Higher Education Academy

TRANSFORMING TEACHING
INSPIRING LEARNING

Innovative pedagogies series: Playful learning

Using games to enhance the student experience

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Introduction

In this case study we examine the practice and benefits of games and learning in higher education. This approach is one that, we believe, can be applied to almost all disciplinary contexts with a little consideration. Modern students have to cope with a variety of pressures stemming from the increased cost of studying and living away from home – and for many this means working within the week, at evenings or at weekends. Students must invent their own study pattern around their timetable and working hours – and this leads to further diversity in the ways students carry out their learning, and access and interact with their course materials, which is often incompatible with traditional teaching formats and timetables. Seeing value and purpose in learning, and staying motivated in these conditions may be challenging.

A dominant argument is that games are beneficial to the current generation of students because they are motivating, meet the needs of 'digital natives' and allow learners to learn without even knowing they are doing so (e.g. Prensky 2007). However, in higher education (HE) many learners are not motivated by games, and the games that students play in their leisure time are not necessarily those most suited to learning (Whitton 2010). The idea of a digital native generation that has different learning needs has been largely discredited, and a much more nuanced understanding is required (Bennett and Maton 2010; Jones, Ramanau, Cross, and Healing 2010), and an understanding of what is being learned, why, and how, is crucial for the development of critical and reflective adult learners.

So, while games do not present a panacea for learning in higher education, we believe that they can provide a flexible option that has the ability to engage students, create active learning experiences, and enable students to experiment in safe playful environments. This case study develops these ideas, and provides concrete examples of how games and be used.

First, however, what do we mean by a game? There is much debate on this in the field of games and learning, but we like to use an inclusive definition, based on the work of Suits (1978), Huizinger (1955), and Salen and Zimmerman (2004):

> **A game is a challenging activity, structured with rules, goals, progression and rewards, that is separate from the real world, and undertaken with a spirit of playfulness; it is also usually but not always) played with other people.**

Similarly, there are a variety of ways in which the idea of games and learning can be constructed, from learning with entertainment or educational games in formal settings, to an analysis of the informal learning that happens in games when they are played for fun. It can include learning that is inspired by games (see e.g. Trapani and Hinds 2013), learning about games as cultural artefacts, or learning through building games. The field of games and learning also includes analysing games and gaming communities to see how techniques and ideas from these areas can meaningfully be applied to learning. In this case study, we focus on ways in which practitioners can easily design their own games to engage and enthuse learners.

Innovating in games and learning

We have both been working and researching in the area of games and learning for many years, developing our own games as well as supporting others to design educational games that balance learning and fun. While games in education have typically focused on the digital, these can be expensive and take control over the game design away from the teachers. The current age of austerity has led to a renewed interest in traditional and mixed-media games, which are far more accessible to develop (Whitton 2012), and there has been a growing use of traditional games for learning in recent years (see examples in Moseley and Whitton, 2013).

We have been asked on many occasions to present on our approaches to game development, and three years ago, in 2012, we developed the ten-step framework to game design as an approach to sharing what we have learnt about designing cheap and effective games for learning. This model was first developed as a workshop for the *European Conference on Game-Based Learning* (Moseley and Whitton 2012) and has since been further developed and refined.

The ten-step model of game design presents an accessible and easy-to-use process by which practitioners can design and test an educational game for their own contexts. It is designed to be flexible so that it is applicable to any type of game, for any type of learners and any form of learning outcomes. The model provides an initial framework for teachers to think about what they want to teach and how best to go about it using games.

There are three stages: context, grand design and refinement (see **Error! Reference source not found.** below).

