Higher Education Academy

TRANSFORMING TEACHING
INSPIRING LEARNING

Innovative pedagogies series: Game-based learning and IT literacy

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Contents

Introduction

The particular aspects of learning and teaching practice covered in this report are my attempts to bring an increased component of game-based learning into the teaching of information literacy skills. I have brought elements of 'playfulness' into my teaching practice that will be outlined here too. There are serious pedagogical reasons for this, and I go a little into the theory later in this report, but I will focus on how my own practice has developed, and I will give some tips for bringing similar techniques into your own learning and teaching practice.

But why should you care? Why should anyone else consider developing their academic practice in a similar direction? For me, I see games and play as great for three different areas: as a flavour of active learning; as a chance for learners to explore ideas in a safe and playful environment; and as a way of increasing engagement. Games often are not always all three of these, but can be any one or more than one.

Games can be online, but I more often use physical, printed games. They can be quick and easy learning activities dropped into an overall session, rather than the sole focus of a lesson. They are familiar to most people; young and old, regardless of background, all of which makes them easy to 'slip' fairly painlessly into your overall teaching repertoire.

One of the earliest game-like activities I used in my practice came out of one of the least likely situations for real learning to take place – the mass inductions we do with first year undergraduates. In the first weeks of the academic year, new undergraduate students have an enormous amount of information presented to them. Everyone from Deans to representatives of Career Services will talk at these students in the hope that some information will be retained. Library staff are equally guilty, using our 30-minute slot to bombard students with everything they may possibly need to know about using computing or library services at the University. Not surprisingly, we find little evidence that any of this information is retained.

The content tends to be primarily factual, rather than skills-based, but I felt they would benefit from a shift in the way these facts are delivered to students. For several years, therefore, I switched many of my inductions from being lecture-style to running as crossword competitions. I describe how I did this later, but this fairly lightweight change had some quick and clear benefits in my inductions.

These inductions switched immediately from being a chance for students to have a 30-minute nap into one where they were awake and actively involved. The library inductions stood out as different from the rest of the induction week, automatically becoming more engaging to the students. Students also asked more questions in the inductions than before, reflecting the efficacy of this simple, lightweight game approach.

This induction by crossword lead onto much more game-based learning in my practice. I hope the theory and examples I give below will give ideas as to how others will get similar benefits from using game-based learning in their own practice.

Innovating in play and games

The separate strands of games and playfulness may be distinct in pedagogical approach, but are also complementary and part of an overall mix of teaching approaches used within my practice.

I teach staff, researchers, taught postgraduate and undergraduate students from a range of disciplines, but the expected learning outcomes are normally quite similar. They tend to be focused around developing the information literacy[1] skills of the target group.

Sometimes the skills we are aiming to develop in the sessions I deliver are fairly low level and primarily routine or factual information skills. We may want students to become more aware of the services that the library offers, or how to access some of those services in person or online. Often, however, the skills we are trying to develop in those sessions are more generic and higher level in nature. Instead of trying to teach students how to access a database, they may be learning how to construct a meaningful search strategy that will work regardless of platform. The students may be learning how to evaluate information they have found, rather than simply finding a set number of resources. A first year undergraduate may learn the basics mechanics of using our main search tool, but later on will need higher-level skills such as analysing the journal articles they find and extracting key arguments from them.

Low level skills help to get the students that I see started as library and information users, but they also need a range of higher-level skills to become independent learners. The mid-level and high-level skills, however, are of limited use until they are put into the subject and academic context in which they are expected to operate. Often even the lower-level information literacy skills and the 'factual' things I get called upon to teach will also only be fully useful with that meaningful context too. Without a meaningful context provided by past experience and the subject area being studied, the students simply do not transfer the skills (or factual matter) into their academic or professional practice. They stay compartmentalised as 'library skills' which may be seen as pointless and irrelevant, so are never thought of again.

I use games and playfulness as a route towards enabling the students to apply the skills and facts gained during my sessions to their own academic and professional contexts. I find these approaches a valuable way to bring that context in from their wider practice to the learning of these information literacy skills and ensure that they become part of their academic or professional practice, rather than staying as irrelevant 'library skills'. In addition, I use these approaches to provide a wider range of sensory stimulation to aid memory formation, to aid in differentiation in teaching and learning in my classes, and occasionally just to inject a little fun into my teaching practice.

A few examples follow of games and methodology I use follow, chosen to illustrate how I have introduced these ideas into my own practice.

