Gamifying design education

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Designers are increasingly in demand in a range of context because of their ability to deal with complexity and develop innovative solutions. Educational practice, however, is not yet on par with the multi-disciplinary and multi-modal learning style of today’s students. Gamification offers the promise of an innovative approach to engage students and produce better learning outcomes. The challenges facing gamification designers are parallel to those of experience designers, chiefly in ensuring the solution is contextually and personal relevant to the user. Learning design thinking, however, is a complex social activity influenced by myriad contextual factors. Cultural historical activity theory, when coupled with design-based research, offers a theoretical foundation that allows for gamification to be used for expansive education. The authors present The Four Orders of Gamification and a Gamification Design System that enables design educators to develop expansive curricula for tomorrow’s designers.

keywords: gamification; cultural historical activity theory; design education

Introduction

Design practice and design thinking have emerged in recent decades as a means for institutions, workplaces and individuals to engage with and work within an increasingly complex, trans-disciplinary and technology-enabled world. The design approach, however, has been relatively slow to penetrate curriculum and pedagogical (educational) practice, even for the education of current and future designers. Efforts and approaches such as problem-based learning are aimed to introduce design practice and thinking into the educational experience. However, these tend to be peripheral rather than central, and
there is a serious gap in our knowledge about what makes for successful problem-based learning environments (Jonassen, 2011).

‘Gamification’, like ‘serious games’ and ‘game-based learning’, is a more recent design-like arrival on the educational landscape with great promise to support the development of soft skills, transversal competencies and collaborative production (Engeström, 2001; Herrington & Reeves, 2011). However, the approach has attracted significant criticism due to many examples of the over-application of very simple game mechanics and a reliance on extrinsic motivation. In this paper we will argue that this limitation of gamification occurs primarily due to a lack of theoretical understanding of what gamified learning environments can and should achieve. Subsequently this means there is a lack of theoretically informed design tools for gamified learning environments.

With reference to a case study from the literature, and to our own work in designing gamified learning environments as part of an educational design-research project, the paper will contribute to closing this theoretical gap. In particular, the paper will provide a reflexive discussion on how cultural historical activity theory (CHAT) can be used to inform the design of gamified learning environments. Before doing so, the paper will set out some basic concepts for our discussion.

The expanding use of design thinking
The field of design thinking has come far in recent decades. From John Dewey’s (1929) foundational concepts of delineating between science, art and practice, to Herbert Simon’s (1996) notion of ‘sciences of design’ and crafting preferred environments, the design process has grown from a largely product- and industrial focus to one which incorporates all manner of problems. As stated by Richard Buchanan in his influential Wicked Problems in Design Thinking (Buchanan, 1992):

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\text{Despite efforts to discover the foundations of design thinking in the fine arts, the natural sciences, or most recently, the social sciences, design eludes reduction and remains a surprisingly flexible activity. No single definition of design, or branches of professionalized practice such as industrial or graphic design, adequately covers the diversity of ideas and methods gathered together under the label. (Buchanan, 1992)5}\]

Design thinking is becoming an increasingly adopted approach beyond the traditional design fields and is, increasingly, a standard for businesses, not-for-profits and governments worldwide (Sobel & Groeger, 2013). This is due in part to the increasing relevance of wicked problems environmental, social and economic problems (Buchanan, 1992; Dunne and Martin, 2006) that are placing increasing pressure on organisations to be skilled in innovation (Dunne & Martin, 2006). The shifts required include mind-sets and styles of work that are collaborative, iterative and abductive (Dunne & Martin, 2006). These ways of working have been widely referred to as ‘twenty first century’ or ‘transverse’ skills (Beckerman & Barry, 2007; Guildford, 1967) and are increasingly seen in the curricula of educational institutions such as Stanford University’s D-School (Melles, Howard & Thompson-Whiteside, 2012).
New knowledge and expansive ways of knowing

