

The Psychology of Play: Understanding Digital Game Evolution through Developmental Psychology

Lindsay D. Grace

American University Game Lab
Washington, DC, 20015, USA
Grace@american.edu

Brooke R. Spangler

Miami University Psychology Department
Oxford, OH 45056
Spanglbr@muohio.edu

ABSTRACT

The purpose of this research is to demonstrate how the pattern of play technologies follows the patterns of play types in developmental psychology. This research provides an overview of dominant theories in developmental psychology and offers evidence of its parallel in play modalities adopted by electronic game audiences. The fundamental benefit of such framing is the potential to offer a future facing understanding of the next generation of play technologies within a variety of environments. Here the researchers have chosen to demonstrate this evolution through the history of arcade game play. However, the researchers conclude with a brief demonstration of how similar developmental stages have been demonstrate in the evolution of portable game systems and home console game interfaces.

This approach describes game design and player preference not as evolutionary, but as developmental. It demonstrates game design and player preference through a developmental framework, which mirrors the maturation of an individual. Players mature into new play modalities in much the way humans mature into play stages.

Categories and Subject Descriptors

K.2.5 [Computing Milieux]: History of Computing-Theory

General Terms

Documentation, Design, Human Factors, Theory

Keywords

Psychology of play, video game design psychology, arcade game design, developmental design theory, design history

1. Introduction

Typically the evolution of play technologies has been understood as a product of social systems and scientific maturation. While this perspective has proven somewhat true in retrospect, it does not offer game designers much to predict the future needs of game players. This may be due to the fact that play technologies are distinct from other types of technologies. Play, from a psychological perspective, is a set of developmental traits indicated by behavior. The development of play within humans

can be demarcated by distinct milestones.

Developmental psychology has accepted four types of play that remain unchanged since their initial documentation eighty years ago. These are non-social play, parallel play, associative play, and cooperative play [1]. Non-social play is generally defined as solitary play involving and initiated solely by the player. Parallel play involves individuals playing next to each other, but without direct interaction or any type of sharing. Associative play requires participants to play near each other, potentially sharing the objects of play items, but not sharing the same goals of play. Cooperative play involves participants that share both play objects and play goals.

As children mature, they move through these phases beginning with solitary play and finishing with cooperative play. These types of play are not mutually exclusive. They are also not deprecated as a child matures. It is, for example, developmentally appropriate that an adult engages in any one of these types of play.

In a recent study [2], school-aged children (between the ages of 6 and 11) were observed at school and at home to examine the types of play and the context of play within the various settings. The children were found to engage in object play most frequently (66.1%) and static play (15.3%) while at home. Not surprisingly, while at home, children spent the majority of their time playing without an adult (approximately 55% of the time), and approximately 40% of their time playing was on their own.

These developmental stages are as much about the individual player as they are about how the player engages in his or her local play community. It is common for children at differing developmental play stages to employ varied play preferences within the same community. A group of very young children may elect to engage in solitary play in a sandbox, while older children cooperatively build a castle in that same sandbox.

What is most important is the relative affinity between these stages of play development and the historical stages of play development witnessed in play technologies. It may be that just as humans develop into an understanding of more complicated play, they also develop into an understanding of more complicated play technologies.

2. Arcade Game History and the Development of Play Preference

The history of arcade game play is an appropriate place from which to begin this understanding. It is a history that is well documented [3,4] and widely dispersed. It is also a history that is greatly affected by social factors, but not dominated by them.

2.1 Solitary Play

While much debate arises around which game is considered the original digital arcade game, for this history we credit the 1971 commercial release of Computer Space [5]. When compared to its predecessors, Computer Space is the only digital arcade game to attempt wide distribution. Unlike Space Wars, it was not the luxury of academics [6], but instead attempted to find presence in the same space in which subsequent arcade games resided, local bars.

Interestingly, this game's design is distinctly solitary play. Gameplay was designed for a single player. The case and screen on which the game was played did not encourage others to watch as the single player played. This is in retrospect an odd choice for a technology intended to compete with the ostentatious pinball machines which shared their successes and failures visually and sonically with onlookers. Instead, Computer Space is a concentrated solitary experience that does little to invite others.

It is not until the introduction of arcade Pong in 1973 [7] that arcade games begin to flourish. The design featured some elements that were essential to successfully evolving arcade play from a solitary experience to something that supported spectator play. The experience of Pong did more to help players understand the notion of video arcade play than its predecessor, despite Computer Space's appearance in the major motion picture, *Soylent Green* [8].