The playful induction

1. 'The playful introduction' outline	
The challenge:	Make library inductions more engaging and help students retain some basic facts.
Number of players:	I did this with up to 200 in a lecture theatre!
Time for activity:	20 mins (ten-minute crossword, ten-minute discussion)
Resources required:	A printed crossword and library leaflet per student.

[1] Information literacy is "knowing when and why you need information, where to find it, and how to evaluate, use and communicate it in an ethical manner." (CILIP 2004).

Outline of game:	I provided crosswords to each induction group of students, with the answers matching all the key facts we were required to cover. The questions were 'simple' crossword type (no cryptic questions!) such as anagrams, fill in the gap, and straightforward question/answer combinations. All the answers could be found in the accompanying library guide we gave out in all inductions. I asked students to work in pairs (or threes at most) to complete the crosswords and offered token prizes of sweets or chocolate to the first few groups to complete the crossword in each induction.
Additional resources found at:	Not applicable.

As mentioned above, inductions are always a struggle to make more engaging. Using crosswords was my first lightweight entry point into using games, and was an easy first step towards increasing engagement and helping students to remember more of the key facts from inductions.

This activity typically took around ten minutes for the majority of groups to complete the crossword. The second half of the session was then spent with the answers displayed on screen at the front of the class, while we discussed the answers as a class. This was the key to its success as a learning tool, as it provided a route to check understanding of the participants and to expand on the bare facts and figures covered in the crossword in such a way that was adaptable for each class, covering the issues raised by them in the short class discussion. For smaller class sizes, it often allowed fears and concerns about using library resources to be raised and addressed in a way that was rarely managed in a standard induction.

SEEK!

2 'Seek!' outline	
The challenge:	Get students to understand how to construct a search strategy and why it might be useful to do so.
Number of players:	Between four and eight per game. I typically use this in classes of around 30 students, with five or six games going on at the same time.
Time for activity:	20 mins (ten-minute game, ten-minute discussion)
Resources required:	SEEK! Cards, sweets or counters for keeping score.
Outline of game:	Players have two cards each. On each players turn they can choose which of their cards to play, asking a question to another player of their choosing. They then discard this card and draw another. Wildcards are also included to add a random element to the game.
Additional resources found at:	**http://eprints.hud.ac.uk/19345/** Includes the full game, player and teacher instructions, plus editable question cards.

One area I have struggled to teach in a way that was meaningful to students at any level, is how to construct a search strategy. Often students and staff will struggle to express their information needs in a way that will give relevant and useful results in a search engine – that is to create a sensible and effective search strategy.

Over the years I have lectured, given various worksheets, and even shown videos of plastic dinosaurs helping a student to search (see: http://www.library.usyd.edu.au/skills/elearning/learn/topic/index.php), but while they all had limited effect, few seemed to reflect on the subject matter and realise it was a skill that would make a valuable difference to their own practice. As my interest in using games for learning developed, I saw this as a prime candidate for gamifying their learning.

The game questions cover topics related to picking keywords from an assignment question and combining those terms in a typical search engine. Most questions are relatively straightforward, but some are deliberately left open to interpretation to encourage discussion.

FIGURE 1 SOME EXAMPLE 'SEEK!' QUESTION CARDS

The game was designed to introduce the same ideas of constructing a search strategy that I have covered in various ways in the past. However, it put the focus on the students to reflect on the knowledge they already had and apply it to the game. Similar questions were asked repeatedly in the game, allowing students to develop that knowledge themselves (whether asking questions or answering them), rather than me presenting them with the 'answer' from the front of the class. The game allowed differentiation, with the mix of questions challenging all levels of students and a wildcard factor balancing the game so that students of all abilities had a chance of winning. In addition, as made clear in the teacher's instructions, there is another layer of learning after the game itself. After the ten-minute game, we spend roughly ten-minutes discussing the game, particularly the trickier or more ambiguous questions. This reinforces the learning that takes place in the game, and helps the whole group reflect on the questions covered and what it may mean for their own academic or professional practice.

Referencing games

3 'Referencing games' outline	
The challenge:	Help students see patterns in our standard referencing system and improve confidence.
Number of players:	I have run this for up to 50 students, split into groups of two or three.
Time for activity:	15 mins (five-minute game, ten-minute discussion)
Resources required:	Set of cards, each of which has a component of a reference printed on it. An APA 6th referencing guide.
Outline of game:	Students build the components of a reference using the elements contained on the cards. This is done in competition with other groups in the class, with a prize for the highest scorers.
Additional resources found at:	**http://eprints.hud.ac.uk/id/eprint/25335** Includes a full set of 'reference element' cards.