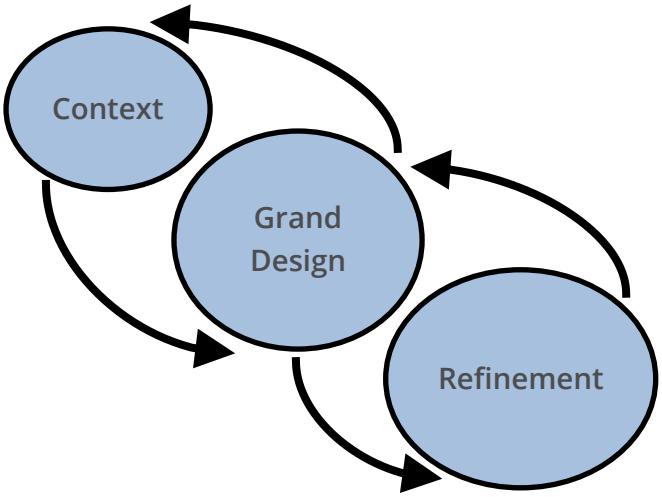

FIGURE 1: THE THREE OVERARCHING STAGES IN THE TEN-STEP PROCESS OF GAME DESIGN

The first two steps involve defining the learning context. Steps three to six involve development of a first prototype, and the final four steps are part of the refinement phase, in which the game is tested and further developed in order to balance fun and pedagogic value. As can been seen from Figure 1, each phase is iterative so a designer may move backwards and forwards through the three phases as a game develops. A more detailed overview of the ten steps in the framework follows.

Phase one: context

1. Define the ***learning objectives*** that you want the game to address.
2. Identify any ***constraints*** to the development process. This can include time, money, technical expertise, the characteristics of the learners, the confidence of the teacher, physical constraints of the teaching location or availability of technology, constraints of the subject matter, and accessibility considerations.

Phase two: grand design

3. Determine the ***game type***. Based on the learning objectives and constraints, decide on the broad type of game to be created. This can be traditional, such as a card or board game, quiz or physical game, or a digital game, mobile app or mixed-reality game.
4. Develop the ***core mechanics*** of the game. These are the basic elements of the game that need to be in place to create a playable experience, and include the player goal, the game rules, scoring, player progression, levels and win states, and the rewards for winning.

5. Refine the ***game balance***. This involves adapting various parameters of the game to make it appropriate for the learning situation and desired outcomes, to balance levels of fun and playability with the educational aims of the game. Elements that effect game balance include playing time, the difficulty of the game, levels of chance and skill, opportunities for collaboration and competition with other players, the seriousness of the game, and the combination of physical and mental challenge in the game.
6. Create and test the ***first prototype***. Develop the artefacts (e.g. game board, cards, objects, screen designs, digital prototype) to allow the game to be played or the game design to be shared with others.

Phase three: refinement

7. Add a ***narrative***. Consider elements such as the fictional setting and context for the game, the roles of the players, and any storyline within the game.
8. Add ***game dynamics***. These are features that add colour and interest to the game design and complement a strong core game mechanic. These include aspects such as set collection, additional elements of chance or risk, the opportunity to sabotage the progress of other players, timed elements, and additional rewards.
9. Check ***learning objectives***. Review the learning objectives against the final game design to ensure that the intended learning outcomes have not been lost or hidden in the game design. Consider surrounding reflective and debriefing activities that could be used to support the game, consolidate learning and transfer to real-world situations.
10. Develop the ***final game***. Create the physical and digital assets associated with the game, refine the rules, and develop the final game as a complete package.

Of course, any ten-step process would not be complete without eleven steps, so it is important not to forget:

11. Play your game!

The process is intended to be iterative and getting the game right may take many cycles of testing, refinement and retesting.

We developed this model into a flexible workshop that aims to exemplify the techniques used within the ten-step process. Participants work in teams to compete in the final of the (fictional) World Game Design Championships, developing, testing and refining their own games to meet the desired learning outcomes. The workshop is designed to run with up to 32 participants over 90 minutes, but is easily adaptable to different times and group sizes. All the materials and guidance for running and adapting the workshop are openly available at: **http://playthinklearn.net/ten-steps-to-game-design.**

Since we developed the workshop in 2012 we have run versions of it, either together or on our own, at a whole range of conferences and events, including: workshops at Manchester Metropolitan University, Lancaster University, University of Huddersfield, Nottingham Trent University, the Pädagogische Hochschule Freiburg; the *World ORT Symposium*; the *ALT Games and Learning SIG* meeting; the *2014 ANTF Symposium*, and the *HEA Arts and Humanities Conference 2012*. The workshop framework was also embedded within the EU-funded Making Games in Collaboration for Learning (MAGICAL) project (see **http://www.magical-project.net**) as a way of teaching trainee teachers about the potential of games and learning, and has been used in Italy, Finland, Greece and Belgium, as well as the UK.

