of empowerment. Note that the role-playing inventory item that aligned with this component relates to trying out new roles and avatar personalities. Normally this level of personal exploration would not be anticipated from a person who felt uncomfortable navigating their physical or social environment.

This is noteworthy because it gives an indication of the immersion enabled by the use of addons related to Research Question #3, “Do players with disabilities who manage their experience with addons have a ‘deeper’ identity immersion experience with the game than players with disabilities who do not?” These data suggest that addon users with disabilities have a deeper experience with the game than players with disabilities who do not take advantage of addons. This means that Blizzard has created an environment capable of facilitating users with disabilities. Developers who create virtual worlds that are educational or entertainment focused and who do not consider the involvement of those with disabilities because of a belief that these types of environments simply cannot be navigated by the disabled do so based on what appears to be a flawed assumption.
Study Challenges and Limitations

While I encountered several challenges in this research they did not negatively impact the work. As noted earlier this population has many reasons to protect their privacy, especially if they are trying to avoid unwanted negative attention. I gather here the challenges I faced as guidance for others wishing to do additional research on this population.

*Difficulty in reaching the target population*

Reaching and engaging the target population was a challenge. While several organizations, including some dedicated to the support of video game players with disabilities, were contacted to request assistance in distributing the instrument only one replied. Timing may have been an issue, as may the method of communication. It is also possible that some agencies have very conservative internal policies about connecting this population with researchers in order to safeguard and protect their privacy. Regardless, there is a lingering challenge for researchers to reach the video game players with a disability population without significant resources or incentives which themselves can create additional challenges. As noted earlier, there were respondents who identified as a player with a disability that had characters at the maximum level of the game. This suggests that the survey did indeed reach players with disabilities who are very familiar with the game environment and suggests that further research on this demographic could benefit from identifying similar disability-specific channels (Twitter handles, websites, etc.) when distributing instruments.
In regards to this study in particular, for the first 6 weeks the survey was available there was little response. By the end of the 6 weeks only 13 people had taken the survey, too small a number to provide useful reference and generalizable data. In May I applied for and received a Texts and Technology Dissertation Research grant funded by the UCF College of Arts and Humanities and the College of Graduate Studies. The grant enabled me to fund an incentive for taking the survey. The funding provided for 200 $10 gift cards to the US Amazon.com store. The incentive worked better than expected but also created some unexpected challenges, discussed later. The survey was re-distributed through the same channels as before over Memorial Day 2014 weekend with the incentive information included. The result was over 600 additional responses in three days. The survey was then closed and initial data collection ended on Memorial Day, May 26, 2014.

**Challenges related to the incentive**

The challenges the incentive created were twofold. First, the total number of responses after the incentive was offered exceeded the grant award amount. Unfortunately there was no language in the announcement or on the instrument that would have limited the number of gift cards. Therefore everyone who responded to the instrument was eligible for the incentive. UCF IRB guidance was to honor all reasonable responses to the survey. In hindsight some text indicating a cutoff, such as “the first 200 responses,” would have limited my liability and the costs that had to be covered for the incentives.
In order to receive the incentive, however, respondents to the survey were required to provide a valid email address. The incentive message indicated the gift cards would be distributed by email. Therefore I emailed all respondents a message in mid-July informing them that I needed to verify that the email address provided was active and accurate in order to avoid sending the gift cards to accounts that could not redeem them. Receivers of that email message were asked to reply to the email from the actual email address provided in their response.

This created the second challenge resulting from the incentive. There were 608 responses to that email. However only 583 emails were sent out. This clearly indicated some potential fraud at work. A close analysis of the reply emails found several addresses that were “spoofed.” In this case spoofing is defined as the sender trying to appear to be sending from one email address when actually sending from another. It is possible that some of these addresses were aliases for other addresses but per the verification message I did not send a gift card to any email account that was not actually in the from field in the email header. Also excluding those addresses that did not respond, the total number of gift cards sent was reduced to 545.

*Lack of follow-up responses*

As mentioned previously, a request for additional information on addon use was sent to a sample of respondents who offered to provide such information in the instrument, but only one response was received. A possible reason for the lack of response was that this query was not associated with an incentive, unlike the full
survey. There was also a similar question in the instrument that solicited information about how the respondent used addons, but the intent was to be brief in the instrument and considerably more detailed in the follow-up email. This may not have been clear to respondents.

Incomplete responses

There were also a considerable number of questions regarding avatar race, class, and specification left unanswered by a majority of respondents. This is likely due to the particular formatting of the survey instrument. In order to answer these questions you first had to answer the one before in what the survey tool calls a “drill down” question style. While this prevented nonsense answers such as listing a Horde race when the respondent had indicated they played as an Alliance, it may also have created an unexpected hurdle for some respondents, particularly if web browsing was a challenge for them.
CONCLUSIONS

I explored three questions at the beginning of this research:

1) Do players with disabilities make extensive use of interface addons in World of Warcraft to manage their game experience;

2) How do addons address the specific disabilities of the player; and

3) Do players with disabilities who manage their experience with addons have a “deeper” identity immersion experience with the game than players with disabilities who do not?

In regards to Q1, just under half of the respondents to this research who are World of Warcraft players with a disability use addons as a regular part of their play. While this may count as “many” for some purposes it does not constitute a majority. Some disability subcategories are more likely to make use of addons but the general players with a disability category do not.

A more impactful finding of this research deals with my second question, understanding how addons address specific needs related to the abilities of players.Addon usage was higher among the non-disabled respondents than it was in the subset of players with a disability. Categorization of addons using the Principles of Universal Design for Learning found considerable overlap in the purpose of addons and most of the Principles of UDL. Most interesting about this finding, though, is that the UDL principles identified emerged organically from the addon creator community. The creators of the addons did not design them with UDL in mind. This suggests that there has been and likely continues to be opportunity for improvements in the design of the
user interfaces of virtual game worlds and other virtual spaces that does not negatively impact the experience of most users yet still benefits those with a disability who come to these environments.