One of the areas that seems to concern students (and often staff) at all levels is referencing. Instead of worrying about what to reference, which should be the hardest part of referencing, they worry about the technicalities of how to reference. Even experienced academic staff get stressed about the exact placements of full stops, or which elements of a reference should be in italics. Students new to a referencing style will often lack confidence, even postgraduates who have used similar styles in the past. This may not always have been helped by the typical approach to teaching referencing, which understandably tends to focus on areas like correct punctuation (for a particular style) that students can struggle with.

My approach over recent years to teaching students how to reference has been to use a simple referencing game, where students will build references using elements already laid out on cards. I use these cards in a few different ways depending on the group, but most typically in the way describe below.

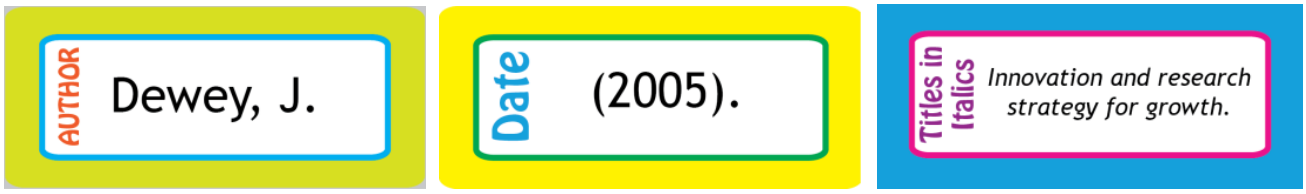

FIGURE 2 SOME EXAMPLE REFERENCING CARDS

I split the class into small groups, preferably pairs or threes. Each group has access to a large number of cards with referencing elements printed upon them (such as author, date, place of publication, etc.). They can then pick what type of reference they want to build first depending on how difficult a reference they want to try and how many points they will try to earn. I vary this by class but I often give one point for a book reference, building up to five points or the most difficult (normally a conference proceeding), so they choose their own balance of difficulty versus potential number of points. Each group has a copy of our referencing guide to help them. They have a fixed amount of time (often just five minutes) to earn as many points as possible through building references. I award a small prize (such as sweets or chocolate) to the group who has earned the most points, and the group who have built the most references (recognising the weaker students who may only be confident in trying the simpler references).

The game, described above, allows students to practice building references without worrying about factors such as punctuation, which are included by default on the cards. The second step is to facilitate a discussion where the groups look for patterns in the references. With several references in front of them, they start to construct rules themselves about the referencing standard, including the formatting and punctuation that many students tend to worry about. After a short discussion, a group will typically have enough rules to construct a reference type that we have not practiced as part of the game. The game and subsequent discussion allows them to practice building references using our guides, but also to understand how a reference is constructed and apply it to new situations, rather than focusing on remembering the exact formatting and punctuation that they apply in each situation.

Journal analysis through collage

4 'Journal analysis through collage' outline	
The challenge:	Extracting useful information from a journal article.
Number of players:	Small groups of three or four learners, the main limit on number of groups is the space required for cutting and pasting.
Time for activity:	15 – 25 mins

Resources required:	A copy of a journal article per group. Scissors, glue, pens and flipchart paper.
Outline of game:	Each group receives a copy of a journal article, some scissors, glue sticks, and a piece of flip chart paper containing a template representing a house. They are then tasked with cutting elements (words, phrases and sentences) out of the article that address certain key areas and to stick them onto the template appropriately.
Additional resources found at:	Not applicable.

Analysing a journal article and extracting relevant information to re-use in your own work, is a higher-level information literacy skill than students new to university may be used to. Often undergraduate students, plus some international postgraduate students, will be used to scanning material and cutting and pasting that material into their own work. If lessons on plagiarism and referencing have been successful, they may know to reference that material correctly, including paraphrasing appropriately, but the earlier act of critically reading, evaluating, and extracting information from a source may be difficult or alien to them.

Rather than use a highly structured, formal game to help students gain these skills, I have instead made it a more creative and playful activity (see discussion of play and games below). I have tried to engineer a learning situation where students can think with their hands, and can physically cut and paste elements from one information source (such as a journal article) into a useful summary for that article. I have tried different shapes and structures for this, but the example given here is one I created with a colleague to use with Education students as part of an academic intervention project.