Historically knowledge has been seen as being disseminated by means of transferring possession of pre-existing codified factual knowledge to students (Burns & Paton, 2005). This concrete and unidirectional view of knowledge, however, is not sufficient for the twenty-first century student or worker. New domains of knowledge are being created at an ever-increasing rate and factual codified knowledge needs to be coupled with tacit performance knowledge (Burns & Paton, 2005). This is particularly so in design fields and is well summarised by Engeström (2010) when he argues:

*individuals and organisations are continually learning knowledge and skills that are not stable and defined, rather that are evolving and changing. In fact, the knowledge, skill and activity is being learned as it is being created.*

Workplace learning in the design fields, therefore, need to evolve to remain germane and to produce skilled lifelong learners and workers for tomorrow’s economy. This begs the need for theoretical foundations and practical guidance for design educators to engage design students and develop relevant tools and mechanisms for the complex nature of modern knowledge generation, transfer and application. In order to engage design students and provide them with the skills, knowledge and experiences they need educational practice needs to be engaging, relevant, to foster collaboration and to embed design practices as part of the learning experience. Gamification is an emerging educational approach that has the potential to deliver such a learning experience (Buckley & Doyle, 2015; Gibson, Ostashewski, Flintoff, Grant, & Knight, 2015).

Gamification as an innovative educational practice for expansive learning

To begin our discussion of gamification, we offer a new definition on which this paper will expand:

*“Gamification is the use of game mechanics and experience design to engage users and solve real world problems”*

In its most basic form, gamification is the use of points, badges and leaderboards to reward performance. It uses social status and team spirit to incentivise and reward desired behaviours. Other common mechanics and dynamics include gaining experience points, levelling up, questing, competition with other individuals and teams, chance, and receiving virtual and real rewards.

Gamification is distinct from games and game-based learning in subtle yet important ways. The first distinction to make is that between ‘play’ and ‘games’; play (paidia) being free-form behaviours based on improvisation and expressions, and games (ludus) being rule-based play with determined objectives (Kalinauskas, 2014). Games, both serious and for entertainment, are a form of activity that often use physical objects and interaction with other players (Deterding, Dixon, Khaled, & Nacke, 2011). Game-based learning is the use of games to promote learning and is used for knowledge- and skill-acquisition. In our use, the key distinction of gamification is the use of game mechanics to reward real-world behaviours – this need not involve an actual game (Deterding et al., 2011).

There are copious examples of basic gamification application to increase brand loyalty, including large companies such as Nike, Samsung, and McDonalds (Kuo, 2015; Rambo,
Gamification is also being applied in other spheres and is also being used in healthcare, environmental sustainability, public services and formal education settings (Hamari, 2013; Morford, Witts, Killingsworth, & Alavosius, 2014).

Closing the engagement gap
While still a nascent field, gamification has received much attention in education due to its promise to close the 'engagement gap' (Towers Perrin, 2008). Towers Perrin (2008) define engagement as the extent to which individuals put discretionary effort into their work and contribute energy, creativity and passion, in addition to understanding and performing their roles and responsibilities. Student engagement in educational contexts is similarly linked with academic performance such as higher achievement, higher educational attainment and decreased dropout rates (Griffiths, Sharkey, & Furlong, 2009). Many studies have found an alarming lack of engagement in schools and workplaces (Herrington & Reeves, 2011; Towers Perrin, 2008). Inspired by the success of the video game industry in engaging individuals to perform virtual tasks repetitively, gamification has seen marketers, organisational psychologists and education designers borrow elements of gameplay and the player experience and apply them to real world contexts. It is estimated that more than fifty per cent of organisations will have at least one gamified process and that the gamification market will reach $5.5 billion by 2018 (MarketsandMarkets, 2013).