Pong could be a solitary play experience in player versus computer mode. It could also be a two-player game. This is essential in understanding its relationship to the developmental stages of play. Pong could be played alone, but it afforded players the luxury of sharing the game's toy, a pixel ball, between two players. While anecdotes are the only proof of this social interaction it is reasonable to consider that most people were introduced to Pong by watching others play it. Much like a ball on a playground, or a shovel in a sandbox, the digital experience of Pong allowed early adopters to play by themselves, but afforded the ability to share the toy. Simply by supporting, but not requiring two players, the game was designed to support onlookers. A player who wanted to know more, but did not want to play, could stand where a second player would.

Structurally, Pong featured a video screen that was less recessed than its predecessor. Where Computer Space required a personal space invading over the shoulder stare, the case in which the original Pong was placed provided more viewing angles for players and non-players. In developmental psychology Pong supports spectator play. Spectator play is a more advanced form of solitary play, which could illustrate the phase between solitary play and parallel play. Spectator play is still solitary play, but you could argue that it gets the individual's focus on others- or their joint attention- which is essential for more complex play.

This also relates to social learning theory, a theory in psychology that relates to the ways humans learn through social interactions [9]. As related to game play, solitary experiences are not social, as games become more social so do the mechanisms involved. For instance, it is typical that when first exposed to an arcade game, an individual watched another expert play. Consistent with emulation, an aspect of social learning theory, an individual plays the game with the same goal in mind, but does not use the same

methods to reach that goal [10]. An individual may watch another play a video game and learn the goal, but vary the approach in which to complete the game.

2.2 Parallel Play

Shortly thereafter, Space Invaders [11] was introduced. Space Invaders is most notably attributed with the rise of the video game arcade. Pong and Computer Space were often installed as individual, stand-alone machines. Demand for Space Invaders was so strong that players waited in line to play. This birthed the traditional game arcade, a bank of the same video game machine arranged for multiple players. Space Invaders not only moved the arcade game from the dark corners of bars, it helped create its own cramped space near the sidewalks of Tokyo and New York City [12]. Such positioning not only promoted spectator play, it also promoted the development of parallel play.

The first banks of video game machines were not a varied collection of the greatest hits. Instead they were rows of Space Invaders. They created a space where friends could engage in the same activity, but pursue their own separate goals. It is important to realize that Pong, a two-player game, did not give rise to the arcade. It was the one-player experience of Space Invaders that did.

Arcade game players move from solitary play to parallel play. Even when two-player game modes were available, it was far more common for games to offer separate game experiences. The model was that player one played, then player two played. Players could play asynchronously on the same machine, or in parallel in two different game worlds.

This model dominates arcade play with the introduction of Galaxian [13], Pac-Man [14] and others. The experience is clearly synonymous with psychology's parallel play. A trip to the arcade with a friend meant each would play their own game in parallel.

This cultural artifact is extraordinarily apparent in the player notion of my game. Unlike the experience of traditional board games like Chess, arcade game players did not share a game. The common phrase reads "it is my game next" or "I'd like next game" instead of requesting the next turn or round. Play in an arcade at the time was sequential and separate.

2.3 Associative Play: Level 1

The development toward associative play occurred most prevalently in 1986. It was at this time that Midway introduced Rampage [15], a game that supported up to three players. In Rampage, players played within the same space, but competed. Each player worked to inflict the most damage on the central toy, a pixelated city populated with victims and military opponents. Players could choose to cooperate, but the game's design biases toward individual achievement. There is no opportunity for a single player to save another player, for example. Players could also hit and inflict damage on each other. Although working for Williams Electronics at the time, former Midway designer Eugene Jarvis helped create a similarly structured associative play game, called Smashed TV [16].

Arcade game designs had primarily matured through associative play until their decline in the late 1980s. Few, if any games offered any more than solitary play, parallel play, or associative

play. It was not until the arcade game's rebirth in the early 1990s that these games matured into the next developmental stage.

2.4 Associative Play: Round Two

Fighting games such as Street Fighter [17] and Mortal Kombat [18] offered players a new experience. They not only supported players in two-player experiences, they were designed around it. The fundamental draw of such games came from a combination of elements. They supported spectator play simply because they were engaging dances to watch. They were full of unexpected displays and variety, sharply contrasted with the predictable experience predecessors like Double Dragon [19].

They also supported associative play, because players had to share their game toy, a chosen fighting character, with another player. Fighting games were typically at their best when players played against each other, not the computer.

The model here is game as play space. Both players elect to join the game to play within its space together. This is a different play dynamic than predecessors. Through this lens, fighting games are ostensibly dancing games. They share more attributes with a competitive dance line than the apocalypse averting goals of their genealogy. Players enter the space to show their special moves. They display what they can do in a kind of braggadocio. Later iterations even support play with the fighting space, using elements from the environment to construct a win.

Fighting games are about sharing a space, or playing near each other. Players do not share the same goal. Fighting games are competitive, requiring the player to best their competitor and ultimately exclude their opponent from play. In the continuing sandbox analogy, players play next to each other in the sand, but they do not build together.