Students cut elements (words, phrases, and sentences) out of the chosen article that address the following areas and to stick them onto the template appropriately:

1. the main purpose of the article (Why has the author chosen to write this article?) (Main body of the house);
2. the key question the author is addressing in this article (front door); what facts or data the author has used to support any conclusions made (foundations);
3. the main conclusions in the article (roof);
4. the key concepts or theories in the article (windows);
5. any underlying assumptions underpinning the author's thinking (What are they taking for granted?) (Bricks);
6. how can it be applied to your assignment/project? (Chimney pot).

They then write one or two sentences in their own words to sum up each of the sections of their collage. They stick their collages to the wall of the classroom and spend time looking at each other's work, adding a few notes (if they wish) to other collages. This activity finishes with a short reflection by every group that is fed back to the whole class. The ability to 'think with their hands' in cutting and organising the elements before summarising them helps the thought process of students and helps them see how they can pull information out of a long, serious journal article with confidence in future.

Model making and LEGO

5 'Model making and LEGO' outline	
The challenge:	Reflecting on a partly-completed literature review and finding ways to improve it.
Number of players:	Up to 20.
Time for activity:	At least an hour. Varies according to number of students who need to feedback.
Resources required:	An assortment of LEGO pieces.
Outline of game:	Five minutes working individually to build a metaphor for their literature review from LEGO. Explain this model to the group, then spend 10 minutes working together in groups to build their "ideal" literature review. Switch again to individual model building to create their own action plan to improve their literature review.
Additional resources found at:	This is based upon (though not strictly following) the LEGO Serious Play methodology: http://seriousplaypro.com/docs/LSP_Open_Source_Brochure.pdf

Alongside collage activities, such as the one described above, the other creative and playful approach rather than a structured game activity that I have taken, is that of model making. I have used modelling clay for similar activities in the past, but the example described below, making a LEGO Literature Review, is my favourite model-making activity for information literacy skill development.

This type of activity allows learners to think with their hands, rather than just their heads, and the easy-to-connect nature of LEGO means that it is quick and simple to build models as metaphors for the ideas I want students to express. It is inspired by the LEGO Serious Play methodology, described later on in this report. When I have asked groups of students in the past how they are managing with literature reviews, the most common answer is "okay". This approach is intended to get something a bit more meaningful from them, help them reflect, and let them build their own solutions to improve their work.

In the workshops, students each have access to a wide variety of LEGO pieces, and sit in fairly small groups, though much of their work is carried out individually. They will either be final year undergraduates, or postgraduates working towards a dissertation or thesis. The activity is designed to draw out problems with their literature review while it is a 'work in progress' and help them find solutions to improve that literature review.

FIGURE 3 LEGO MODEL MAKING IN ACTION

The students are given five minutes to build a LEGO model of their literature review as it is at present. The time given is deliberately short, as we do not want a very detailed model, simply a model that represents, in some way, the literature review that they can then talk about. The act of building the model physically with their hands helps them reflect and think about their literature review in a different way and they can then talk about the model as one step removed from themselves, making it 'safer' to express their progress and problems.

Once the five minutes is up, they then have to explain their model to the rest of their group (if a small class, this is to the whole class, otherwise to the small number of people they are sat with). In itself, this enables much richer reflection and sharing than without the model making activity.

The next step is to spend ten minutes working as a group to build their vision of an 'ideal' literature review. This is shared with the whole class and discussion held around the similarities and variances between the models to get a whole group vision of what an ideal literature review would look like and how that may be achievable (with the instructor facilitating that discussion). The result should be a list of characteristics of a good literature review and an idea of how to achieve it.

The learners can then return to their original, individual models and build their own solutions showing what they need to do next to turn their existing literature review into an 'ideal' one. They share that with the rest of their group, which becomes their action plan to carry out after the session.

How this practice evolved

These practices developed out of my early experiences of teaching information literacy skills as a new subject librarian. With limited teaching experience and no teaching qualification, I found I was expected to teach these skills to undergraduates, postgraduates and staff. The materials shared with me suggested that the 'normal' way of doing so was largely didactic in approach, with slides that were talked to, some demonstration of 'how to search databases' and perhaps an element of time for students to 'practice' where they were expected to enact the steps shown during a demonstration to carry out searches on their own.

I found this unsatisfactory on both personal and professional levels, with both myself and the students being bored and learning little. What little learning did take place seemed to be largely on a surface level, with students copying what I had shown them and little real change taking place in their information literacy practices.