Several psychological theories underpin the success of games and gamification in education. The most notable is behavioural psychology’s Self-Determination Theory (SDT) (Conway, 2014). SDT describes three core needs and incentives, namely autonomy, competence, and relatedness. Autonomy is the player’s level of choice and free will; competence is the skills required and gained; and relatedness it the feeling of connectedness to others. These needs are more likely to be met when the goals created in a game are intrinsic, or sought for their own sake, rather than extrinsic, or sought as a means to an end (Songer & Miyata, 2014). Another is Csikszentmihalyi’s concept of autotelic flow (Hektner & Csikszentmihalyi, 1996), a psychological state in which individuals are completely immersed in the activity to the point where they can lose track of time and physical needs such as food and even sleep. This state is achieved when a player’s competence and the challenge of the activity are aligned. The principles of autonomy, competence, relatedness and flow are well utilised in games, where players are guided or on-boarded into the game when they begin, and gradually gain competence as they aim for levels within the game. Each level becomes increasingly more difficult, and provides a new challenge for the player as they become more skilled and competent at the game. It is through these principles and mechanics that games and gamification can engage and motivate learners.

An example of a gamified curriculum
The following example of a gamified science curriculum (Kingsley & Grabner-Hagen, 2015) demonstrates the power of replacing the current educational practices with a gamified one. The case study by Kingsley and Grabner-Hagen (2015) is a 4-week technology-based science unit that was replaced with a gamified one in a Midwestern metropolitan school, grades 5 and 6. Instead of the common lecture style and activities followed by an exam or assignment to test learning, the curriculum content was designed as a quest-based game.
Using a platform called 3D GameLab, the teacher designed the content as a series of quests for students to complete, who were rewarded with XP (experience points), badges and awards for completion. The content was provided in multi-media format and included teacher-created and external public information, such as Bill Nye’s ‘Phases of Matter’ hosted on YouTube. Students were able to select quests based on their interest and ability, instead of the traditional linear and fixed progression through content. Quests increased in difficulty as students ‘levelled up’ based on their XP. Students earned badges for progression through the quest levels, which were named to reinforce science vocabulary and concepts. For example, the first level of quests was centred around solid matter and students progressed through the states of matter as they levelled up through the curriculum, ending in sublimation.

The result of the gamified curriculum was an increase in engagement and learning, and a greater satisfaction with the educational experience as compared with traditional non-gamified design. Students reported that the quality of their work increased as a result of the gamification (87.2%) and that the content was easier to learn (82.9%). Students also reported increased motivation as a result of the self-regulation of content, with one student stating:

“I get to decide which lessons I want to do. In my other classes, I have to go by the teacher’s schedule.”

It can be seen that this gamification design utilises the principles of Self-Determination Theory and autotelic flow to achieve engagement. Through the gamified curriculum, students approached their learning as if it were a game, making the educational experience both challenging and fun. Allowing students to self-regulate and tailor their pace and content resulted in increased motivation and better learning outcomes. The process of transforming the curriculum into a gamified one is a design process itself. The curriculum is now a user-centred one, that empowers students and engages them in a manner congruent with their desires and expectations.

**Key questions for design educators**

The chief question then becomes how gamification can be used to create engaging curricula for design students. Several challenges in developing gamified learning need to be addressed. The first of these is that, despite its increasing popularity and application, gamification does not have a shared and evidence-based framework or process. Much like the field of design ten to twenty years ago, gamification is undergoing academic and practical debate regarding its definition, application, and process for creating desired futures.

Secondly, an important consideration and criticism is the over-application of simple mechanics, such as points and badges, which focus on extrinsic motivation (Conway, 2014). An over-reliance on these simple extrinsic motivators can have a crowding-out effect of intrinsic motivators, leaving players without internal motivation to pursue the target behaviour and activity (Hamari, 2015). The danger this creates is that the player focuses on the achievement and consumption of signs, such as more points or a new level, instead of the transformation of learning. This results in the cessation of the behaviour if the extrinsic motivator is removed.
As well as ensuring a mix of intrinsic and extrinsic motivators, gamification designers also need to ensure the design provides motivation for a range of user or player types. Different players achieve this state of flow under different conditions and for different intrinsic motivations. This is the notion of player types, or classifications of how players tend to interact with their real or virtual world. The most well-known classification is the Bartle Test, which classifies players into four main types based on their motivation and predilections (Kim, 2015). While there is some debate about the generalisation of Bartle’s four player types to different games and gamification (Dixon, 2011), the concept of understanding and designing for different player types is critical to all game and gamification design.