The strongest finding of this research comes from Q3. There is significant evidence that players with disabilities who use addons have a more meaningful immersive experience with the virtual world. This is significant because it suggests that this versatile approach to UI design may enable more effective virtual environments in the future, especially for those environments created for educational purposes. It also should diminish the credibility of assumptions about the ability of those with disabilities to interact with these types of environments. If users with disabilities have difficulty navigating a virtual environment the findings of this study suggest that we should reconsider the design of the interface for the environment instead of the abilities of the users.

Extending theory

The results show that Peterson’s cognitive theory approach to avant-garde film comprehension and consumption has influence here. Peterson grounds his argument in the idea that avant-garde viewers practice a sort of problem solving when watching films. They are able to “solve” these problems and get meaning from the films based on heuristics learned from repeated exposure to the medium. I hold that the longevity of World of Warcraft has allowed a heuristics to evolve around and through interaction with the game’s virtual world. Additionally this has allowed an inferential system of meaning
to develop within the game that makes the diversity of current addons possible. This inferential system has also therefore enabled the evolution of the UDL principles within the addons because the meaning of information within the virtual world (character health, etc.) can be abstracted from the “official” code of the standard UI and redefined according to whatever principles the addon creator wishes to use. This system is most powerful when used to address deficiencies in the standard design for players with disabilities but most importantly, the system works for any player of the game because all players share those heuristics. It is just that this particular set of players, those with disabilities, see specific significant benefit.

It is possible that the inferential system at work in World of Warcraft can be found in other virtual world games. Since a system of inferential meaning would take time and repeated exposure to develop and the medium has been around for more than a decade, and there is evidence that other game designers have taken World of Warcraft’s design into consideration as they create their systems, it is reasonable to assume that the same inferential systems have propagated through the industry. One potential avenue for exploring this possibility is identifying other games released since World of Warcraft that allow for a similar UI addon model and looking for evidence of UDL principles within those addons.

Another approach, and in my opinion the one with the greatest potential impact, would be to identify a learning virtual world environment that is at least a few years old where the interface could be modified by a researcher to work in a similar way to World
of Warcraft’s UI and addon system. The advantage here would be an existing base of
users in an environment already primed for UDL implementation. A researcher can
watch addon iterations over time to see if any of the principles emerge and look for
connections to an inferential system of meaning related to WoW that is not apparent
through the standard UI. The disadvantage here is that a player’s time and emotional
engagement and investment in a learning environment is likely less than that of a
commercial game. It is possible that an addon community would not evolve without
some prodding by the researcher.

Lessons for UI designers

Given that an inferential system of meaning likely already exists in virtual world
development, and that the commercial success of World of Warcraft has had a
significant impact on that system in the past 10 years, it would be advantageous for
future (and current) virtual world UI designers to pay considerable heed to the
emergence of UDL principles in the addon system. It’s important for UI designers to
understand the UDL does not create a framework for separate interfaces but rather
encourages flexibility within the existing environment that can meet a diverse set of
needs. By providing “multiple means” of doing something within the world one is
ensuring that the largest number of people can interact with the virtual environment.
This is desirable from a philosophical, accessibility viewpoint but also from a more
practical, business one as well: the more people that can interact with your virtual world,
the more people who are likely to buy it. There doesn’t have to be a loser in this
consideration and in fact a well-executed strategy of openness could even enhance the product and the publisher’s standing.

I do see this issue of flexible interface design as a more critical one for virtual worlds meant for education and learning. In this area I would recommend that publishers closely consider the inferential systems of meaning of these environments and from that consideration develop a common standard for flexible UI design. This might include a shared API library or at the very least a common understanding and implementation of the major elements of the UI function (navigating the virtual worlds, exploration tools such as opening or interacting with objects, etc.). In conjunction with a user development community similar to the addon community for World of Warcraft it should then be possible to broaden the appeal and impact of these types of systems. The goal is not to make all educational or learning environments look the same. Rather the goal is building a base framework upon which those with very specific needs can get the same educational experience as everyone else using that system.

Avenues for Future Research

Disability subtypes and identities as gamers

There were not enough respondents to this research to do good generalizations for specific subtypes of players with disabilities, such as blind or manual dexterity-challenged players. Since this research suggests some differences between these groups it may be beneficial to conduct targeted research towards these subtypes. This
would help to fill in some of the missing explanation for differences between the
subtypes suggested by this research. It would also be useful to gain a better
understanding of the attitudes and views video game players generally have towards
those with disabilities, for instance are they more or less favorable to these people than
the general population. If the answer is less that may help to explain some of the
difficulty I had in connecting with this population for my research and could hopefully
suggest more effective methods of reaching them in the future.

It would also be beneficial to investigate more deeply how players within the four
disability categories used for this research (visual, aural, manual dexterity, cognitive)
came to choose that particular category (or did not choose one at all). For instance,
were any of the players who identified as a person with a visual disability colorblind? Did
all players who are colorblind identify as a player with a disability? While the Americans
with Disabilities Act defines many types of disability under law that does not mean that
individuals that meet the ADA criteria think of themselves as disabled. It may therefore
be more advantageous in the future to pursue research about this population using
different terminology and / or messaging.

Addons created specifically by or for gamers with disabilities

No addons created specifically for use by players with a disability were
discovered as part of this research, but that doesn’t mean they do not exist or have
never existed in the past. Since the addon inventory at Curse.com was first done for this
research the number of addons listed on the site has decreased by nearly 2000. This
suggests that addon lifespans are finite and that there is historical data yet to be mined. It is possible that some addons have been created in the past with players with a disability specifically in mind and then later incorporated into current addons but not documented.

