That Ball Game

A Game for Teaching Game Design

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ABSTRACT

For the past six years I have been teaching a game design class to a diverse group of programmers, artists, media theorists and designers. I have found that traditional academic model of teaching, as the handing down of established knowledge from expert to novice, fail badly in such a young and dynamic discipline. Instead I have embraced a more interactive model of learning, accepting students as fellow knowledge-creators and working together to find the ideas to help us better understand our design practice.

In this paper I present a ball game I use as an opener in the very first class. I describe the rules of the game in full and discuss how I employ as a teaching tool. I have used it every year and it has grown in importance as a way to break down the barriers between lecturer and student and between students of different backgrounds. It also serves as an thought-provoking example to help students think more carefully about some of the most obvious and yet troublesome ideas in the field: 'fun', 'rules', 'play' and 'game'.

Keywords

Game design education, Mechanics, Dynamics, Aesthetics, Design Patterns

1. INTRODUCTION

The Game Design Workshop is a single-semester course in game design for computer science and digital media students at the University of New South Wales [11]. It is based on the principles of experience-based, player-centric, iterative design using the Mechanics-Dynamics-Aesthetics (MDA) framework and LeBlanc's 8 kinds of fun [5, 13, 6]. My objectives in teaching the course are to open the students' eyes to the many kinds of experience that can be created through play, to give them a wider vocabulary to describe these experiences, and to equip them with a toolkit of design patterns they can use to craft new experiences deliberately.

Philosophically, I adopt a learning strategy based on the theory of experiential learning [8]. Abstract ideas are couched in concrete experience, both before and after. Students are given games to play, in class and as prior homework, to expose them to the ideas that we will cover in lectures. We follow this with design exercises to turn ideas into practice.

In this paper I focus on one particular game we play in the very first class of the semester. The game has no official title but goes by the moniker of 'that ball game'. It is a simple and rather childish activity that involves throwing brightly coloured balls around the classroom. Nevertheless, it has proven to have remarkable depth as a learning experience. I have been playing and refining it with my class for over six years, and my graduate students have urged me to document it as they have begun to take it on in their own teaching practice.

In the following, I describe the game and how I employ it as a teaching tool. I have found it to be useful as a way of restructuring the classroom, as a community building exercise, and as an illustration of the ideas of game mechanics, dynamics and aesthetics. I offer it here for others to use and remix to their own purposes as they see fit.

2. THAT BALL GAME

The basic idea of the game is simple. The class is divided into four teams and each team is assigned a corner of the room as their territory. A large bag of brightly coloured balls is upended in the middle of the room. Players are instructed of the rules:

1. A piece of music will be played. At the end of the music the team with the fewest balls in their territory wins.
2. Team members must stay in their own territory.
3. Players may not use any tools beyond their own bodies to carry the balls.
4. Otherwise anything goes.

The music is played and the game begins. At the end of the music the game ends and as referee I determine the winners.

While these rules are quite simple, there are a number of subtleties in the design which can significantly add to the experience:

The Room: Ideally the game should be played in a classroom with moveable furniture rather than in a separate space. The experience begins when I ask the students to stand up and move all the chairs and desks to the sides of the room. This allows them to witness the subversive transformation of the classroom into a playground. This is a symbolic moment which sets the stage for the rest of the course.

The room should be large enough to seat all the players without too much space to spare. We want to create space for safe free movement while maintaining a sense of 'fullness'. The action tends to get lost if the room is too large.

Furniture should be stacked around the sides of the room to create a large open space in the centre. The stacked furniture will play an important strategic role as an obstacle in the game.

The Players: About twelve people seems an appropriate minimum. Fewer than this and the teams are too small. I have yet to find a maximum bound. I have played with groups of up to fifty with no problem, but I would imagine that their comes a point at which it is hard to keep every player involved in the action.

With regard to age, I have played the game with a range of ages from high school students through to young adults (Google engineers). One of my students has lead the game with a class of high-school teachers. The childish nature of the game seems to make it more widely appealing to adults, rather than less.

The Teams: I assign teams arbitrarily by having each player take a ball and then sending all those with a red ball into one corner, those with a yellow ball into another corner and so forth. In the classroom situation the random teams serve to create interaction between students of different backgrounds who may not have met previously.

