

Games and Learning Styles

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Abstract

Several ways to address learning are: 1) through learning theories, 2) through learning styles (treated as distinct from learning theories here), and 3) through instructional design theories and models. This paper looks at the second approach to examine how modern games support various learning styles in their design and gameplay. Four well-known learning style models are examined in the context of computer game design. These are: the Keirsey Temperament Sorter, the Gregory Style Delineator, Felder's Index of Learning Styles, and Kolb's Learning Style Inventory. Good, i.e. top-rated games can be shown to incorporate aspects of most, if not all of these, and in this way actively support learners of all learning style preferences.

Keywords: Computer Game, Learning Styles

Introduction

“(T)he central point of education is to teach people to think, to use their rational powers, to become better problem solvers.”

Robert Gagné [1, p. 85]

There are many ways to address the problem of how to teach people to be better problem solvers, from understanding how people learn and the development and application of various learning theories, through understanding how people can be taught and the associated instructional theories and models. A third alternative looks at how individuals differ in *style*, both in their approaches to learning, and to teaching. It is generally accepted that different learning styles exist, although articulating what those differences are, how to identify them and how to address them remain areas of active research and debate. However, several viewpoints seem to be shared by all. First, people learn more effectively, and are generally more satisfied when their personal learning styles are taken into account in the design of instruction. Second, if we only cater to an

individual's strengths by presenting everything in their favorite style then we are doing them a disservice by not encouraging them to develop their other skills. Finally, while most teachers have definite preferences for teaching styles, most can also learn to adopt others, given adequate support.

Digital games are beginning to rival movies and television as an entertainment pass time. Many now feel that games constitute an important learning technology [2-4]. Modern games tend to be very complex, often requiring many hours to learn to play, and successful games support players very effectively during this learning phase. Although we may not appreciate *what* the players are learning, game designers have been very successful at teaching all kinds of individuals how to play their games. Given that games teach *something* well enough to establish a \$10 billion industry (in the U.S. alone), it follows that intentionally or not, games are designed to support various learning styles.

Games Support Multiple Learning Styles

The potential exists to address all three of the previous viewpoints through the use of games for learning, that is, supporting preferred learning styles, encouraging development of other styles, and support for various teaching styles. Whether or not what is learned through games is valuable will not be debated here, but it cannot be denied that a great deal of learning *does happen* in games. [3] Computer games that are considered “good” (i.e. popular and highly rated) already provide information in various formats, although the preference in most games is for information to be visually presented. By providing information in multiple formats (visual, textual, auditory, etc.), players cannot only choose a style that matches their own preference, but they can also practice their skills in others, and sometimes they do this even without realizing it. Games may not do much for helping teachers to develop other teaching styles (unless the teacher is an active participant in the game activity), but they can be used to provide alternatives that the

teacher may not be comfortable providing on his or her own.

Games are typically designed to target specific demographics. There are sports games, fantasy games, slower paced strategy games and high-action adventure games, to name just a few. Some games are intended for younger audiences, and some for older audiences, but in order to sell well, the differences in the games must go beyond mere narrative and imagery. If the gameplay is not appropriate to the audience, the game will not sell. Since the targeted audiences invariably include individuals with various learning styles, it follows that to be successful the gameplay must address these learning styles, deliberately or not. Modern games are very expensive to produce, so an adequate return on investment is essential.

In his seminal work on intrinsic motivation, Thomas Malone outlined four criteria that can be used to examine how to engage learners [5, 6]. To use Malone's criteria then, in order to be successful, a game must incorporate the right amount and kinds of challenge, curiosity, fantasy, and control. Although beyond the scope of this paper, there exist direct parallels between those elements considered to be important to engagement and motivation by Malone, and most, if not all of the learning styles described in this paper. Games that are highly engaging according to Malone's criteria will also be found to meet the criteria necessary to engage learners of different learning styles.

Some games appeal to a fairly specific kind of audience, such as Half-Life II [7], while others appeal to a wide range of ages, such as the Phantasy Star series [8], Pikmin [9], and the SIMs [10]. These games are **not** designed specifically with preferred learning styles in mind, yet they are very successful at capturing the desired demographic. Many games have a fairly steep learning curve, and so must be well-designed to support players while they learn the game, yet once the player is acclimatized, the gameplay must change. Missing the mark in either case results in a game that doesn't sell. Inadequate support while learning the game discourages novices, while too much 'support' during gameplay is obnoxious to experienced players. Designers accomplish this feat in a number of ways, which are often employed simultaneously in the game. For beginners, they exploit many different learning approaches that keep people engaged and help them learn the game. A player who remains in one area too long may be offered a hint about a direction they might try, or one who is supposed to be searching for a particular item may be given more information about how to obtain that item. Rarely do games simply give the player the 'answer'. These hints sometimes come in the form of images, sometimes text, narrative or just sounds. As players become better at using the game, the amount of support offered automatically is

reduced, by monitoring the players' actions in ways very similar to what educators call assessment, and responding appropriately. As the players' skills increase, so do the challenges. Players are also often given direct control over the amount of support they receive and can choose among various modes (beginner, expert, etc.).