Thanks to some colleagues, particularly at professional conferences, I quickly picked up on the idea of taking an active learning approach. Instead of learners passively listening (or not listening) to me talking at them from the front of a classroom, this approach meant that they had to be actively engaged in their own learning. I built a toolkit of active learning approaches and used them widely in my own information literacy skills sessions, bringing benefits to the students and making the teaching experience more satisfying for myself.

Several of the techniques that I used fairly early on had game-like elements to them, including quizzes and the induction by crossword described above. Many of the games I use stay within the spirit of these activities and are short enough to be dropped into any session I deliver as one component of an overall class.

While still thinking about active learning approaches, rather than games, I carried out a project within my library service to gamify the use of the library and its resources (see: **https://library.hud.ac.uk/lemontree/**). While this was quite lightweight gamification – offering badges, points, and leaderboards as elements to engage students with the library – the project gave me the confidence to look again at my active learning techniques through the lens of play and games. I considered my teaching practice and allowed it to become more 'playful' and to allow some of the elements I used to teaching particular information skills to become 'games' in their own right.

Even though I wanted to do this, I was still unsure whether information literacy games would be one step too far for my institution and service and I was sure they would not be willing to pay for the design and printing of such a game. I therefore sidestepped official approval and funding, instead aiming to raise a small amount of money through crowdfunding to create a game (SEEK!) through Indiegogo (see: https://www.indiegogo.com/campaigns/seek-a-game-for-information-literacy-instruction). This raised enough money to pay for a librarian and former graphic designer to take my specifications and create a finished game. It paid for the design work, the printing (through a print-on-demand game company, Game Crafter), and the distribution of games as rewards to the crowdfunding backers.

The game was prototyped and play-tested using colleagues in my workplace, before being committed to print with the final designs, questions, and wildcards that we tweaked through prototyping in order to get the balance of the game correct. It was then made available under Creative Commons licences through Jorum and my institutional repository (http://eprints.hud.ac.uk/19345/) as print-on-demand versions, together with editable question cards so that anyone can create their own version of the game.

The same basic process, without the crowdfunding element, has been repeated whenever I wanted to create new learning games. I have become more confident in identifying suitable learning objectives, then designing a game that meets those objectives; prototyping and play-testing the game several times; involving graphic designers where possible to create a workable, good looking design to print; and then sending the game to be printed. Students, including placement students, interns in my workplace, and recent graduates, have been a great source of graphic design expertise for relatively little expenditure. I have used them wherever possible to create more polished games than would otherwise be possible. For card-based games, I have often used flexible business card printers (such as moo.com) rather than professional game printers, to create small volumes of cards for limited expense.

As I have continued to create games, so I have become more confident in bringing in less structured play, such as the collage activity and model making activities described above. These have similar benefits, though not identical (see discussion below) and take a similar pedagogic approach, but can require more confidence to use as they are less structured and controlled than more formal games.

To spread the use of games in information literacy instruction, I now run workshops regularly, where attendees learn how to take a similar approach within their own teaching practice. Workshops last half a day, or full day, with a high degree of group work, resulting in each group producing their own learning game through the same methodology I use. Prototypes created at these workshops are then shared through a blog in the form of short videos (see: http://gamesforlibraries.blogspot.co.uk/).

How this practice is situated theoretically

Game-based learning is situated in different educational and pedagogic areas. I sketch out some of these below, which may be useful in situating the reader's own practices and providing a framework for developing them. Ideas of active learning (and constructivism) appear throughout the practices and are central to the whole approach. In addition to this, theories of games and play are important to the construction of the activities and have benefits in addition to the active learning approach taken. If you know some of the theory behind using games, you can take full advantage of them as a learning methodology. Last, but not least, the idea of embodied cognition, that we think with our bodies as well as our minds, is important in many of these activities, particularly the more creative ones, and will be described in the context of LEGO Serious Play that inspired the model-making activities.

Active learning

My favourite description of active learning has always been 'learning by doing' (Gibbs 1988), perhaps because I tend towards simple definitions anyway, but primarily because it is a great summing up of the core idea of

active learning. Students engaged in active learning, who are actively doing, discussing, questioning, playing, describing, creating rather than sitting back passively, are able to work things out for themselves and develop better, more in-depth, understanding than if simply presented the same information. This is the core of constructivism, the construction of models of knowledge by the learner themselves, and so active learning is clearly a constructivist approach to learning (Pritchard 2008). Active learning builds on the learner's existing relevant knowledge and skills, and uses these to make sense of new challenges that the educator presents. It therefore focuses on the process of enabling, or scaffolding, that development of knowledge rather than the learning outcome on its own. Active learning does not feed information to students, but explicitly makes sure students take an active part in their own learning processes (Chickering and Gamson 1987; Pritchard 2007).