Four teams seems ideal as it allows interesting inter-team dynamics. Each team is considerably smaller than its opposition, but dynamic 2-vs-2 alliances are possible. Three teams is much more likely to result in a 'gang up on the leader' scenario, and two creates a much simpler head-to-head battle. I imagine more than four teams would be too confusing.

The Territory: Assigning each team to a corner makes territorial divisions easy and obvious. Chalk can be used to draw boundaries if desired, but I haven't found this to be necessary. The imprecision of the boundaries is accepted as part of the non-serious nature of the game. Assigning teams to corners means every team has a protected 'back' and an open 'front', allowing for emergent specialisation in the teams.

The Balls: The balls are regular 'ball pit' balls. They are about 10cm in diameter, lightweight and brightly coloured. They can be bought in packs of 100 from most toy stores. I try to have at least six balls per player; fewer than that and it is too easy for a team to control them all.

The Rules: The territory rule is used to make it clear who is on which team, which can be confusing if players are allowed to roam more widely. The prohibition against tools is to stop it from being too easy for players to hoard all the balls. In one case before this rule was added, a player got hold of the sack and set about collecting all the balls. It was a clever play but removed much of the point of the game for the other players.

The rules are explained briefly and the game is quickly started to provide the teams with little time to orient themselves before the action. If any strategising is to be done it must be on the field of play. There are no time-outs.

The Music: A two- to three-minute piece of music is appropriate; high tempo and energetic. The music adds drama to the game and provides an intrinsic sense of how much time is left without being over-precise. A stopwatch is a poor alternative. Three minutes is long enough for some players to recognise the inherent pointlessness of the game and perhaps devise a strategy, but not so long that the game becomes boring.

The Winners: As referee, I judge the winners in a carefree manner without resorting to counting. The winning team is applauded but no great importance is otherwise attached, to avoid sore losers.

2.1 How it plays

A soon as the music begins the game erupts into what one student has described as 'brightly coloured chaos'. The immediate impulse is to collect and throw balls as quickly as possible. The result is a lot of hurried action with little planning. Roles soon emerge: some players take on front-line duties, deflecting incoming balls, others move to the back, crawling under tables to gather balls to throw.

Over time players realise that they are not making much headway with these tactics. Some players plough on regardless, too caught up in the action to care. Others choose more strategic behaviour, such as aiming deliberately for the hard-to-reach corners. Small pockets of coordinated play may appear as teams find ways to work together.

There is a transformative moment in the game when someone makes a key realisation: throwing balls is largely pointless. It only gives control of the balls to your opponents who will throw them back at you. A better strategy is to hoard as many balls as you can and throw them all at the last second. When a team discovers this strategy, the pace of the game shifts as they suddenly stop attacking. Their behaviour becomes more organised and less reactive. There is a noticeable change of feeling in the room.

Soon the other teams will pick up on what is happening, and they too will start hoarding balls. The frantic action can quite suddenly turn into a tense standoff as each team holds fire and waits.

All hell breaks loose at the last second and frantic throwing resumes. The end of the game passes unnoticed and it can take several loud protests from the referee to quell the activity. Which team wins is usually quite arbitrary. If only one

team hit on the hoarding strategy, they are likely to win. Otherwise it is more or less random.

3. THE PURPOSE OF THE GAME

The game serves multiple purposes: first to subvert the standard classroom model, second to build a community, and third to illustrate troublesome concepts such as 'fun', 'rules', 'play' and 'game'.

3.1 Subverting the classroom

The first purpose of the game is to set the scene for everything to come. It is a deliberate attempt to subvert the students' expectations of the classroom and to create a class culture of active rather than passive learning. We begin in the standard classroom configuration: students at desks facing the lecturer at the board, emblematic of the assumed 'novice/expert' relationship in which the lecturer hands down established knowledge to the students who consume it respectfully.

If there is any class for which this model is appropriate, it is not game design. The study of games is still very new and the 'established knowledge' is largely a patchwork of ideas, good advice and speculation. We are working towards a common vocabulary, but many of our terms are still open for debate – including some of the most fundamental. The design principles by which we work are often little more than intuition and popular wisdom. Our knowledge is more concrete than abstract – we know how to make good games, but we don't know what we know.