Some styles do seem to be better supported in games than others, and this has implications for how children who play games are "learning to learn". Given the strong and still growing popularity of games in the developed world, this 'training' often begins before they even start school, and continues all through school and beyond. Whether this will be found to influence learning styles in individuals, and to what extent, remains to be discovered. As Marc Prensky says, any time people spend that much time doing something, it is bound to have an effect on their brains [11]. There are indications that this also has an effect on how they learn and work once they get older [12], so early indications are that at least some aspects of an individual's learning style may be affected through gameplay.

The Four Models

Four learning styles models were chosen for analysis that are popular, and reasonably well-known. They include the Keirsey Temperament Sorter, the Gregory Style Delineator, Felder's Index of Learning Styles, and Kolb's Learning Style Inventory. Each model is summarized, followed by an analysis of how games address the key points raised.

Keirsey (Myers-Briggs)

The Keirsey temperament sorter is based on the Jungian model developed by Isabel Briggs Myers and her mother [13]. It uses four different scales, which are used to classify personalities into four different basic types:

1. *Artisans* value freedom and spontaneity. They tend to be impulsive, playful and creative.
2. *Guardians* value belonging to a group or community. They tend to be traditional, responsible and conservative.
3. *Idealists* value personal growth, authenticity, and integrity. They tend to try and encourage these traits in others. This group includes people they define as "teachers".
4. *Rationals* value competence and intelligence. They strive for knowledge, predictability, and control. [14]

Each type is defined by the result of a test, which categorizes traits into one each of four preferences. The results allow for sixteen possible combinations: four for each personality type.

E = Expressive (extrovert)	I = Reserved (introvert)
S = Observant (sensation)	N = Introspective (intuition)
T = Tough-Minded (thinking)	F = Friendly (feeling)
J = Scheduling (judgment)	P = Probing (perception)

Although in truth, the degree of choice permitted in games is largely an illusion, the appearance of virtually unlimited choice exists. As a consequence, artisans get their freedom, and through the non-linear (sequential) possibilities built into most games, their need for spontaneity is met. Additionally, there is usually a relatively “linear” path through the game that can be taken, which will comfort the guardians and rationals, but the choice remains with the player. Many games cannot be won without some form of cooperative efforts, either with other players (as in most MMOGs¹, and some multiplayer console games), or with the non-playable characters (NPC) that are part of the game. A game like Pikmin 2 [9] requires the player to enlist the help of dozens of tiny “Pikmin” as they are essential for everything from picking up objects to defense from attack.

Aspects of personal growth, authenticity, and integrity are inherent in many games too. Transgressions, and playing the “bad guy” are permitted, but many games implement character attributes such as “health” and “wisdom” which are often diminished as a direct result of these actions.

One of the key aspects of successful games is how well they balance between randomness and predictability – a game that is too predictable quickly becomes boring, yet one that is too unpredictable appears random, and players do not feel in control. Most games allow users to adjust the degree of randomness, and so stout rationals can reduce the element of chance, while artisans can “dial it up”.

Kolb’s Learning Styles

David A. Kolb (with Roger Fry) included four elements in his model: concrete experience, observation and reflection, the formation of abstract concepts and testing in new situations. [15] These four elements form the nodes of a connected circle of experiential learning, with learners able to begin at any point along the circle. Ideally, learners will possess balanced abilities in each of the four areas, but in reality, they tend to polarize towards one of four “poles”. These four poles are summarized in the table below.

Learning style & Characteristic	Description
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Converger: Abstract conceptualization (AC) + active experimentation (AE)	<ul style="list-style-type: none"> · Practical application of ideas · Focus on hypo-deductive reasoning on specific problems · Unemotional · Narrow interests
Diverger : Concrete experience (CX) + reflective observation(RO)	<ul style="list-style-type: none"> · Imaginative ability · Generates ideas and sees things from different perspectives · Interested in people · Broad cultural interests
Assimilator : Abstract conceptualization (AC) + reflective observation (RO)	<ul style="list-style-type: none"> · Can create theoretical models · Excels in inductive reasoning · Abstract concepts rather than people.
Accommodator : Concrete experience (CX) + active experimentation (AE)	<ul style="list-style-type: none"> · Doing · Risk taker · Can react to immediate circumstances · Solves problems intuitively

Once an individual’s style is identified, instruction can be organized to support his or her strengths to give confidence, while still encouraging the further development of the others. In games, the converger can remain unemotional, yet imaginative exploration is encouraged and rewarded. Theoretical models can be devised and tested with minimal risk, yet risks *can* be taken, and normally the worst that will happen is that the player must start over.