Design educators can be tempted to simply overlay existing behaviours with points and badges in attempt to use the power of gamification to create engaging learning experience. However, the challenge in gamified curricula is to ensure the experience is relevant and tailored to the specific learning context and for all actors in the system. The core challenge therefore becomes how to design a gamified learning experience that is contextually-relevant, caters for various learning styles, and produces meaningful learning outcomes for design students.

*Understanding learning environments through cultural-historical activity theory*

Just like other educational design, gamification design needs to follow a process rooted in design-based research to ensure the design is contextually relevant and achieves the desired outcomes. Learning design thinking skills is complex and as such requires an expansive view of learning. Cultural-historical activity theory and cognitive ecology offer such a perspective.

Learning environments consists of myriad of internal and external resources and interactions that can be likened to a biological ecosystem (Hutchins, 2010). Researchers in the nascent field of cognitive ecology have demonstrated that human cognitive processing and learning are embodied and enacted; developing through goal-orientated action and interactions between the human organism and its environment (Hutchins, 2010; Rueschemeyer & Bekkering, 2009). It follows, they argue, that individual learning happens as part of the environment, not in isolation from it. Learning is influenced and determined by the structure of the cognitive ecosystem surrounding the individual and learning occurs as a dynamic formation of particular practices within the ecosystem (Hutchins, 2010). This interaction between the learner and his or her context results in the simultaneous learning and creation of new forms of activity, known as expansive learning (Engeström, 1995). Expansive learning argues against this limited view of learning to be about the acquisition of skills and knowledge that have already been mastered and codified (Engeström & Sannino, 2010).

Similarly, cultural-historical activity theory (CHAT) emphasises the criticality of the environment in human learning and consciousness (Gustavsson, 2009). Pioneered by Vygotsky in 1920’s, CHAT is becoming an increasingly accepted theory in educational design because of its acknowledgement and embracing of the complexities of human learning (Roth & Lee, 2007). CHAT emphasises that learning is culturally mediated through artefacts, tools, and language. It states that consciousness and learning are mediated through the use of artefacts and are oriented towards goals or objects, as well as being
strongly situated in the local cultural, social and historical context. Cognition is therefore embedded in and inextricable from activity and local practice. Key elements of an activity system include the object, an entity or a goal which is continually evolving; the activity, a form of doing that is directed to an object, is goal-orientated and targeted to a need; mediating artefacts such as tools, signs and language; subjects, the human actors or participants in the system; community which consists of subjects that share an interest and involvement with the same object; division of labour, the roles within the community, including division of power and resources; and rules, which regulate the subject’s actions and interactions within the system.

An activity or learning system can be mapped on the CHAT triangle model, which provides a framework and method with which to understand the unique factors and interaction of the particular context in question, particularly when combined with a design-based research approach (Anderson & Shattuck, 2012; Yamagata-Lynch, 2007). The CHAT approach embraces and organises the particular components of the learning context, and in this way, can map the richness and multi-factored nature of activity systems. This richness of understanding is the key differentiator and value of using CHAT in the understanding, evaluation and design of learning systems.

![Figure 1: Cultural-Historical Activity Theory triangle](image)

**Developing CHAT-based gamified design education**

CHAT understands learning to be expansive, complex and social, thereby providing design educators with a non-linear understanding of learning. This expansive view of learning allows design educators to reframe the learning experience as a series of interactions and dynamics, and incorporate these into the gamified design curriculum. This activity system
approach to gamified design curricula requires a deliberate design decision about the extent to which gamification should be used.