Furthermore, students often possess wider experience than their lecturers, at least in terms of games played if not in terms of creation. It can be difficult, as a working adult, to keep up with the wealth of new titles on the market[1]. I often find my class citing experiences in games that I have never encountered.

As such the ideas we discuss in class are rarely new to the students. They have experienced them in a wide variety of games. However their experience is typically unreflective. They are aware, for instance, of the experience of flow (they call it 'being in the zone') and can describe it as well as Csikszentmihalyi [3]. What they lack is the vocabulary to name it as a concept and consciously consider how to use it in the design of their own games.

In these circumstances, the standard 'knowledge-delivery' model of the classroom is inappropriate. My aim is to reconfigure the classroom relationship as a 'knowledge-creation' model in which we are all experts, reflecting together on our experiences and building a vocabulary of design patterns to use in our work.

Students, however, are trained through years of schooling to understand their place as 'knowledge receivers' and have trouble stepping out of the role. And so my first action in the class is a symbolic demolition of this expectation. The furniture of the classroom is reconfigured and the space is turned into a playground. Taboos are broken: chalk is drawn on the carpet, loud music is played, objects are thrown around the room. And the students' attention is turned from the lecturer to each other. All of this is necessary to establish that this is no ordinary class. This is a class that will involve active participation.

After the game I make sure not to restore the furniture before continuing. The rest of the session proceeds *en déshabillé* with students sitting on the floor, on desks or in chairs at various angles. The balls are not collected until the end of the class and lie scattered around the floor. This is to maintain the sense of informality and playfulness, to encourage the creative 'open mode' of thinking. If I could, I would run the class in this fashion every week.

The final act of subversion is the ritual humiliation of the lecturer. At the end of the class, I hold out the bag to re-collect the balls. The position invites what inevitably happens: students throw the balls from where they are sitting into the bag, until some wag 'accidentally' throws at my body or face. The balls are light and there is no harm but I loudly complain nonetheless. Naturally, this only encourages more students to join in. I shout and cry out jovially until they relent. I believe this little game is important as it symbolically represents my willingness to be confronted and contradicted. This bears fruit later, when students feel confident to contribute their perspectives on topics in class, even if they disagree with mine. I have always found such disagreement to be more valuable than disruptive.

One simple game cannot magically undo years of enculturation and it is easy in the subsequent weeks to fall back into the old patterns of expert and novices. It takes ongoing effort to maintain the co-creative model of the classroom but I believe that this game is a strong opening move.

3.2 Building a community

The second purpose of the game is to build a community out of disparate groups. Whenever I ask industry professionals about what I should cover in my class, I hear the same refrain: 'You train talented programmers and creative artists but they don't know how to talk to one another!' It is often lamented that programmers and artists come from two different worlds, one technical and one creative, following the popular myth of 'left brain/right brain' thinking [9].

The reality, in my experience, is that the differences are not that profound, more a matter of language than of thought. Many artists are highly technical, absorbed in the careful application of their craft. Many programmers are wildly creative, delighting in using their technical skills to express themselves and create beauty. It is only because maths and computing are stigmatised as 'nerdy' that there is any division. The reality is that they are as much the tools of creativity as any other medium.

Games are, in a very literal sense, the art of programming. A game, even a non-digital card/board game, is a process defined by rules. Without the trappings of art and narrative, a game can have meaning merely through the process it represents. Programming is fundamentally the craft of designing process, and game design turns this craft to the end of creating art.

[1]or rather *markets*: console, web, PC, mobile, table-top, live action...

It is this realisation – that programming is a craft, just as painting or woodwork is a craft, to be turned to artistic ends – that brings programmers and artists together. Programmers can think of themselves as creative practitioners and artists can see programming as a creative tool in its own right. This doesn't solve the language problem but it provides space for the problem to be solved, as the two groups need no longer regard each other as aliens. In this I am explicitly following the philosophy of Randy Pausch and Don Marinelli for Carnegie Mellon's Entertainment Technology Center [10].