Evolution of practice: Alex's perspective

A discipline specialist in Archaeology and heritage, I have been involved in the design of engaging and effective curricula for a number of years, principally working on research and practical skills at both undergraduate and postgraduate level. Such curricular elements are often "experienced as difficult, dull and

uninteresting" due to a disconnect with students' own views of their future work (Murtonen, Olkinuora, Tynjälä and Lehtinen 2008, p. 600).

In 2007, I was reading the Sunday paper when a mysterious postcard dropped out, containing an illustrated puzzle surrounded by odd codes and colour bars. Intrigued, a little exploration revealed this to be part of an *Alternate Reality Game* (ARG) called Perplex City, where thousands of people across the world were solving puzzles connected to an overarching virtual world that meshed subtly and cleverly with the real world.

A relatively young game form, ARGs started to form in the late 1990s, and came to public conscious when the first commercial ARG (*The Beast*, *2000*) launched to promote the film *A.I.* Based around the tenet that 'this is not a game', ARGs deliberately blur narrative in a fictional reality with objects/events/locations in the real world, such that "every aspect of the player's experience [is], phenomenologically speaking, real." (Mcgonigal 2003, p. 112). This blurring of fiction and reality clearly connected with ARG players: resulting in very high levels of engagement among a small subset (typically under 5%) yet noticeable engagement with a more sizeable portion – and this was certainly true of *Perplex City*. About a year into playing, I realised not only how much free time I had personally spent solving puzzles in the game (one memorable evening was spent researching theatre lighting gels in order to solve a tricky colour-based puzzle), but that there were many others who spent far longer: investigating, reading, discussing, researching for many hours every day. This contrasted with my undergraduate students, who were demonstrating quite opposite patterns of engagement with the similar skills required on their research skills course. It was at this point that I switched from player to action researcher.

I observed the game to its conclusion (the finding of a buried silver cube in rural Northamptonshire) and then interviewed the most engaged players: 50 interviewees drawn from the 100 or so players still discussing the game a month after it finished. The results were fascinating and I arrived at seven key features that could be applied to a higher education context, to encourage engagement (Moseley 2012). These were:

1. Problem solving at varying levels.
2. Progress and rewards.
3. Narrative devices.
4. Influence on outcomes.
5. Regular delivery of new problems/events.
6. Potential for a large, active community.
7. Base on simple, existing technologies or media.

These principles were used in a complete redesign of a Historical Studies research skills course, which became known as *The Great History Conundrum*.

Case study 1: The Great History Conundrum (GHC)

The GHC places students in the framework of an historical researcher: they deal with real problems and real issues with the real tools, while working alongside other research colleagues and supported by more experienced historians: this creates a strong, stimulating context, or *epistemic frame* (Shaffer 2006) that the students can engage with, and that strengthens as they move through their degree.

Students are provided with three puzzles of varying difficulty, covering different cognitive research skills (searching, selection, filtering, critique and application). Some can be solved as an individual; others need a partner or larger teams. Answers can be submitted 24-7, and are immediately marked, with points added to a live leader board; a new puzzle is then sent to the student via email (instant reward and delivery of new problems drawn from the ARG study). Collaboration is encouraged through some of the group puzzles, and through discussion forums: where students can post hints, reviews or requests for help and are graded based on how reflective and critical their posts are. Postgraduate moderators in the discipline grade these posts and encourage the students to improve; and the grades are added to the live leader board so that students can see their overall progress at all times.