Active learning, in using existing knowledge and building upon that foundation, is more fluid than more didactic styles of teaching, encouraging discussion and participation between groups of learners, as well as learners and the instructor. Other similar approaches, such as problem-based, enquiry-led learning, and student-centred learning may be seen as more focused versions of active learning (Chalmers 2008) but from the same pedagogic stable. This active learning approach sits underneath a lot of approaches I take in the examples within this paper, but through the lens of playfulness and games, which takes the active learning approach in a particular direction.

Games and play

Building on the active learning approach, games and play have particular benefits in the types of learning I am trying to encourage. The literature on adult learning and play tends to be slightly fragmented depending on the type of games or play being described, but here I will outline some ideas of what play and games are, what they may be particularly good for, and why that has influenced my adoption of them within my teaching practice.

Definitions of games and play can be problematic, partly as everyone has an opinion on what a game actually 'is', so long complex definitions may be less helpful than sketchier, more practical ones. This is explained by Caillois and Barash (2001), where Caillois brings play and games together on a spectrum of "play forms". Instead of an activity being pure play, or a formal game, all game and play-like activities sit somewhere on the overall spectrum.

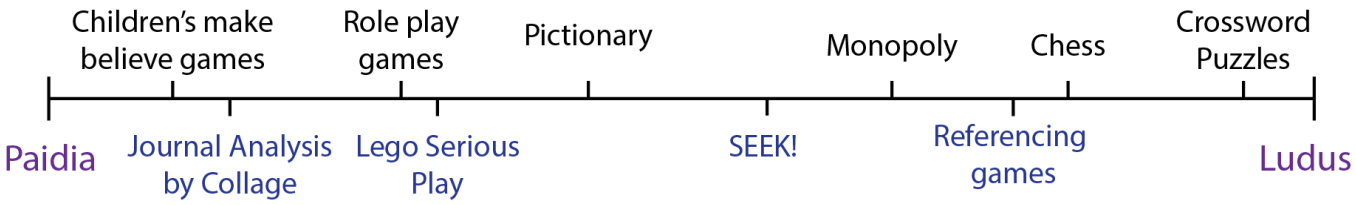

FIGURE 4 AN EXAMPLE SPECTRUM OF PLAY FORMS, WITH APOLOGIES TO CAILLOIS. (NOT TO SCALE.)

An incredibly formal and structured game, such as chess, may sit towards one end of it, the 'Ludus end' in Caillois' terms. Completely free imaginative play in which a child may engage with her friends is at the opposite end of the spectrum, the 'Paidia end'. So playful activities and formal learning games sit on different spots within the same spectrum, and share similar characteristics. What vary are the characteristics that may be dominant within that particular activity. That said, I will give some definitions of play and games that may be useful and show where they sit within my teaching practice.

I find the definition of play by Brown (Brown and Vaughan 2010) particularly useful as it defines play using a list of key features. It states that play is:

> Apparently Purposeless (done for its own sake); Voluntary; has Inherent Attraction; Freedom from time; Diminished consciousness of self; Improvisational potential; and Continuation desire. (Brown and Vaughan 2010, p. 17).

The particularly powerful ideas for learning in my examples, are those attributes of a "diminished consciousness of self", and "improvisational potential." These allow the leaner to express ideas and to create new knowledge (such as within the journal collage and LEGO activities) in a safe environment. They have the freedom within that activity to approach it in their own way and improvise in how they pull the information together and the playful nature of the whole activity means they are less aware of themselves and braver in expressing their own ideas. These attributes are the key ways in which games, and particularly the playful end of the games–play spectrum, create a 'magic circle', which provides safe places to learn and explore, often through the use of metaphors (Francis 2009; Gauntlett 2011).