**Reflections from an ongoing study**

The following conceptual models and frameworks presented here are part of an ongoing design-research project that is investigating gamification’s application to collaborative learning environments to foster high-order behaviours such as knowledge sharing, collaboration and building team culture. As this paper is a largely theoretical contribution, the details of the study will be presented only briefly here.

The study takes a mixed-methods and design-based research approach with the methodology detailed elsewhere (Oberprieler & Leonard, 2015). Building on Yamagata-Lynch’s (2007) work, this study incorporates design-based research with CHAT analysis as both a theoretical basis and a practical research tool. The immersive and iterative approach of this methodology has the unique strength of enabling locally-relevant and timely changes to the design that can more quickly lead to improved environments. In addition, the design principles and lessons learnt throughout the process can be generalised and add to existing theory.

The study is being conducted in strategic design consultancy, ThinkPlace Australia, and uses a gamified experience to incentive and reward particular behaviours in employees. These range from daily irritants, such as tidying the office and submitting timesheets, to higher order and important business activities such as writing proposals for project and sharing knowledge. These activities are framed as daily and weekly quests to complete, and employees are rewarded with points that count towards their team, and can be exchanged for goods. Other mechanics include badges for achieving milestones, weekly team rankings, team breakfasts for office-wide achievements.

The findings to date have shown a distinct change in behaviours since the gamification introduction. When the gamification is in play, timesheets and cleanliness increase significantly. One of the most significant changes in behaviour and culture is the active use of the company’s knowledge sharing platform, Bloomfire. This platform is important for building and sharing knowledge and intellectual property. Prior to the gamification, employees were slow to take up the use of this new platform, and finding IP and examples of work was difficult and relied heavily on verbal corporate knowledge. Sharing and engaging with new content was gamified, and the platform is now part of the daily activity of employees, used in the company’s offices in several countries, and it is a key resource for new employees as part of the induction process. The number of weekly uploads and the percentage of overall engagement (includes reading, commenting, downloading) is significantly improved from less than 20% to 58%. From a social and behavioural perspective, this practice has now become part of the discourse between employees, who now use the name of the platform is used as a verb. For example, if an employee speaks about a useful product or article, another employee will often ask ‘Have you “bloomfired” it?’.

While this study is ongoing, it demonstrates the potential of gamification to change behaviours and social interactions. This is for administrative tasks, but more importantly, for behaviours such as creating, sharing and engaging with new knowledge. The emerging
evidence of this study is that gamification can lead to expansive learning experiences that meaningfully change behaviour.

Systemic gamification
Developing a gamified design curriculum can be viewed as a design activity, because it uses design thinking principles and methods to create improved social and learning environments. Like design thinking, gamification can be applied to a range of contexts and to varying levels of complexity. Based on Richard Buchanan’s four orders of design (Buchanan, 1992), the authors present the Four Orders of Gamification. This model provides gamification designers with a framework with which to understand the type and extent of the gamification they are intending to design.

Ascension from first to fourth order is based on the complexity of the learning behaviour being gamified, the duration of gameplay, and the integration between the gamified and real world. This increasing complexity between orders also requires increased sophistication in the gamification design and mechanics. Design educators can use this framework to construct the mechanics and dynamics of their curriculum based on the order at which they wish to gamify learning.

The criteria for each order is based on the following categories.

- **Objective**: The behaviour the gamification design is aiming to influence and change, including the complexity, sociality and duration over time.
- **Rules**: The boundaries and challenges for the behaviours, ranging from simplicity and immediacy to complexity of interaction and sustained effort required.
- **Reward**: The nature of the feedback to players, including scores, levelling, currency and prizes.
- **Integration**: The amount of integration of the gamified system with its contexts, such as other people, other systems, and real world consequences.