A key aspect of good games is that the player can take up the game in many different ways: as a neutral orchestrator, or as an impassioned participant. Games encourage accommodator abilities of immediate reaction to circumstances and converger abilities of the application of ideas, both within the bounds of the “magic circle” of play [16] because the usual rules and consequences of reality don’t apply. Divergers can identify with other players or NPCs (non-playable characters) as though they are people, and assimilators can relate to them using whatever conceptual frameworks they like. Some will lead to greater success within the game than others, but the fact remains, that it is only a game – exploration and experimentation are actively supported in most good games.

Gregorc

Based on left / right brain studies, Gregorc’s system of learning takes into account the different ways of perceiving and ordering information. Perceptual preferences can be abstract, which involves reason, intuition, and deduction, or concrete, which involves the senses. The ordering preferences indicate how individuals are most comfortable organizing the information they incorporate. The two ends of the spectrum here are

¹ MMOG = Massively Multiplayer Online Games

sequential (or linear and systematic), or random (less organized). [17]

Gregorc's Learning Styles	
Concrete-Sequential	- Linear and sequential.
Concrete-Random	- Concrete and intuitive - Thrives on problem-solving.
Abstract-Sequential	- Abstract and analytical - Thrives on a mentally challenging but ordered learning environment.
Abstract-Random	- Emotional and imaginative, - Prefers an active, interesting, and informal learning environment.

By design, good games support the approaches of concrete learners through a myriad of feedback mechanisms: visual, auditory, textual, progress charts, etc. while abstract learners can ignore which ever feedback mechanisms they choose – often by simply switching them off. Abstract learners can develop theories and test them out within games in ways not feasible in real life. The “reset” button remains available to both whenever they get into trouble.

Sequential learners can progress through games in an orderly fashion, they can strategize about which tasks to complete first when there are choices, and follow through. But most games also permit a fairly ordered progression through the challenges, yet for more random learners, the option also exists to choose among various “next steps”. Although some games require certain tasks to be completed in certain orders (good for sequential learners), most also allow for a substantial degree of freedom for random progressions.

ILS (Index of Learning Styles)

Felder’s model is based on the assumption that students will learn better if material is presented in a manner that best matches their style, so for each learning style, there is also a teaching style to match. [18] The original model has been altered in recent years to exclude the original aspect of inductive/deductive style as the authors have come to believe that the “best” method of teaching is inductive regardless of which style the learner prefers. [19]

Index of Learning Styles	
Active (Doing)	Reflective (Thinking)
Sensing (Facts, processes)	Intuitive (Concepts, relationships)
Visual (Seeing, picturing)	Verbal (hearing, reading, saying)
Sequential (Step-wise)	Global (Leaps, random)

When it comes to Felder’s learning styles index, the only aspect that is not well supported within most games is that of reflection, although it can often be found to be thoroughly supported through the communities of players that can evolve outside of the game. [20] One of the qualities of games that makes them both distinct from other technologies that have come before and intrinsically suited to experiential approaches to learning, is that they are highly interactive. ALL games require players to “do”. Most modern games are highly visual in presentation, and yet they almost always include narratives and text to either augment visual information, or provide extra information not available in other forms. They require players to learn facts and understand processes, but they also require them to understand concepts and synthesize relationships. Games have sequential aspects, which are balanced by global requirements.

Discussion

Much work remains to be done before we can begin to use games for learning with the same confidence we currently enjoy for text-based and other learning technologies. That players are already learning a great deal through gameplay is clear. Whether or not we can leverage this learning to other objectives is less clear.

One body of knowledge that must be developed is to study gamers to determine if particular learning styles are found to be more common than would be expected in the general population. If so, then we need to determine whether specific genres of games are preferred by people with specific learning styles, or all games have similar attractions. This information can be significant in deciding if, and how games can be effectively used in instructional settings.

Just as Felder now finds it appropriate to advocate for inductive teaching styles for all types of learners, it may also be appropriate to now advocate for supported learner control for all. That learning is more effective, and learners more amenable and responsive when they are given greater control over their learning environment is now a widely endorsed tenet. *Games already do this.* Control over one’s environment is a key aspect of virtually all popular games, from Lord of the Rings [21], to Paper Mario [22] and Metroid Prime [23].

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