The GHC is embedded into the wider degree in two clear ways. First, the puzzles were designed based on ideas from all departmental staff (tutors were asked to provide their 'most common student errors' and 'most useful resource for their subject area'); second, towards the end of the GHC, the students work in small groups to create a shared Wiki-based 'guide to research skills', where they synthesise all of the skills and resources they have uncovered through solving the puzzles into a guide: they retain access to this for the remainder of their degree.

The GHC has been running for seven years to date, and has proved successful on a number of levels. Students make full and active use of the 'immediate' aspects, with access data showing significant activity beyond 11pm in the evenings and throughout the weekend. The pass rate for students on the module is now at or very close to 100% (compared to below 90% pre-GHC) and students are achieving, on average, higher grades (73% achieve a mark of 60% or above, compared with a 56% average the year before the GHC was introduced). More detail is provided in (Moseley 2014).

The GHC approach has been developed into a similar approach in English within the same institution, and also adapted for a weekly challenge course for an Archaeology distance learning module. A version of the GHC is also now in use at the University of Sheffield History department.

Evolution of practice: Nicola's perspective

I have always had an interest in computer games, from playing *Lemonade* on an Apple II at my father's work, to programming games on my Spectrum, and playing an early multi-user dungeon as a student. When given the opportunity to study for a PhD, the potential of computer games in education seemed like an obvious choice of topic.

While convinced of the theoretical potential of great games to engage, stimulate curiosity and creativity, and get people working together on meaningful problems in a fun environment, I have been exercised by the problem of development time, skills, cost and expertise required to create truly excellent games for learning. When I discovered the potential of alternate reality games to create flexible, low-cost playful experiences, I saw the potential as an exciting and accessible way to allow educationalists to develop their own games.

Case study 2: ARGs for orientation, socialisation and induction

Alternate Reality Games for Orientation, Socialisation and Induction *(*ARGOSI) was a JISC-funded innovation project that ran in 2008-9 and aimed to use an alternate reality game as an alternative way of complementing traditional student induction to provide a way for students to get to know the city and meet new people. In addition, the challenges encountered matched the set of introductory information literacy learning outcomes covered in the University's standard library induction.

The game ran during the first ten weeks of the academic year 2009 and recruited over 150 players. The narrative was based around a fictional student, Viola Procter, who used cryptic posters, postcards and stickers to draw players into the game and recruit them to help her solve a mystery about a secret society linked to Manchester's industrial past. Players worked together to solve a series of online and real-world challenges (designed to develop information search and evaluation skills), using a discussion board to help each other, and keeping in touch with Viola via regular updates on her blog. As the game progressed, the story unfolded and the challenges grew harder. The game made use of a bespoke game engine that delivered and assessed challenges, showed personal progress against others, and offered a means of group and individual communication. The game also made use of external web resources including a bespoke site set up as part of one of the challenges, blog sites, social networking and video hosting sites.

Despite a fairly comprehensive marketing strategy, the take up overall was relatively small with a much smaller number who showed extremely high engagement and took part in the majority of challenges. Research indicated that kick-off during freshers week had contributed to the poor take up, as well as the cryptic nature of the publicity materials. Students indicated that they would have been more keen to take part if the marketing had made it more explicit that this was a game, and it was clear what steps they were expected to take. Although many respondents said that they did not have time to play 'a game' but would be more interested in taking part if they had realised that it would benefit their studies or there was external motivation such as a prize (Whitton, Jones, Wilson and Whitton 2014; Whitton 2011).

Although the project itself was not a remarkable success in terms of engaging students, it has had lasting impact in informing later projects. All project resources (including presentations and delivery notes, re-usable graphical artefacts, research findings, and guidelines on game and narrative design) are freely available at **http://www.argosi.playthinklearn.net** and have been downloaded thousands of times.