Choice of server type (PvP or PvE) among players with a disability

Most of the players with disabilities reported playing on PvP servers. As discussed in The Warcraft Environment section of the introduction, if players with disabilities were especially concerned with their ability to manage their avatar in the virtual world one would assume they would avoid PvP servers because of the increased opportunity for griefing in the virtual world on these types of servers. The specific reason for this cannot be determined from this research. However this could be yet more evidence suggesting that at least in World of Warcraft players with disabilities do not see themselves at a particular disadvantage when playing with the able-bodied in the virtual world. More research into this area is suggested.

Closing Remarks

A lesson to be learned from the World of Warcraft example is that an invested and dynamic user community can help to create these player remediations. It is even arguable that they can do a better job of this than an intentional UI designer within the firm since the collective experience of the user base is inherently richer and more diverse than a company can hope to build with a single UI development team. In striking
a balance between user configurability and protecting the integrity of the game, Blizzard Entertainment created an environment where nearly anyone can play a videogame, even the completely blind. By taking these findings into our practice we can create learning environments equally inviting to and effective for everyone.
Approval of Exempt Human Research

From: UCF Institutional Review Board #1
FWA00000351, IRB00001138

To: Don Merritt

Date: March 28, 2014

Dear Researcher:

On 3/28/2014, the IRB approved the following activity as human participant research that is exempt from regulation:

- **Type of Review:** Exempt Determination
- **Project Title:** The Impact of User-Generated Interfaces on the Participation of Disabled Users in Virtual Environments
- **Investigator:** Don Merritt
- **IRB Number:** SBE-14-10150
- **Funding Agency:**
- **Grant Title:**
- **Research ID:** NA

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB.

When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual. On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Signature applied by Patria Davis on 03/28/2014 03:11:20 PM EST

IRB Coordinator
APPENDIX B – RESEARCH INSTRUMENT
Q1 EXPLANATION OF RESEARCH

Title of Project: The Impact of User-Generated Interfaces on the Participation of Disabled Users in Virtual Environments

Principal Investigator: Don Merritt, PhD candidate
Faculty Supervisor: Rudy McDaniel, PhD

You are being invited to take part in a research study. Whether you take part is up to you.

The purpose of this study is to explore how disabled users (broadly defined) play the World of Warcraft. Specifically, we want to see how these players interact with the user interface and their immersiveness in the environment of the game.

You will be asked to complete an online survey that asks some basic demographic information (age, type of disability, where you live, etc.) along with information about your WoW character and how you play the game. We will also ask what addons or macros you use, if any. You will be given the opportunity to volunteer to be interviewed by the researcher at the end of the survey. The survey will finish in May and interviews will be conducted via email through June. The research will be complete by October 2014. Respondents to this survey will be offered a $10 gift card to the US Amazon.com store, to be delivered electronically by email. You do not have to answer every question or complete every task.

It will take about 20 minutes to complete the survey. You must be 18 years of age or older to take part in this research study.

Study contact for questions about the study or to report a problem:

If you have questions, concerns, or complaints you may contact Don Merritt, PhD candidate, Texts and Technology PhD program, College of Arts and Humanities, 813-803-2524 or donmerrittucf@knights.ucf.edu or Dr. Rudy McDaniel, Faculty Supervisor, Texts and Technology PhD program at 407-823-0218 or by email at rudy@ucf.edu.

IRB contact about your rights in the study or to report a complaint:

Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

You may print this page for your records.

☐ I agree to participate in the research. (1)
☐ I do not wish to participate in the research. (0)

If I do not wish to participate... Is Selected, Then Skip To End of Survey
Q2 This set of questions is to gather some basic information about the types of people who play WoW.

Q3 As of today, what is your age? Please enter your answer as a number.

Q4 Do you currently live in the United States?
   ☐ Yes (1)
   ☐ No (0)

Q5 With what gender do you identify?
   ☐ Male (1)
   ☐ Female (2)
   ☐ Other (3) ____________________

Q6 Do you identify as a person with a disability?
   ☐ Yes (1)
   ☐ No (0)
   If No Is Selected, Then Skip To How many years have you played World ...

Q7 What category or categories would you consider best describes your type of disability? You may select more than one. These are broad categories and are not meant to perfectly describe your situation but rather to give the researcher an idea of the types of challenges you may encounter when playing WoW.
   ☐ Visual (blindness, color blindness, etc.) (1)
   ☐ Auditory (deafness, tinnitus, etc.) (2)
   ☐ Manual dexterity (amputations, limited arm mobility, paraplegic, etc.) (3)
   ☐ Cognitive (dyslexic, PTSD, etc.) (4)
   ☐ Other (5) ____________________

Q8 If you use special hardware to play, such as a special keyboard or other input device specific for your disability, or if you use off-the-shelf devices in a non-standard way please include that information here.

Q9 How many years have you played World of Warcraft (WoW)?
   ☐ Less than 1 (.5)
   ☐ 1 (1)
   ☐ 2 (2)
   ☐ 3 (3)
   ☐ 4 (4)
   ☐ 5 (5)
   ☐ 6 (6)
   ☐ 7 (7)
   ☐ 8 (8)
   ☐ 9 or more (9)
Q10 How many WoW characters do you have currently? This is the total number of characters on all realms on all your accounts (if you have multiple accounts). Please enter this answer as a number.

Q11 On what operating system do you play WoW?
- Mac OSX (1)
- Windows (2)
- Other (3) ________________

Q12 This set of questions is intended to gather information about your main or most frequently played character. You will not be asked your character name or the name of the server on which you play to help protect your privacy. If you do not currently play WoW then please include the information for the character that was your main when you stopped playing.