**First order: Playful design**

- **Objective**: Application of game-like mechanics to attract attention, engage and have fun for a brief amount of time.
- **Rules**: None or very few.
- **Reward**: Immediate and limited to engagement for a short period of time.
- **Integration**: There is limited integration or effect.

Examples include visually designed objects, such as augmented reality posters and visual design that uses game mechanics to engage the viewer. The reward is instant and limited to being engaged sufficiently to attend to the content for a few minutes. Examples include The World’s Deepest Bin and Piano Stairs.
Second order: Basic gamification

- **Objective**: Use of gamification mechanics to incentivise and reward simple real-world behaviours. The behaviours targeted are relatively simple or uni-dimensional, and can largely be done individually, with social interactions such as sharing and commenting.
- **Rules**: Focused on frequency of simple behaviours, such as completing simple tasks.
- **Reward**: Simple, predominantly in the form of points, badges and leaderboards, and some form of virtual or real reward.
- **Integration**: Some level of integration exists, for example, ability to purchase items outside of the gamified system, and connecting on other platforms, such as social media sharing.

Examples include Nike+, Chore Wars and Zombies, Run encourage real life activities and behaviour through points, badges, leaderboards.

Third order: Interactive gamification

- **Objective**: Change or generate complex behaviours through gamification, including social interactions and multi-faceted tasks.
- **Rules**: Include collaboration with others and tasks that require cognitive and emotional effort, such as knowledge creation.
- **Reward**: Virtual and real rewards, as well as significant real-life benefits, such as habits, learning and building relationships.
- **Integration**: Integrated with other systems in the environment that impact the user’s real world experience outside of the gamified world.

Examples of ongoing gamified experiences that address complex behaviour is limited. SuperBetter is one example, which creates healthy habits by helping individuals to self-reflect and identify key behaviours they want to engage in on a regular basis.

Fourth order: Systemic gamification

- **Objective**: Change and create complex behaviour patterns that involve multiple interactions with others and the environment in which the gamification is situated.
- **Rules**: Emphasize challenging behaviors and working with others to complete difficult tasks that take weeks, months and years to complete.
- **Reward**: Extend to real-world rewards with significant impact on the individual.
- **Integration**: Substantially or fully integrated with the environment.

Examples here are also rare. The Kingsley and Grabner-Hagen (2015) gamified curriculum presented earlier, exemplifies fourth order gamification because it replaced the traditional school curriculum with a gamified world. Instead of grades, exams and teacher-directed lessons, students completed learning quests, collaborated and learned from others, and levelled up based on reaching self-driven competency attainment. As the field of
gamification progresses and matures, systemic gamification will become more commonplace for education, career pathways in workplaces and more.

Fourth order gamification requires an understanding and embracing of learning environments as activity- and artefact-mediated ecosystems. It requires gamification designers to understand the complex behaviour patterns and interactions of the students in this ecosystem. The mechanics should be focused on higher order behaviours and how these change over time, i.e. months and years. The mechanics and rewards should be integrated substantially or fully with the environment, with rewards extending to the real-world and significantly impacting on the individual’s learning and growth. It is in fourth order gamification design that meaningful and transformative learning experiences can occur.

CHAT provides the means which with to understand and visualise fourth order or systemic gamification. A fully integrated gamification design is one in which all interactions in the system are gamified. Gamification therefore changes the activity system by changing the interaction between the elements in that system. For example, in a non-gamified learning system the exchange between the student (subject) and her peers (community) can occur naturally through conversation and individual motivation to interact and collaborate. In a gamified learning system that encourages and rewards collaboration, the exchange can occur more frequently, with more deliberation, and with more individuals as they are all rewarded, say through points or progression towards a collective goal or ‘mission’.