Competitive gameplay is the dominant model for gameplay through this period. When a game supports two players, players are in competition. The goal is to best the opponent. Sharing the game space is centered on dominating the space. Players did not support each other in achieving a shared goal. For these reasons, the experience is largely associative. They players may share, but their sharing is only to achieve an individual goal. These goals are commonly mutually exclusive, necessitating the elimination of others players to achieve them.

2.5 Cooperative Play

By the late 1990's the character of arcade play had taken a noticeable turn. In the United States and similar markets, the traditional arcade game space had vanished. The Space Invader's style parallel play had been supplanted by home console experiences [3] and an interest in different types of play.

The family fun center blossomed in the absences of the traditional game arcade. Dave and Buster's, Gillian's and Chuck E Cheese persisted and even flourished. In particular, the adult oriented Dave and Busters and Gillian's provide an interesting milestone in the development of play preference. Both environments offered a significantly different style of game play. They provided games with shareable physical toys, more than two players, and most importantly, cooperative play.

The archetypical examples of such games are Time Crisis [20] and House of the Dead [21]. Players each had their own toy gun to shoot in the shared game world. Both games allowed players to cooperate toward the same goal. Players could not hurt each other. Players had to assist each other to progress. Fun came in the form

of shared instructions and warnings about hidden opponents. Players were in the conflict together.

In these games, players moved from besting their opponents, to helping each other solve the game's presented challenges. Nothing about either game is new, save for the emphasis on cooperation.

3. Handheld Gaming Devices

Arcade games are not the only digital play experiences that demonstrate this developmental psychology pattern. Handheld electronic games follow a similar set of developmental stages. In 1977, Mattel introduced the single player, single game experience of Auto Racing [22]. In 1979 Game and Watch [23] and Milton Bradley's Microvision [24] offered more widely adopted single player experiences. Even with Microvision's, multi-game format, these designs were clearly solitary play experiences. They were designed for personal play on a long commute or as a way to disengage from outside stimulus.

In 1989, the Nintendo Game Boy [25] offered a primarily single player experience with the ability to link to players. Among Game Boy's many touted features was the ability to video link. The link allowed to players to share games for competition. True to form, Nintendo advertises the video link as a tool to "blow your opponents away" [26].

The Game Boy's competitor, the Atari Lynx, offered up to 17 players [27]. While the Nintendo Game Boy prevailed as the de facto handheld device, it is important to note that the Lynx offered both improved technology and more opportunity to share games with others. Scholars and market analysts agree that the Lynx suffered from expense. Yet, while data about the use of Game Boy's two-player link is limited, it is clear that the ability to share game experiences was not a high priority for hand held game players. It was most common for Game Boy machines to be played in parallel if they were played in the presence of others.

The preference for associative play really begins with the Game Boy Advance[28]. The console allowed players to use their handheld gaming device as a controller for the GameCube home console. Simply, the device could be used alone or it could be shared with others. The Game Boy Advance also supported sharing data between devices.

More recently game consoles such as the NGage [29], Play Station Portable [30], and Nintendo 3DS [31] have developed as expected. They have moved toward cooperative play, allowing players to share their experience and even work toward the same goals.

4. Other Gaming Devices

Similar analogies can be made for a variety of gaming systems. The history of home consoles systems is marked by a growth from a few players to many players, mimicking the move from solitary play toward cooperative play. Majors titles, such as Halo [32], were widely marketed as developmental milestones for their use of cooperative play. Squad based cooperative play in many first person shooters, also illustrates a development from the preceding model of competitive parallel play common to LAN parties for games like Unreal Tournament [33].

Most recently, Playstation has introduced a Simulview for their 3D display [34]. The technology allows two players to share a screen without needing to divide screen real estate. This is an interesting approach to associative play, as it extends the game experience of two disparate game worlds into a single shared

screen. Instead of dividing a resource as had been done in the early traditional game arcade, players share a screen but receive their own image. This moves the associative divide of my game on top, your game on bottom play toward the notion of our game.

5. Conclusion

There are clear patterns in the development of play technologies. These patterns mimic human developmental psychology in its traversal of the four stages of play. This paper aimed to demonstrate how these patterns emerge in the development of two distinct gaming technologies. The authors believed that these developmental stages are apparent in other user-centered technologies.

It is unclear if these stages are managed by changes in technological experience, exposure to play modalities, or through an evolving relationship to technology and society. It may be that players grow into technologies in much the same way that people grow into themselves. What is most important is that an understanding of these stages may help designers understand player preferences more naturally. If play experiences are understood as a set of stages that develop from the introduction of the play technology, designers may address the needs of their players more directly.

New technologies are often described as in their infancy. If designers continue this analogy, it makes sense that play technologies be designed for their appropriate play preference. While there will always be exceptions to a rule, such framing should help focus efforts for an ever developing world of players.

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