Q13 What is your main / most frequently played character's current level? Please enter this answer as a number.

Q14 On what type of server is your main / most frequently played character?
- PVE (1)
- PVP (2)
- RP (3)
- RP-PVP (4)

Q15 What is your main / most frequently played character's:
- Faction
- Race
- Gender
- Class
- Specialization

Q16 What crafting professions (if any) does your main / most frequently played character have and at what level is the profession?

<table>
<thead>
<tr>
<th>Profession</th>
<th>Does not have</th>
<th>1 - 150 (1)</th>
<th>151 - 300 (2)</th>
<th>300 - 450 (3)</th>
<th>451 - 600 (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alchemy (1)</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
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<td>☒</td>
</tr>
<tr>
<td>Blacksmithing (2)</td>
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<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Enchanting (3)</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Engineering (4)</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
<tr>
<td>Inscription (5)</td>
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<tr>
<td>Jewel Crafting (6)</td>
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<tr>
<td>Leatherworking (7)</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
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<tr>
<td>Tailoring (8)</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
<td>☒</td>
</tr>
</tbody>
</table>
Q17 What gathering professions (if any) does your main / most frequently played character have and at what level is the profession?

<table>
<thead>
<tr>
<th>Profession</th>
<th>Does not have (0)</th>
<th>1 - 150 (1)</th>
<th>151 - 300 (2)</th>
<th>300 - 450 (3)</th>
<th>451 - 600 (4)</th>
</tr>
</thead>
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<td>Herbalism (1)</td>
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<td>○</td>
<td>○</td>
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<tr>
<td>Mining (2)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Skinning (3)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Q18 What minor professions (if any) does your main / most frequently played character have and at what level is the profession?

<table>
<thead>
<tr>
<th>Profession</th>
<th>Does not have (0)</th>
<th>1 - 150 (1)</th>
<th>151 - 300 (2)</th>
<th>300 - 450 (3)</th>
<th>451 - 600 (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archaeology (1)</td>
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<td>○</td>
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</tr>
<tr>
<td>Fishing (4)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Q19 This set of questions will gather information on your use of addons or macros in WoW.

Q20 Do you now or have you ever used addons when playing WoW?
○ Yes (1)
○ No (0)

If No Is Selected, Then Skip To Macros

Q21 How important are addons to your enjoyment when playing World of Warcraft?
○ Not at all Important (1)
○ Very Unimportant (2)
○ Neither Important nor Unimportant (3)
○ Very Important (4)
○ Extremely Important (5)

Q22 Why do you use addons?

Q23 Approximately how long have you used addons?

Q24 Where do you get your addons? If you get your addons from a website please include the URL for that site. You may include multiple sites. If you create your own addons please include that here too.

Q25 What addons do you use?

Q26 Do you now or have you ever used macros when playing WoW?
○ Yes (1)
○ No (0)

If No Is Selected, Then Skip To End of Block
Q27 How important are macros to your enjoyment when playing World of Warcraft?
- Not at all Important (1)
- Very Unimportant (2)
- Neither Important nor Unimportant (3)
- Very Important (4)
- Extremely Important (5)

Q28 Why do you use macros?

Q29 Approximately how long have you used macros?

Q30 Where do you get your macros? If you get your macros from a website please include the URL for that site. You may include multiple sites. If you create your own macros please indicate that here.

Q31 The next sets of questions will help us understand how you enjoy playing the game. There are several questions in each set. Please take your time to think about your responses.
Q32 How important is it to you...

<table>
<thead>
<tr>
<th></th>
<th>Not Important At All (1)</th>
<th>Slightly Important (2)</th>
<th>Somewhat Important (3)</th>
<th>Very Important (4)</th>
<th>Extremely Important (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>to be grouped rather than soloing? (1)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>to be well-known in the game? (2)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>to use a character builder or a template to plan out your character's advancement at an early level? (3)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>to know the precise numbers and percentages underlying the game mechanics? (i.e., chance of dodging an attack, the math comparing dual-wield to two-handed weapons, etc.) (4)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>that your character is as optimized as possible for their profession / role? (5)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>that your character can solo well? (6)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>that your character's armor / outfit matches in color and style? (7)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>that your character looks different from other characters? (8)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
Q33 How much do you...

<table>
<thead>
<tr>
<th></th>
<th>Not At All (1)</th>
<th>A Little (2)</th>
<th>Some (3)</th>
<th>A Lot (4)</th>
<th>A Great Deal (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>spend time customizing your character during character creation?</td>
<td></td>
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</tr>
<tr>
<td>(1)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>enjoy working with others in a group? (2)</td>
<td></td>
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<tr>
<td>(2)</td>
<td>○</td>
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<tr>
<td>enjoy leading a group? (3)</td>
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<tr>
<td>(3)</td>
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<tr>
<td>take charge of things when grouped? (4)</td>
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<tr>
<td>(4)</td>
<td>○</td>
<td>○</td>
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<tr>
<td>enjoy exploring the world just for the sake of exploring it? (5)</td>
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<tr>
<td>(5)</td>
<td>○</td>
<td>○</td>
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<tr>
<td>enjoy finding quests, NPCs or locations that most people do not know about? (6)</td>
<td></td>
<td></td>
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<tr>
<td>(6)</td>
<td>○</td>
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<tr>
<td>enjoy collecting distinctive objects or clothing that have no functional value in the game? (7)</td>
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<tr>
<td>(7)</td>
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Q34 How important are the following things to you in the game?