Using the CHAT triangle throughout the gamification design process allows design educators to map the learning experience and interactions; initially to understand the uniqueness of the context, then to design the gamified system to target the interactions, and finally, to measure the changes in learning behaviours and outcomes through changes in the interactions. Figure 2 shows the blue activity system overlaid with the orange gamified interactions, and how a fully integrated gamification design interacts with and changes all dynamics within the system to achieve both a learning and a game outcome.
Principles and gamification mechanics for expansive learning

Systemic gamification design requires a deliberate and careful selection of gamification mechanics to produce a meaningful and expansive learning experience for design students. The mechanics and dynamics selected need to promote goal-orientated activity for individuals in the learning system, and work together to provide a holistic learning experience that achieves learning objectives. The game components that require consideration include content and skills, mechanics, visual aesthetic design, narrative design, incentive system, and musical score, if required (Plass, Home and Kinzer, 2015). Principles and mechanics to achieve expansive learning in systemic gamification can be defined into four categories.

**Situatedness**

The foremost requirement for systemic gamification is that the curriculum be relevant for the uniqueness of the learning environment or activity system as defined by CHAT (Engeström, 2010). This socio-cultural placement of the gamified learning increases relevance and meaning for the students (Plass, 2015). In their meta-analysis on effective game-based learning, Crocco et al (2016) found deep learning occurred when learning outcomes and game objectives and mechanics were aligned. The CHAT and design-based research methodology (Barab & Squire, 2009; Yamagata-Lynch, 2007) provides educators...
with the approach and tools to understand the learning context and design a gamified curriculum that aligns with it. This includes selecting content, narrative, incentive and visual design that aligns the learner’s values, desires and motivations.

**Adaptivity**

Plass et al (2015) state that adaptivity is the:

> “capability of the game to engage each learner in a way that reflects his or her specific situation. This can be related to the learners’ current level of knowledge, to cognitive abilities, to the learners’ emotions, or to a range of other variables.” – page 260

This principle is critical to ensure a learner-driven experience and is supported by the self-determination theory need for autonomy (Conway, 2014). Allowing design students to choose their own content, difficulty level, customise an avatar and select rewards are beneficial mechanics to engage and allow organic interaction in the learning system.

**Socio-cultural interactions**

The social interaction between learners during the learning process has been found to increase retention of knowledge (Plass, Homer & Kinzer, 2015). Encouraging discussion, collaboration, seeking and giving help in the gamified learning context enhances learner’s affective, cognitive, behavioural and sociocultural engagement (Plass, Homer & Kinzer, 2015). Mechanics include social sharing, team quests, and gifting between design students.

**Meaning**

Successful systemic gamification requires a strong narrative and for the content to be reinforced through the mechanics and dynamics. The content needs to be integrated with the narrative and the learning outcome (Crocco, Offenholley & Hernandez, 2016). Mechanics include a narrative and visual design that reinforce the content being learned, including badges and rewards that relate to the learning and level of the player.

**The gamification design process**

Design educators need to employ these principles and mechanics when designing fourth order systemic gamified curricula. A process and methodology is needed to embrace the complexities of the learning context and use them in gamification design for expansive learning outcomes. Gamification is in essence the design of an experience, using game mechanics and other game elements to elicit particular behaviours. It therefore employs principles and tools used by experience designers. These include a user-focus, design based research and user ethnography, immersion in the context, prototyping and working iteratively.

The Gamification Design System presented by the authors here takes inspiration from the five phases in the ThinkPlace Design System and is adapted for the specifics needed for gamification design (ThinkPlace, 2016). It is an early prototype of a gamification methodology being developed as part of the aforementioned study.
The Gamification Design System takes a five-phased approach to the gamification challenge. The process is characterised by a transition from divergent to convergent thinking, beginning with exploration of alternatives and asking questions, and converting to critical thinking and choosing between alternatives to arrive at the final design (Guilford, 1967).