Evolution of practice: a happy coincidence

We met by chance in 2008 when we both presented papers on our work with alternate reality games at the same conference. Since then, we have worked together on many collaborative projects, including two edited books. Recently, the idea of pervasive learning environments (developed by Alex and Simon Brookes) has been adopted by Nicola at her institution.

Case study 3: pervasive learning environments

As ARG-like features started to appear in educational contexts in the form of *authentic* or *pervasive* activities, researchers became interested in how they fit with, and compared to, traditional simulation approaches. (Herrington, Oliver and Reeves, 2003) examined these two approaches and found that the biggest difference between effective and non-effective student activity was based on a 'suspension of disbelief'.

Simon Brookes, Lecturer in Enterprise at the University of Portsmouth, developed a new form of learning activity which drew from both of the above forms, and was also influenced by the way The Great History Conundrum created an *epistemic frame* for the students. He created the virtual town of Porthampton, complete with university, businesses, council, music bands, etc., and used it to immerse his students in realistic situations that allowed them to try out approaches without affecting any real businesses or populations. Playing on the principle of 'suspending disbelief', there were no high-end digital visualisations or models: instead, Simon and colleagues played the roles of Porthampton personalities, there were a number of websites set up to represent different organisations, and the students received 'real' prospectuses, letters, texts and emails from them throughout the ten-week module. Assessment was also authentic in form, involving presentations to a Managing Director of a Porthampton company; short answer questions posed by different characters; and peer assessment of their own performance within the environment.

The approach has been so successful, with high student engagement and performance, that it has since been taken up by the University of Leeds, and variations have been developed at the University of Cardiff (where students are tasked to set up a Porthampton music festival) and in a Research in Practice unit at Manchester Metropolitan University (where students are asked to respond to a call for proposals from the Porthampton Research Council, who then guide 'successful' bidders through the process of running a collaborative research project).

Brookes and Moseley (2012) classified this new approach as a *pervasive learning activity* (PLA) and describe both its theoretical development, and practical steps to develop further PLAs within that paper.

How this practice is situated theoretically

While the use of games for learning has been increasing in recent years across all educational sectors, there is a lack of robust studies into their educational effectiveness (Girard, Ecalle and Magnan 2012) and empirical evidence is inconclusive (Perrotta, Featherstone, Aston and Houghton 2013). However, it could be argued that issues are methodological (e.g. short-term interventions, small sample sizes, biased samples) rather than implying a lack of pedagogic value in the use of games. While the evidence for the value of games for learning is weak, there is stronger evidence for their impact on engagement (Connolly, Boyle, MacArthur, Hainey and Boyle 2012).

What research does tell us is that games certainly have the potential to have a positive impact on learning and engagement, but the use of a game does not ensure this as there are so many other factors that have to be taken into account. Despite the lack of empirical evidence for the value of games, there is a strong theoretical argument for their pedagogic value, based on their ability to create constructivist learning environments, the use of mechanics specifically designed to engage, and creation of safe play-spaces (Whitton 2014).

Constructivist theorists focus on the idea that knowledge is mutually-constructed and has three key precepts: situated cognition (individuals' understandings are developed by interactions with their environments); cognitive puzzlement (incongruence provides a stimulus and goal for learning); and social collaboration (knowledge evolves through social negotiation and discussion with others) (Savery and Duffy 1995). Games can be viewed as constructivist learning environments in that they are based around a puzzle that the player

must actively resolve, in a situated context of game play, and are typically played with other people (if not in real-time, often through web sites and shared interest groups).

In terms of pedagogic theory, games can be viewed from a number of perspectives. They embody ideas of problem-based learning (Boud and Feletti 1998) and experiential learning (Kolb 1984) by their nature as puzzles that need to be actively solved by the player. They provide authentic learning environments, in which learning is situated (Brown, Collins and Duguid 1989) in the context of the game, and that these environments are rich and meaningful epistemic frames (Shaffer 2006) that can be developed as pervasive learning activities (Brookes and Moseley 2012). The social nature of learning through games is also key, drawing on ideas of communities of practice (Lave and Wenger 1991), affinity groups (Gee 2008) and Vygotsky's (Vygotsky 1978) theory of the Zone of Proximal Development, which typifies the idea that players can learn more under the mentorship or guidance of others with more experience or knowledge.