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<th>Not Important At All (1)</th>
<th>Slightly Important (2)</th>
<th>Moderately Important (3)</th>
<th>Very Important (4)</th>
<th>Tremendously Important (5)</th>
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</thead>
<tbody>
<tr>
<td>Leveling up your character as fast as possible (1)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
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<tr>
<td>Acquiring rare items that most players will never have (2)</td>
<td>o</td>
<td>o</td>
<td>o</td>
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<td>o</td>
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<tr>
<td>Becoming powerful (3)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Accumulating resources, items or money (4)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Knowing as much about the game mechanics and rules as possible (5)</td>
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<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Having a self-sufficient character (6)</td>
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<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
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<tr>
<td>Being immersed in a fantasy world (7)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Escaping from the real world (8)</td>
<td>o</td>
<td>o</td>
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</table>
Q35 How enjoyable are the following things to you in the game?

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<th>Activity</th>
<th>Not Enjoyable At All (1)</th>
<th>Slightly Enjoyable (2)</th>
<th>Moderately Enjoyable (3)</th>
<th>Very Enjoyable (4)</th>
<th>Tremendously Enjoyable (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helping other players (1)</td>
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<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Getting to know other players (2)</td>
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<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Chatting with other players (3)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Competing with other players (4)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Dominating / killing other players (5)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Exploring every map or zone in the world (6)</td>
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<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Being part of a friendly, casual guild (7)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Being part of a serious, raid / loot-oriented guild (8)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Trying out new roles and personalities with your characters (9)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Doing things that annoy other players (10)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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</tbody>
</table>
Q36 How often do you...

<table>
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<tr>
<th></th>
<th>Never (1)</th>
<th>Seldom (2)</th>
<th>Sometimes (3)</th>
<th>Often (4)</th>
<th>Always (5)</th>
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</thead>
<tbody>
<tr>
<td>... find yourself having meaningful conversations with other players? (1)</td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>... talk to your online friends about your personal issues? (2)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>... get support from online friends when you have a real life problem? (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>... make up stories and histories for your characters? (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>... role-play your character? (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>... play so you can avoid thinking about some of your real-life problems or worries? (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>... play to relax from the day's work? (7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>... purposefully try to provoke or irritate other players? (8)</td>
<td></td>
<td></td>
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</table>

Q37 To receive the US Amazon.com store gift card please provide an email address to be used to redeem the gift in the text box below. If you would like to volunteer additional information for use in the survey you may leave a valid email address in the field below and check the box indicating your willingness to provide additional information. Your privacy will be respected and protected if you choose to remain anonymous. This is entirely voluntary.

Q38 May we contact you at the email address above to further discuss how you use addons?
- Yes, I am willing to further discuss how I use addons in *World of Warcraft*. (1)
- No, please do not contact me later. (0)
APPENDIX C – FOLLOW-UP EMAIL REQUESTING ADDITIONAL ADDON USAGE INFORMATION
Thank you for agreeing to provide more information about how you play World of Warcraft. In your response, you indicated that you play using specific addons, mods or macros. We would like to know more about how and why you use them. We are trying to understand what each one allows users to do that they could not do without it. This may or may not be related to the disability you identified in your response.

Please list the addons, mods or macros you use and then after each provide a description of what it allows you to do that you could not do without it. Please share with us whether or not that ability is related to the disability you identified in your response to the survey.

For instance:

1. Bartender4
   - I use it to work around only having 1 hand
   - I use it to let me move the action bars around so that I don’t have to move the mouse as far between each bar, since it’s hard for me to use both the mouse and the keyboard at the same time.

2. TradeSkillMaster
   - It has nothing to do with my disability
   - I use it to make more gold on the auction house

Your description or explanation may be as detailed as you like but it is ok to be brief.

We would also be interested in any other comments you may have about being a person with a disability who plays WoW. Any insight you can offer into your perspective on the game and its community would be greatly appreciated.

Thanks,

Don
APPENDIX D – LIST OF ADDONS FROM CURSE.COM AS OF FEBRUARY 19, 2014
<table>
<thead>
<tr>
<th>Addon Name</th>
<th>Monthly Downloads</th>
<th>Total Downloads</th>
<th>Created</th>
<th>Likes</th>
<th>Version Support</th>
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<tbody>
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<td>79,171,248</td>
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<td><strong>Bagnon</strong></td>
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<td><strong>Tidy Plates</strong></td>
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<td>14,505,067</td>
<td>22 Nov 2009</td>
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</tr>
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<td><strong>Deadly Boss Mods - Burning Crusade and Vanilla mods</strong></td>
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<td>14,859,998</td>
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<td><strong>LibSharedMedia-3.0</strong></td>
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<td>1,754,991</td>
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<td><strong>Deadly Boss Mods - Cataclysm mods</strong></td>
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<td>5,205,724</td>
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<td>15,719,780</td>
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<td><strong>Addon Control Panel</strong></td>
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<td>5,966,012</td>
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<td><strong>MoveAnything</strong></td>
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<td>4,179,528</td>
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<td><strong>Deadly Boss Mods - Wrath of the Lich King mods</strong></td>
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<td><strong>PetTracker</strong></td>
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<td>Omen Threat Meter</td>
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<td>Titan Panel</td>
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</tbody>
</table>
APPENDIX E – ADDONS REPORTED BY RESPONDENTS
Reported addons