- **Phase 1 Intent** is about defining the desired future state for the behavioural and cultural change, and how this aligns with the learning and educational objectives.
- **Phase 2 Explore** clarifies the target learning behaviours and activities being gamified through design-based research and capturing the current cultural-historical activity system.
- **Phase 3 Make-Test-Learn** takes Lean Start Up Methodology (Ries, 2011) approach to creating a concept for the gamified solution, including choosing the best gamification mechanics, dynamics and components to reward the target learning behaviours. This involves mapping the gamification CHAT triangle, and iterating the design as using immersive and iterative design-based research methods, as well as usability and play-testing.
- **Phase 4 Launch** includes preparing the students for the introduction of gamification, and building engagement and excitement.
- **Phase 5 Evolve** is about monitoring and evaluating the gamification solution for effectiveness and experience. Depending on the scope and duration of the gamification, it can also include introducing new features.

**A staged process for the gamification of expansive design education**

The gamification design process is staged and question-driven, and supported by various design-based and CHAT-based research methods and techniques not presented here. The following process is an early version of a larger piece of work currently being undertaken.
The Intent phase encompasses key questions about the objective and learning outcomes of the curriculum.

- What are the learning outcomes for the design students? What knowledge, skills and experience are required?
- What learning barriers and challenges exist in the current design curriculum that we want to address?
- What are the success criteria for the gamified curriculum?

Phase 2 Explore uses design-based research to understand the students and the uniqueness of their particular learning context. The context is visualised using the CHAT triangle to make visible the unique interactions and design variables of this environment.

- Who are our users, including demographics, player type, engagement preferences?
- Which learning or design behaviours is the gamification targeting and why?
- What order of gamification are we aiming? For example, a simple gamified design of content or an integrated and transformed gamification curriculum?
- What challenges or constraints are we designing within in this particular learning context? Which cultural or multi-cultural aspects do we need to consider?

Phase 3 Make-Test-Learn is an iterative phase of hypothesis-driven prototyping and testing. The gamification mechanics and dynamics are prototyped at increasing levels of fidelity.

- Which CHAT interactions is our gamified design targeting, and how?
- Which mechanics, dynamics and components will be used to achieve the desired student behaviours?
- What narrative, visual and incentive design will resonate most with these design students?
- Which are core, important and peripheral? (musts, coulds, shoulds)
- How will players be onboarded and learning scaffolded?
- What are the feedback channels and what will be measured to understand effectiveness?
- Which behaviours are being more/less enacted? Are there any parts being ‘gamed’?
- If fourth order gamification, how well are the principles of situatedness, adaptivity, socio-cultural interactions and meaning being applied?

Phase 4 Launch occurs once the gamification design has been converged on, and focuses on preparing design students for the change in their learning experience.

- How will the in-real-life (IRL) benefits be communicated to design students?
- What support is required by the teacher in delivering the gamified curriculum?
- Who else needs to be engaged and involved during the gamified experience?

The final phase Evolve is about monitoring and evaluating the effectiveness of the gamification intervention in achieving the design learning outcomes.
• How has the gamified curriculum changed the learning experience in comparison to the traditional curriculum?
• Using the CHAT triangle method, which behaviours and interactions changed and how?
• If continuing the gamified curriculum over a long period of time, which new behaviours and activities should be added and when?

Conclusion
Gamification offers an innovative approach to creating expansive learning experiences for the next generation of designers. Design educators using gamification face several challenges when developing a gamified curriculum, chiefly, how to create meaningful experiences that go beyond basic game mechanics and results in deep learning. Taking an expansive and cultural-historical activity system view of learning provides design educators with a framework with which to understand and create for engaging learning experiences. This systemic gamification requires a deliberate design approach, which is presented at a high level here. The gamification design process introduced in this paper requires further development and refinement, including the integration of theoretical frameworks and practical tools. These frameworks and tools also require application to various contexts in order to provide evidence and evaluate its effectiveness. While gamification for education is still nascent, it holds promise for design educators to provide an expansive and contextually-relevant learning experience for tomorrow’s designers.

References


About the Authors

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