As well as being active learning environments, games also employ a variety of mechanics that are designed to engage players and keep them playing. This includes elements such as:

- Challenge – the way in which games provide clear goals and rules to create challenges that are motivating because they are hard yet achievable (Malone 1980);
- Visible progression – through the use of mechanics such as points that can be accumulated and compared to other players, and by showing players what they need to achieve to reach the next goal in the game;
- Community – either by encouraging players to work collaboratively (either explicitly or because they are too difficult for one person to achieve alone) or by supporting play and communication outside the game itself (e.g. by provision of forums or other community space);
- Completion – some players will simply want to complete the game and achieve all the tasks or challenges, similar to wanting to complete a jigsaw to see the full picture;
- Competition – an element of competition can motivate some people, although it may turn off others, so it has to be used carefully in the context of learning;
- Mystery – by uncovering narrative elements or solving puzzles or problems to advance the game;
- Creativity – the opportunity for players to make things, through creative problem-solving or the development of their own artefacts within the game (e.g. creating posters, video, or stories).

Flow theory (Csikszentmihalyi 1992) provides a useful framework for understanding why games can be so engaging. Flow is a state of complete concentration and absorption with a loss of a sense of time and self-consciousness, and can be achieved when levels of skills and challenges are in accord. In a situation where a person has low skills and high challenge, anxiety ensues, and high skills and low challenge leads to boredom, but challenges that are equal to skills leads to flow. Games are particularly good a producing flow because of the way in which levels of challenge rise gradually, and the players are provided with appropriate scaffolding to help them meet the challenges at any given level.

Particularly in the area of higher education, one of the most overlooked theoretical benefits of games is their role as play spaces. A useful concept in theorising this is that of the magic circle (Huizinga 1955; Salen & Zimmerman 2004), which is a mutually-constructed play space, that is designated a separate from the real world (by the players) in which the rules of the real world do not apply the consequences in the real world are not the same. Construction of the magic circle can be formal, for example, by setting up a chess set; or informal, for example, by participating in a playful activity such as banter. The magic circle provides a safe space in which participants have freedom to make mistakes, learn from failure, play with fantasy and identity, have control over decisions and outcomes, and create objects and artefacts.

The creation of these safe play spaces is crucial for learning as they allow students to learn from their mistakes without real-world consequences, to negotiate social interactions and friendships, to experience the world from the positions of others, to explore possibilities, use imagination and think laterally about what might be possible.

How others might adapt or adopt this practice

While the case studies we have described represent increasingly more complex (in terms of setup/delivery) games-based approaches, they were all developed from the same simple principles drawn from our and others' research into game design. As we have discovered at every workshop we have run, a few simple design principles and a bit of imagination are all that is needed to create some really quite innovative and fun-to-play learning games.

Our most important advice, however, is to start by finding out for yourself what games can offer to your students. Even if you do not see yourself as a game player, think about the game-like activities you enjoy – sports included. What is it that keeps you coming back to that mobile scrabble game you play on your commute? Why do you enjoy watching Wimbledon? Which elements of family board games did you enjoy as a child – and just as important, which elements of any of these do you *not* enjoy? If you have honestly not played any games within living memory, try playing a few of the most popular simple games on the web or your mobile: Candy Crush, for example, or Angry Birds.

By reflecting on the motivating and demotivating factors surrounding your own engagement with games, you will start to find elements which might work in a learning environment; and which ones should be avoided. You will also start picking up some of the core game mechanics on which all games and sports are based, which will become useful tools when you start to develop your own approaches: Can you find examples of those we have listed in the previous section? Are there particular examples which resonate with you? For example, do you like the way a dice roll brings a different outcome each time you play? Then think about how randomness could add a sense of interest to your teaching activities. Enjoy the way that teams work together on the football pitch? Reflect on that when incorporating collaborative activities. And so on.