1. _NPCScan.Overlay
2. ACE3
3. AchievElt
4. Ackis Recipe List
5. Action Bar Mods
6. addon studio for *World of Warcraft*
7. adibag
8. Afterlife Crowd Control
9. Altoholic
10. Archy
11. ArenaStyle
12. ArkInventory
13. AskMrRobot
15. Auctionator
16. Auctionator
17. auctionlite
18. aurora
19. AutoAssistLite
20. AutoRepair
21. BadBoy
22. Bag search addon
23. Bagnon
24. BarovHelper
25. Bartender
26. Beta-version AddOns
27. BigBrother
28. Bigwigs
29. BobBars
30. box
31. Browse Addon Packs
32. Buff, Debuff, Spell
33. ButtonFacade
34. Carbonite
35. Chat Mods and Buff, Debuff, Spell.
36. Chatter
37. ClassTimer
38. Clique
39. collectme
40. Combuctor
41. Combustion Helper
42. Cooldown Count
43. CoolLevelUp
44. Coordinates
45. CT_RaidAssist
46. Cursor
47. DAB
48. DailyQuestCounter
49. DBM
50. DeadlyBossMods
51. Decursive
52. DRTracker
53. EasyMail
54. ElvUI
55. EVENTALERTMOD
56. Farmhand
57. fbngBuffFrame
58. FlyoutButtonCustom
59. FramesResized
60. Gatherer
61. GathererDB
62. GatherMate2
63. GatherMate2_Data
64. Masque
65. GetToThePoint
66. Gladius
67. GladSA
68. grid
69. Group, Guild & Friends
70. GryphonsRemover
71. HaloPro
72. Halven UI pack
73. HandyNotes
74. HealBot
75. Healium
76. Higher HotKey
77. HighValue
78. IdiotCheck
79. ImprovedtableFrame
80. InterruptBar
81. InterruptTracker
82. ItemLevelDisplay
83. Juked
84. Junk Seller
85. KeepingTabs
86. Leatrix Plus
87. Livestock
88. Loremaster
89. LoseControl
90. mapster
91. Microbar Enhancement
92. MiirGui
93. Mini Games, ROFL
94. Minutiae
95. MogIt
96. More powerful
97. myslef combination
98. Nice Damage
99. NPC-Silencer
100. NPCScan
101. oBar
102. Omen
103. OmniCC
104. OneClickEnchantScroll
105. OpenRDX Ace
106. oqueue
107. Otis
108. oUF_P3lim
109. Ovale SpellFlash
110. Overachiever
111. PetJournal Enhanced
112. Pitbull4
113. PlayerScore
114. PoMonitor
115. Postal
116. Prat
117. Quartz
118. Quest Helper Lite
119. QuestHelper
120. QuestHelperLight
121. QuestMaster
122. QuestMyMap
123. QuestNoise
124. Raid Mods
125. RaidBuffStatus and
126. Comergy
127. RareS0
128. ReagentRestocker
129. Recount
130. reforgelite
131. rQuestWatchFrameover
132. sActionBar
133. SavedInstances
134. SexyMap
135. ShadowedUF
136. ShestakUI
137. SilverDragon
138. Skada
139. Skada Damage Meter
140. SkadaCCTracker
141. SLDT
142. Smartunitframe
143. SmoothQuest
144. SpellFlash
145. StealPurgeDispel
146. Stuf
147. SuperLoot
148. Tank Compilations
149. TellMeWhen
150. Tidy Plates
151. Titan Panel
152. TomTom
153. TradeSkill Mods
154. TradeSkillDW
155. TradeSkillMaster
156. Utility Mods
157. VoidTransmog
158. Volumizer
159. Vudho
<p>| | |</p>
<table>
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<tr>
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<td>161</td>
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<td>162</td>
<td>whoa UnitFrames</td>
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<td>163</td>
<td>WoWCube</td>
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<td>WoWHead</td>
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<td>xanMortarPestle</td>
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<td>166</td>
<td>ZoneLevelInfo</td>
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</table>
Hello, and thank you for participating a few weeks ago in my research study:

**The Impact of User-Generated Interfaces on the Participation of Disabled Users in Virtual Environments.**

Click here to see the explanation of the research again

Because you took the survey you are eligible for a $10 gift card to the US Amazon.com store to this email address:

username@emailprovider.com

To verify that this is a valid and active email account, please reply to donmerrittucf@knights.ucf.edu from the above email address before Friday, August 1 at 11:59pm. You must reply from the email address submitted when you filled out the survey. Limit one gift card per email address.

You may opt out by clicking here

Gift cards will be sent to valid email addresses in early August. We will not send a gift card to addresses from which we do not receive a reply by the due date.

Thanks,
Don Merritt, PhD candidate
Texts and Technology PhD program
UCF College of Arts and Humanities
donmerrittucf@knights.ucf.edu
APPENDIX G – RESPONSES TO WHY PLAYERS USE ADDONS
1. WoW Cube (17cube) addons for *World of Warcraft*. Its delicious experience is designed for wow players
2. very useful
3. v
4. Trying out new roles and personalities with your characters
5. To make the screen more visually clear
   - To reduce distracting UI elements
   - To locate resources between characters
   - to explain boss fights
   - To communicate with other players (both chat-mods and DBM)
6. to be well-known in the game
7. to be well-known in the game
8. They enhance my game play. They make it easier to play the game.
9. The way a player use to control game.
10. Strengthening game Accessibility
11. spend time customizing my character during character creation?
12. save much time
13. save much time
14. Quick Upgrade
   - Enhancing properties of various skills
15. outfit matches in color and style
16. oh, my character looks different from other characters
17. my character looks different from other characters or players
18. My character looks different from other characters
19. My character is as optimized as possible for their profession
20. My character can solo well
21. Mostly out of convenience/necessity, even though I use some visual addons as well.
22. More powerful
23. More convenient play game
24. makes me strong
25. Make the game playable
26. Make the game more smooth.
27. Make the game experience better
28. make game easier
29. Make a game experience more personalized
30. look likes cool than other players
31. look likes cool than before
32. look likes beautiful than before
33. Leveling up my character as fast as possible
34. Let the game become more interesting
35. let my character looks different from other plays.
36. let my character looks different from other characters
37. let me like WOW more and more
38. let me like WOW more
39. Let me be more convenient operation
40. Let me and other players make different
41. let me character looks different from other characters.
42. le me character can solo well
43. I'd like to be well-known in the game
44. keep it to where our games are really simple, so many people can enjoy playing them
45. it's very useful
46. It's helped me to focus on playing the game
47. it looks very beautiful.
48. it is good for me
49. It is convenient.
50. It helps me to save time
51. it can save much time when i playing game
52. it can save much time for me
53. it can help me when I play
54. it can help me
55. Improve the gameplay of our favorite network game.
56. Improve skills Properties
57. If there is no addons, you can not complete the task of WOW
58. I've been trying to import nodes for days now, and nothing is importing, despite the fact that it did before.
59. i would like to becoming beautiful.
60. I would take charge of things when grouped
61. I want to know the precise numbers and percentages underlying the game mechanics
62. I want to doing things that annoy other players.
63. I want to character looks different from other characters
64. I want to be well-known in the game, and addons very helpful
65. I want to be well-known in the game
66. I use addons to statistics DPS, automatic routing, and change some UI
67. i think use addons could help me play WOW More easily
68. i think addons is very helpful to me
69. I find the icons and layout of the default UI hard to interpret, I can use addons to make a cleaner and more streamlined display that only shows what I need to see.