I take advantage of the safety that play and games enable, as I often only see students for 'one-off' sessions, perhaps two or three times through their whole time at university. I introduce new ideas that I want those students to reflect upon and to work out themselves how those ideas fit within their current practices as groups of students, or in their future professional practice. This fits in with the explicit argument that play is particularly important at transitional periods as social learning groups, in new situations and in learning new ideas. It provides "a non-threatening forum for experimentation and a means to form a cohesive subculture/group in which the student feels a sense of belonging or relatedness" (Cooper 1996, p. 33). Even within the more formal games I use (such as SEEK!), I often find that students will adapt the rules themselves as they play to suit the group dynamics at the time. The safety that play enables within the game allows them to feel safe in doing so, and allowing them to explore the ideas contained within the game in different ways.

Games can be thought of as play with more formal rules (rather than improvised rules), but instead of giving a full definition here, I instead give one that can help when thinking about creating learning games. Jane McGonigal (2012) says that "All games share four defining traits: a goal, rules, a feedback system, and voluntary participation." (p. 21) So, when creating a game, bear in mind that there should be a clear goal in mind, game mechanics that move us towards that goal (the rules), and a feedback system (so you can tell if you are moving towards the goal).

LEGO Serious Play

The use of model building, such as the LEGO activity, is just a specialised case of play. It has the same benefits of play in the provision of a safe environment, a 'magic circle' in which participants can step outside of themselves to explore difficult ideas and concepts. LEGO Serious Play came from a research group associated with the LEGO Company. (For more details see: Kristiansen and Rasmussen 2014.) The inspiration behind it came from two areas that they combined: play and embodied cognition. They wanted to reap the benefits of play, as outlined above, in encouraging the creative exploration of business strategy, including within the LEGO group itself.

One of the researchers read a book by an American neurosurgeon, Frank Wilson (1999), which introduced to the group the idea that we think with our bodies as well as our minds. People problem-solve by picking objects up and manipulating them, so a learning process that includes an element of thinking through our hands (or bodies) can give better results than pure 'intellectual' problem solving.

The two ideas – play, plus embodied cognition (see Wilson 2002 for further explanation) or 'thinking with our hands' – together form the core of the LEGO Serious Play methodology (see: http://seriousplaypro.com/docs/LSP_Open_Source_Brochure.pdf). LEGO Serious Play creates a safe environment for participants to build metaphors representing ideas or problems. As it was created through the LEGO Group, it should be no surprise that the medium they choose to build those models was LEGO bricks. That said they work well for such activities, providing a massive range of building options with pieces that most people find easy to put together. Within LEGO Serious Play, there are set processes to facilitate problem solving, as well

as specially created LEGO sets. So, although the model making I carry out is inspired by this methodology and overlaps considerably, it is definitely not official LEGO Serious Play.

The model-making and collage activities I have described above come from the same pedagogic backgrounds as LEGO Serious Play. They sit on the more 'playful' end of the spectrum between free play and formal games. They take advantage of the 'magic circle', enabling safety and creativity in participants, while also bringing in similar elements of embodied cognition, in respect of meaning problem solving partly through using our hands. The building of models, or moving pieces around a table that have been cut from a journal article, allow participants to work out their thoughts partly through physical manipulation.

Whether I focus on 'playful' activities, or the more structured games, depends upon the focus of my learning objectives at the time. The structure and sometimes repetition of facts and ideas within games such as SEEK!, or induction by crossword, can suit objectives where I may want to introduce facts; allow practice through repetition; or introduce ideas for later discussion. The more formal and structured a game is, the less it allows exploration of ideas.

The opposite is true for the most playful activities. The freer the play, the more the activity allows exploration of concepts and reflection upon prior knowledge, but the less it allows the introduction of, or embedding of, new facts.

So the activities that are freer and more playful in nature I use when participants may already have most of the 'facts' available, and need to build upon that knowledge to create new understanding, often as part of a group consensus. There are elements of both within all the activities I have described, but the choice is simply which to bring to the front, which to prioritise, when creating new learning activities.

How others might adapt or adopt this practice

My key suggestion for adopting similar practices to those described above is to start with a simple, non-digital game. Create a game that would meet a learning objective that you already teach in your existing practice and introduce it as one activity among the range that you already employ.

This suggestion, however, raises a follow-up question: How do I create a game? There are a few simple steps to follow that help in this respect:

1. Set learning objectives

As with creating any learning object, this is the first step to take. Make sure you have a clear learning objective in mind before you start creating a game. This should be forefront in your mind through the rest of the process. Make sure that you will be able to measure whether any objective has been met either through the gameplay or as a follow up activity once the game has finished.