Once you have built up a small personal toolkit of ideas you like and aspects you dislike, you will be more than ready to try designing some game-based activities of your own. Using our ten-step approach, you could do this in a number of ways:

- **individually** – a major benefit of taking a playful approach is that failure is welcomed, and can be as valuable as success. Therefore, do not be afraid to try working through the ten-step approach yourself: if you are not sure whether the resulting game or activity is a good one, test it out with close friends or colleagues – or even small groups of students. Ask for honest feedback, and you will get a wealth of feedback on what to improve or change for your next version (or next new idea);
- **as a departmental team** – if you ultimately want your game-based activity to become part of a degree programme, it is a good idea to get colleagues involved right from the start – even if they are not involved directly on your own course. Running a game-design workshop is a great way to get colleagues working together and generating valuable ideas. The ten-step approach provides the model and resources for a fast-paced, fun workshop which works for up to 32 participants;
- **with your students** – as discovered in Alex's study of ARG games; and fitting with the increasing inclusion of students in curriculum-related decisions (Kay, Dunne and Hutchinson 2010), involving students in creating learning approaches is engaging and valuable for both staff and students. Involve your students in creating learning games using the ten-step workshop: the notion that their games could end up being used to teach the next intake of students is a powerful motivator (as well as the workshop being a light relief from studying). Asking students who have just been through your existing course is a good idea, as they will have recent memories of what they like and dislike from the current experience.

When designing your first games-based approach, whether alone or with other staff or students, you might like to bear the following tips in mind – drawn from our own practical experience. We have grouped them into the three sections of our framework.

Phase one: context

- think about the principal ideas you are teaching within your session; and in particular the concepts students find most challenging. Distil these down to their simplest form: If there were three things you would want your students to leave the session understanding or experiencing, what would they be?

Phase two: grand design

- Can any of the key concepts you identified be represented by a game mechanic, gameplay element or similar? For example, to denote random events in science/politics etc., you might use a dice roll; to denote concepts in finance/economics you could model your scoring system around them; to represent critical analysis of sources you might use puzzles, or competition between different sides of an argument;
- create prototypes using simple, available media – even if ultimately you want your activity to take place online/digitally. Use card, felt pens, and counters/dice from existing board games. It is much easier to amend a piece of card, or ditch cards altogether, after a playtest than to recode something digital.

Phase three: refinement and beyond

- playtest, test and test again – until you are making no more tweaks to your design. After the initial game design workshop or session, try to test out your game on as many groups as possible: family, friends, colleagues and your students themselves. In each case, note down areas of confusion and features that seem to generate good discussion or high engagement – then try to remove the former and boost the latter with each iteration;
- if you are embedding your game into an existing curriculum, you might need to begin with a non-credit-bearing approach, but then integrate it gradually into assessment. In the case of the GHC, in its first four years it contributed 10%, 20%, 30%, and 50% (respectively) to overall assessment on the module as it gained in reputation within the department.

Conclusion

We have both learnt a great deal from using games in our educational practice, and are passionate advocates of their potential. However, is crucial to acknowledge that games are not appropriate in every circumstance, and people prefer to learn in other ways. What is important is that we use games when they add real value to a learning experience rather than simply to motivate, and that learners perceive the real value of using games rather than something that is frivolous, trivial or a 'waste of money'. Also key to the use of games in learning are the activities that surround the game and the critical and reflective processes that learners engage in. It has been argued that a game is simply the trigger for the debrief, which is the important element for learning (Thiagarajan 1992), and it is important to consider opportunities for discussing what has been learned during a game and how those learning outcomes might apply to the real world.

Finally, a key thing to remember is that making games is difficult, and making games for learning is doubly difficult because they have to be both fun and educational. Not all games will be engaging, and not all will support learning, but by taking risks and engaging learners in discussions about the rationale and value of games, we have the potential to create meaningful, exciting and delightful educational experiences. And have a lot of fun in the process.

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