   I have trouble multi-tasking so I need raiding addons to show me timers so I know when o react

   and magenuggets reminds me to keep self-buffed & spellsteal
70. I enjoy collecting distinctive objects or clothing that have no functional value in the game.
71. i can use it more freedom.sometimes instead of the mouse.
72. i can use a lot of addons to save some times when playing.
73. i can save a lot of time.
74. i can save a lot of time and it is convinient.
75. I can play the game more freedom and can see the blood volume and so on
76. I can learn some special skills.
77. I can learn more skills.
78. I can do some special things.
79. I CAN SAVE A LOT OF TIME
80. Get more perfect game experience
81. Get more high-quality epic experience
82. For example, if there is no DECURSIVE, the first BOSS of MC can be destroyed easily?
83. Enjoy exploring the world just for the sake of exploring it
84. Enhancing the role of attack and defense, and finally win the victory
85. Enhanced achievement, detection of rare elite
86. Enhance the role of the level, strengthening property and equipment
87. Enhance the performance of a variety of skills
88. Enhance the game comes with team frame interface
89. Easy to win a game
90. Easy to use
91. Easier to figure things out.
92. Easier interface
93. Doing things that annoy other players
94. Customizing my character
95. Create personalized interface
   - Enhancing properties of various skills
96. Convenient
97. Character can solo well
98. Cancel hostile cast time
99. Cancel cooldown, Cancel hostile cast time
100. Can help me solve some problem
101. Being immersed in a fantasy world
102. Becoming powerful
103. Becoming beautiful
104. Because they allow me to manage my gaming time more efficiently, which is very
     important as I can't play for very long, perform or automate routine actions with less
     clicks/keybinds, and also play better, such as in raids when they give me advance
     warning about mechanics so I can prepare myself to move.
105. Beautify the interface, the interface becomes a game of my own personality
106. Beautify the interface
   - Enhancing properties of various skills
107. Addons make the game simple
108. Addons make the game easier to play and give me important information that the
     base game doesn't offer
109. Addons make mouse only gaming easier. Changes to UI scales, placement,
     lowered mouse movement, etc. all make clicking faster & more efficient.
110. Addons is very useful to me
111. Addons can beautify my interface
112. 1 beautify the interface
2 for more information.
3 enhanced gaming experience
113. can reduce the operational burden on the player
114. customizing my character
APPENDIX H – UDL CATEGORIZATION MATRIX
| Curse rank | Addon Name                      | Response mention | 1.1 | 1.2 | 1.3 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 3.1 | 3.2 | 3.3 | 3.4 | 4.1 | 4.2 | 4.3 | 5.1 | 5.2 | 5.3 | 6.1 | 6.2 | 6.3 | 6.4 | 7.1 | 7.2 | 7.3 | 8.1 | 8.2 | 8.3 | 8.4 | 9.1 | 9.2 | 9.3 | UDL score |
|------------|--------------------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1          | Deadly Boss Mods              | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 31 |
| 18         | Decursive                      | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 29 |
| 19         | HealBot Continued              | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 29 |
| 20         | Gladius v3                     | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 28 |
| 5          | Tidy Plates                    | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 26 |
| 16         | GTFO                            | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 25 |
| 3          | Recount                        | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 24 |
| 25         | Skada Damage Meter             | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 24 |
| 31         | Quartz                         | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 23 |
| 17         | Bartender4                     | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 22 |
| 4          | Baggon                         | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 21 |
| 14         | Ackis Recipe List              | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 21 |
| 9          | Auctioneer                     | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 18 |
| 15         | AtlasLoot Enhanced             | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 17 |
| 24         | AskMrRobot                     | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 17 |
| 11         | MoveAnything                   | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 13 |
| 13         | PetTracker                     | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 12 |
| 28         | Postal                         | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 11 |
| 10         | Addon Control Panel            | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 10 |
| 2          | _NPCScan                       | x                | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | x   | 9  |

Table 16 - Full matrix of UDL principles identified in the addons
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APPENDIX J – ADDITIONAL BACKGROUND ON GAME CLASSES AND RACES
As an example of the implications of server choice on gameplay, if one is playing on any type of PvP server one can be attacked at almost any time by a player from the opposite faction. This means one must constantly be “on alert” and situationally aware of one’s environment to avoid getting “ganked,” which is the act of surprise attacking a player from the opposite faction. It is not uncommon to hear complaints from all players about getting ganked by higher-level and therefore more powerful players when trying to move through an outdoor area in the world. Repeatedly ganking a player, especially a lower-level one, is one form of “griefing,” or playing only to cause grief to or harass another player. The only exception to this manner of play is in areas called “sanctuaries” where PvP is disabled or otherwise prohibited by the programmers. These areas tend to be places where players from opposite factions would necessarily congregate peacefully within the narrative of the world, like some neutral cities that would have their own guards intent on keeping the peace and attacking any player character that attacks or causes damage to another.