2. Consider your key constraints

There is no point in trying to design a complex online game with cutting edge gameplay and professional graphics if your budget is zero and your likely materials are made up of whatever you can raid from the admin office. List some key constraints at this point and bear them in mind throughout the rest of the process. Constraints to consider maybe: How many students must it be delivered to? How much time will they have to play the game? What skills can I draw on from my team? Your own list of constraints will depend on your own situation at the time.

3. Decide on game mechanics

Game mechanics are those elements that drive a game forward towards its conclusion. They are the elements described by the game rules and describe how the game is played and what happens on each turn.

Examples are too many to list here, but include such things as rolling dice, drawing and discarding cards, playing co-operatively or competitively, etc. The best way of finding game mechanics is to think of games that you are familiar with and consider what happens on each turn of the game. If you identify some game mechanics you want to use, these will become the building blocks of the game as you develop it.

4. Pick a theme or feel for the game

If you strip away the theme or story of a game, you can find the same game mechanics used again and again in very similar games. The theme provides a narrative over the top of the game mechanics, creating a richer and more engaging experience. If in doubt, you may want to leave it quite 'clean' and without an overt theme, but it will be less engaging as a result. An example of how a theme can dramatically change a game is Zombie Dice (see: https://boardgamegeek.com/boardgame/62871/zombie-dice) – the same game could be played with simple dice, but the addition of zombies, brains and shotguns makes it a more engaging experience.

5. Prototype

The steps above can be carried out as a purely intellectual exercise. The 'prototype' step is where it actually becomes a 'real' game. Use bits of paper, sticky notes, any bits and pieces that come to hand to create physical game pieces, to write down questions, draw game cards and boards, and to create as much of a physical game as you can. While the earlier steps can be quite difficult, once you start physically creating a game, it evolves quite quickly (see embodied cognition above for an explanation why). You may divert from your initial ideas of game mechanics and theme at this stage, but remember to stick to your learning objectives and key constraints.

6. Play-test and improve (several times!)

At some point you will end up with a prototype that is just about playable. Try and play it through, preferably with some willing colleagues, and see what happens. There is a fair chance that the game will not work as you expected, which is good! This play-testing stage is deliberately designed to find out what works and what does not so it can be turned into a finished game. Repeat the prototyping stage and play-test again as many times as you need to. In the later stages you may find the game works, but needs extra game mechanics introduced such as random elements to balance the game and make sure it does not depend solely on luck (putting off many players) or solely on skill/knowledge (putting off the less able players).

7. Write the rules

This is surprisingly difficult, but is vital to do it well. It gives the players something to follow rather than depending on your guidance to the whole class, plus it enables other instructors to be able to pick up the game and use in as a learning activity themselves.

8. Finish the design and print

If you can bring in a graphic designer, even if they are a willing student from your institution, it can be worth it. You will end up with a more professional-looking and engaging game as a result. A good designer may also bring in elements that make the gameplay work more effectively, so if necessary play-test again at this stage and feed it back into an improved design. Print the game materials to as good as quality as possible, which again improves the student engagement.

If you can follow the steps above, while bearing in mind the key characteristics of games – "a goal, rules, a feedback system, and voluntary participation" (McGonigal 2012, p. 21) – it is a relatively painless process to create a useful game activity for your teaching practice.

My second suggestion would be to seek out the experts, people who know how to create learning games and will help you develop yourself in this area. The Games and Learning Special Interest Group of the Association of Learning Technologists (ALT-GLSIG) are supportive, creative and incredibly knowledgeable in this area.

Conclusion

My movement towards using play and games within information literacy skills instruction has taken time, but has been built from the solid foundations of active learning approaches to education. I find the techniques I have illustrated and discussed above a valuable way of allowing students to have deeper learning experiences than occurred in the past, even with the limited contact time I have with them.

It has given me another set of tools to use as a teacher (I do not exclusively use games!), especially in trying to get students to understand difficult concepts. I am using increasing numbers of game activities in my teaching and I am creating new games to use regularly. As well using these with my learners, I am enjoying sharing my experiences with others, for example, running workshops where staff create prototype games to use in their own work (see: **http://gamesforlibraries.blogspot.co.uk/**).

The next challenge is to try to bring more playfulness into the library and the University as a whole. We have done a little of this at the University of Huddersfield (Walsh 2014), turning using the library into a slightly more playful experience, but it would be fabulous to go further. Can we make going to university a playful experience, where students would feel safe exploring new knowledge and spend as much time as possible in that state of optimal experience, or flow (Csikszentmihalyi 1991) that games aim for? A definite challenge, but one I would love to work towards.

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