How does the ball game address this issue? Only in the most primitive way. It provides a diverse group of artists, programmers and others with a common foundational experience – an experience which belongs to neither camp, or equally to both. We do not begin by talking about computers, nor do we talk about art. We begin with a ball game that harks back to their common childhood experience. All players can enter into it equally. It is such a foolish and uncomplicated game that none can claim special expertise. So we all start on equal footing.

The subversiveness of the activity gives it the quality of a shared secret. We are insiders who have had a special experience that outsiders may not believe or understand. You had to be there. This experience helps dissolve the artist/programmer distinction and forge a new group identity as game creators.

3.3 Illustrating Ideas

The final purpose of the ball game is to illustrate four of the basic troublesome ideas of game design: 'fun', 'rules', 'play' and 'game'. These are difficult words as they are both very familiar and very poorly defined. The remainder of the class is used to discuss these ideas, using the ball game as an example. The meat of this discussion is outlined in the next section.

In a sense, any game could be used to illustrate these terms, but I have found that it pays to have a fresh, common experience that lies outside their usual experience of games. First, it is immediate and concrete, so it is available for reflection in detail. Second, everyone has shared the same experience – which is rarely the case if we talk about other games, even very popular videogames – so everyone can contribute to the discussion. Third, it is unusual and doesn't immediately fall into familiar categories, requiring fresh thought. Finally, playing in the classroom and analysing immediately afterwards encourages the practice of reflective play, a necessary skill for all designers.

4. FOUR TROUBLESOME CONCEPTS

Definitions are tricky things. Taking a concept such as 'game' that is familiar to all and giving it a specific, precise definition is both difficult and dangerous. Difficult because the word is used broadly to refer to many things that may not have a single unifying quality. Dangerous because definitions give power. To claim that the 'legitimate' meaning of a word is one thing is to cast all other uses as 'illegitimate' and thus to (perhaps unintentionally) demean their users.

However to make progress in our fledgling field we need a common language of well-defined terms to communicate our ideas to each other and even to ourselves. A meaningful vocabulary of game-design terms can help us think more clearly and design more deliberately.

Four ideas are fundamental to our discipline: 'fun', 'rules', 'play' and 'game'. I use the ball game to explore these four ideas in my class and to introduce the 8 kinds of fun, the MDA framework and game design patterns, all of which are important concepts in the game-design lexicon.

4.1 Kinds of Fun

The word 'fun' is an empty signifier [1]. When applied to games it means little more than generic approval. To state that a game is fun is merely to say that it has succeeded at being a game, without in any way describing the kind of experience it conveys. One of the first principles of design is to be clear about the kind of experience we want to create. To say we want our game to be 'fun' is to say nothing at all. We need a broader vocabulary to describe and distinguish experiences more precisely.

In spite of a few critics who want to define the pleasure of games rather narrowly, there are actually a large number of ways in which games entertain. Various taxonomies exist. I favour the 8 kinds of fun of Hunicke, LeBlanc and Zubek [6] as one that is comprehensive without being painstakingly detailed. To this, I add an extra category 'subversion' drawn from Costello's taxonomy [2], creating the list:

1. Sensation
2. Fellowship
3. Challenge
4. Discovery
5. Drama
6. Fantasy
7. Self-Expression
8. Ritual
9. Subversion

In my class, we do not start with this list, rather we begin by reflecting on the ball game and listing every word we can think of to describe the experience. It is not hard to fill the whiteboard with such words as: 'colourful', 'energetic', 'difficult', 'cooperative', 'competitive', 'frantic', 'taboo-breaking', 'childish', 'repetitive', 'silly'. I push the students to come up with as many words as possible and they are often surprised of the depth of such a simple game.

As rich as it may be, the game does not cover all the possible kinds of fun (fantasy is most notably absent) and so I have the students do a personal reflection exercise to round out the list. Having described this game, I ask them to describe three other activities in similar terms: a game they played recently, a game they played as a child, and a non-game activity that they enjoy (such as dancing, cooking, rock-climbing etc). We share our findings and add any as-yet unlisted kinds of experience to the board.

At this point I give a commandment: the word 'fun' is henceforth forbidden. It is 'the F word'. I encourage students to broaden their vocabularies when analysing and designing games, to describe experiences more precisely. I introduce the 8 kinds of fun as a mnemonic, less as a set of proscriptive categories and more as a reminder to look at experiences in a variety of ways.