On a PvP server, two or more players from different factions can fight each other directly and without warning. They can also fight one another on non-PVP servers but the players must either enter tell the system they want to participate in PVP fights through an in-game selection or enter a world area where players are automatically flagged for PVP, though these areas are rare. Players from different factions also cannot form a group to fight together in a dungeon though the most recent expansion, *Mists of Pandaria*, did introduce a game mechanic where out in the world players from both factions can fight what are called “world bosses,” extremely powerful monsters in
common areas that are a threat to both factions. However, it is still possible to accidentally (or intentionally) strike a player from the opposite faction during one of these world boss fights. On a PVP server, this accidental attack could lead to a very chaotic dual-melee situation.

The Horde is decidedly less human and more “mongrel”: Orcs, Trolls, Forsaken (reanimated dead, mostly humans, who have a specific narrative of recovered free will within the game world), Tauren (two-legged humanoid cow-like creatures), Goblins, and Blood Elves (very human-like and the exception to the rest). Like the Draenei, the Orcs are not native to Azeroth but were originally invaders from another world, called Draenor.

Previous game titles from Blizzard Entertainment covered the Orc invasion and explained that during the invasion they were called The Horde (now referred to as the “Old Horde”) and were under the influence of demonic beings using them as a weapon and intent on destroying Azeroth, hence the “planet-hopping.” The Old Horde lost and at the end of that war their planet was mostly destroyed, though some remnants are still accessible within the game. These remnants, and the story of the life left on them, comprised the first expansion of the World of Warcraft game and was called The Burning Crusade.

The Burning Crusade also introduce the Draenei and Blood Elf races and a change in faction dynamics in most servers. Before this expansion the majority of players chose to play Alliance races, which was problematic on PvP servers since the
Horde were considerably outnumbered and therefore Horde players found themselves often the target of ganking in the world. After the introduction of the more-human Blood Elves, the balance between factions evened out across most servers.

Within the narrative of the game world, after being trapped on Azeroth, the Orcs were subjugated by the humans until a young orc leader named “Thrall” rose to lead the orcs to both freedom and the promise of a more noble existence. His adventures bring him in contact with the Tauren and Trolls and later the undead of the Forsaken. Together they form the new Horde, dedicated to the preservation of their races. This combination of narrative history and non-human races lent a very “noble savage” feel to the Horde and Horde-character gameplay in the early years of the game, though with the later addition of the Blood Elves, Goblins and the recently-introduced Pandaren this has been watered down a bit.

The newest expansion, *Mists of Pandaria*, has introduced a race than can choose its faction after creation, the panda-themed Pandaren. This means there can now be members of the same race on opposing factions. From a play point of view, one always knew whether another player was an ally or not based solely on their race, though there are other means of determining alliance. Now that line is blurred somewhat, which only has an impact on PvP servers, albeit a minor impact at best. Otherwise the choice of avatar race is always tied to choice of faction – Humans are always Alliance, Orcs are always Horde, etc. There has been some player debate as to the “nobility” of one faction versus the other, which is heavily influenced by the narrative
as played out within the game. Besides racial traits that provide an in-game benefit and the cosmetic, narrative, and self-representational differences, there is little impact on the way the game can be played as a member of one faction or the other.

“Classes” are the vocations of avatars and are consistent with what one might expect of a fantasy world game. There are Warriors adept at fighting, Mages (magic users), Priests who can heal, martial-arts masters called Monks, and Paladins, the “holy” warriors of the narrative. Class choice is usually limited by race choice (see Table 2). Some races can also choose to become a Shaman, master of the elements and able to manipulate earth and wind; Druid, a shape-shifter who are attuned to nature and can transform into a bear, a lion-like cat or a bird; Warlocks, who derive their power from the demonic and can even summon demons as servants; and Hunters, who perhaps seem a bit out of place at first but here they are defined as masters of the beast, able to tame even the wildest of creatures who then fight alongside the player. Not all classes are available to all races. For instance, Orcs cannot be paladins; Night Elves cannot be warlocks, etc.
The group roles and responsibilities of each class are further determined by a specialization of that class. The druids, for example, can choose to be Guardian Druids where their bear form is their primary role and they are the tanks of their groups, or they can choose to be Restoration Druids, where their primary responsibility is that of the healer of the group. There are 696 possible combinations of race, gender, class and specialization in *World of Warcraft*, though given that there are no game-mechanic differences between genders there are 348 gameplay impactful choices of avatar. Of those, there are 35 different specializations among the classes (each class has three specializations except druids, who have four).
Each of the 35 variations comes with specific unique abilities to that specialization. Each ability has an optimal use-case, whether it be the timing of the use of the ability against a particular monster or the use in combination with the abilities of other players. Each ability also has individual visual and audible effects to help differentiate them from the others during the chaotic moments of a big battle. This helps players to better coordinate their efforts, and Blizzard Entertainment has designed most of these encounters to require the close coordination of all involved in the fight. For these “boss fights” all engaged players are required to play to the best of their ability in order to ensure the success of the entire group. There is little room for non-serious play at this top level of the game, called “end-game content.”

As you can see this is a very complex game with many different interconnected methods for interacting with the world and other players. Navigating this world could be a challenge for any player, not just a player with a disability. Since the game is a subscription service it is in Blizzard Entertainment’s best interest to make the game as accessible as possible to the widest possible audience. As mentioned previously, they often introduce changes to the game mechanics, sometimes to simplify managing one’s character and experience. However as will be described in this research, the most significant way a player can manage their experience is through the use of user-created addons.
REFERENCES