4.2 Rules and Mechanics

As game designers we understand it is our task to design the rules of the game. But what are rules? If we look back at the description of the ball game earlier, we see that it had very few rules, and yet there were a large number of design decisions that influenced play, including the choice of music, the size and shape of the room, the mass and material of the balls used, and others. Change these things and the experience of play could well be different. And thus I introduce the idea of 'game mechanics' – all the mechanical details that define the game.

This works best as a 'what-if' exercise. I encourage students to consider how the game might play under various hypothetical changes, such as:

- What if there was only one ball? Or two? Or four? How few balls is too few?
- What if there were a thousand balls? Ten thousand? How many is too many?
- What if there were only four players? Or four hundred?
- What if we played with tennis balls? Or beach balls? Or newspaper?
- What if the game was much longer? Ten minutes? An hour? Several days?
- What if we played with the lights out?
- What if there were a $1000 prize for the winning team? Or a $1000 penalty for the losers?

I encourage students to come up with their own counterfactuals as well[2]. I use them to illustrate common mechanic concepts such as incentives, resources, timing, information and player relationships.

This leads to a discussion of the difference between card/board games, in which the mechanics are mostly enacted by the players, and computer games in which the mechanics are mostly enacted by the computer. This is an important distinction: it means that computer games can have much greater mathematical complexity (which computers do well) at the expense of social complexity (which computers do badly). For this reason computer games can offer superior physical and economic simulations but are much poorer at supporting role-playing than table-top games.

4.3 Dynamics of Play

At this point we reach a crucial concept. We design for a particular experience, but we design by creating a mechanical system. How will our mechanical decisions affect our experience? How do we know what mechanics to use to create the experience we want? For some aspects it may be obvious: upbeat music will make the game feel more frantic than slow music; but other decisions are less clear. Exactly how many balls should we use? Why?

The answer can only be determined by looking at the system dynamics of the game in action. It turns out that a player can carry about four balls at a time. So if we have fewer than four per player, the game feels 'controlled' and loses some of its frenzy. Too many more, and the game feels impossible, there are always many more balls on the floor than the team can handle. The ideal balance is around five or six per player – enough to provide a sense of precarious control with sufficient activity. In other words, it is a flow curve, carefully balancing difficulty and capacity.

I use this as an example of a game dynamic, a pattern of play that emerges when the players interact with the rules. Play, as Salen and Zimmerman [12] would have it, is free movement within a more rigid structure. Different mechanics allow or encourage different patterns of play.

I introduce the class to the Mechanics-Dynamics-Aesthetics (MDA) framework [6] as a way to understand how dynamics link mechanical decisions to aesthetic outcomes. As an exercise I have the students identify other important dynamics of the ball game, with their mechanical basis and the experience they engender. I encourage them to generalise these dynamics into design patterns that can be found across a variety of games.

To take another example, an important dynamic of the ball game is that there are many things going on at once, more than a single player can attend to. This gives the game its particular chaotic quality. The player is aware of having many balls to fetch to at any point in time. Each one is important but they are spread over a large space and must be addressed separately. There is pressure to deal with them all as quickly as possible. The resultant dynamic is one of constant activity and divided attention.

This 'many points of attention' dynamic can be generalised into a design pattern that we can recognise in other games. The player is aware of many simultaneous spatially distributed threats that must be dealt with individually as quickly as possible. The experience is hectic and chaotic, especially if there are multiple players in the same situation. We can see this same pattern at play in the videogame *Left 4 Dead*, in which a team of players must fight an onslaught of zombies coming from every direction.

Recognising and naming common game dynamics gives us better tools to design. Familiarity with patterns such as these and the forces that drive them allow us to design deliberately towards a particular experience. Iterative design is still necessary, as players are never completely predictable, but we need not start every game from a blank slate. Everything is a remix. We can't introduce anything new until we are fluent in the language of our domain [4]. I follow Austin Kleon in encouraging my students to steal like artists [7].

4.4 What is a game?

To round out this discussion, I offer my own definition of a 'game'. It comes from my observation of the MDA framework and how it relates to other media. Every medium

[2]One of my favourites was: 'What if we played with fluoro balls under UV light?' This is a game I have to try some time.

has a mechanical component, a work created by an author. Every medium has an audience to whom we wish to provide an aesthetic experience. In some media, such as visual art, the audience observes and interprets the work directly, but other media, such as music or theatre, require an intermediary: the performer. The performer enacts the work, literally 'plays' it, and usually there is room for play within that performance. The performer can add some of their own creativity to the expression of the work, lending it particular colour or character within the constraints of the author. The audience's experience, therefore, is partly the creation of the author and partly that of the performers.

The defining character of a game, I claim, is that it is a performed work in which the performers and the audience are one. Different games may provide more or less freedom to play and may provide diverse experiences, but they have one thing in common: they are played for the experience of playing. This crucially sets them apart not only from works which are not performed but also from works which are played to a separate audience.

This definition is not without its problems. It excludes some activities that are commonly regarded as games, such as professional sports, which are predominately played for the pleasure of the spectators, not the athletes. It also includes activities that may not be traditionally thought of as games, such as sex, social dancing or playing a musical instrument for one's own enjoyment. However, from a designer's perspective I think it is useful. It focuses on the importance of the agency and experience of the player, while admitting a wide variety of play experiences that narrower definitions exclude. We may have challenging games, creative games, sensual games, subversive games, and more.

5. CONCLUSION

Game design is an art and no amount of abstract terminology can make up for a lack of concrete experience playing and making games. Yet I firmly believe there are useful abstract ideas and design principles to be drawn our mess of concrete experience, rules we can use to improve our designs whether by following or by creatively breaking them.

We are at an exciting stage in our discipline, at which practice is well ahead of theory. This presents unique challenges to educators as our familiar model of the classroom fails. I believe this is an opportunity to be embraced, to throw away passive models of learning and encourage students to be active and reflective learners. This is difficult, but we have an advantage: games are some of the best tools for active learning we have. I have presented my own game in the hope that others may find it useful in their teaching, but moreover, I hope it inspires other creative approaches to games education. I look forward to playing the results.

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Games cited

Left 4 Dead by Mike Booth, Turtle Rock Studios.

6. REFERENCES

[1] I. Bogost. What is fun? Keynote Speech, GAME conference, 2011.

[2] B. Costello and E. Edmonds. A tool for characterizing the experience of play. In *Proceedings of the Sixth Australasian Conference on Interactive Entertainment*, New York, NY, 2009. ACM.

[3] M. Csikszentmihalyi. *Beyond Boredom and Anxiety: Experiencing Flow in Work and Play*. Jossey-Bass, San Francisco, CA, 1975.

[4] K. Ferguson. Everything is a Remix [online]. 2010. Available from: *http://www.everythingisaremix.info/* [cited Dec 2012].

[5] T. Fullerton. *Game Design Workshop: A Playcentric Approach to Creating Innovative Games*. CRC Press, Boca Raton, FL, 2008.

[6] R. Hunicke, M. LeBlanc, and R. Zubek. MDA: A formal approach to game design and game research. *Proceedings of the AAAI-04 Workshop on Challenges in Game AI*, 2004.

[7] A. Kleon. *Steal Like an Artist*. Workman, New York, NY, 2012.

[8] D. A. Kolb. Learning styles and disciplinary differences. In *The Modern American College*. Jossey-Bass, San Francisco, USA, 1981.

[9] I. McGilchrist. *The Divided Brain and the Search for Meaning*. Yale University press, 2012.

[10] R. Pausch and D. Marinelli. Carnegie Mellon's Entertainment Technology Center: Combining the Left and Right Brain. *Communications of the ACM*, 50(7):51–57, 2007.

[11] M. Ryan. Eleven programmers seven artists and five kilograms of play-doh: games for teaching game design. In *Proceedings of the 4th Australasian conference on Interactive entertainment*, New York, NY, 2007. ACM.

[12] K. Salen and E. Zimmerman. *Rules of Play: Game Design Fundamentals*. MIT Press, Cambridge, MA, 2004.

[13] J. Schell. *The Art of Game Design: A Book of Lenses*. Morgan Kaufmann, Burlington, MA, 2008.