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## Gamification pedagogy: A motivational approach to student-centric course design in higher education

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## Gamification pedagogy: A motivational approach to student-centric course design in higher education

### Abstract

This article explores the praxis of gamification pedagogy and post-secondary course design. The literature on gamified design theory and current research on its application as a pedagogy are explored. A student-centric, motivationally based gamification design model is proposed, operationalized, implemented, evaluated, and reiterated. The design process, application strategies and challenges, and resulting qualitative outcomes over a two-year implementation period of the re-designed gamified course are detailed. Student evaluations rated both the overlaid gamified structural design and the integrated course mechanics as highly motivating and contributing significantly to their success and positive learning experience. The gamified course design was able to resolve historical challenges for the identified course and increased student engagement. Gamification pedagogy proved uniquely effective for two sub-groups of students, those struggling with anxiety and second language learners. This innovative pedagogy effectively leveraged students' unique intrinsic and extrinsic motivators to create an empowering, supportive, and highly effective learning framework.

### Practitioner Notes

1. A comprehensive gamification pedagogical course design involves the identification and matching of student motivators and gamified mechanics to engage learners to achieve academic success.
2. Gamification pedagogy can bridge contemporary students' learning needs and existing university course content by designing student-centric motivationally based course frameworks that enhance learning engagement.
3. Gamification can be applied to resolve historical challenges in courses, while maintaining existing course content and academic rigor.
4. Subsets of students reported that select groupings of gamification mechanics mitigated their anxiety and language barrier needs, contributing significantly to their academic success.
5. By design, student-centric, motivationally based gamification pedagogy should theoretically be equally effective with any targeted group of students and any subject matter to achieve desired outcomes.

### Keywords

Gamification pedagogy, motivational approach, student-centric course design, higher education

## Introduction

Contemporary post-secondary students are different on many dimensions from previous generations (Holston, 2020; Isaacs et al., 2020). Most of these students are digital natives raised in the era of information technology connectivity. This reality has implications to their learning proclivity for digital elements in education (Koumachi, 2019). Also referred to as Gen Z (born after 1995), these students have preferences for fun, relational, inclusive, and dynamic learning environments that offer choice, practical skills, assessment rationale, opportunities for knowledge sharing, micro-chunks of learning, and informal immediate feedback (Cretu et al., 2020; López-Santacruz & Guízar-Mendoza, 2022; Mohr & Mohr, 2017). As such, universities need to reconsider traditional post-secondary course formats to ensure relevance and responsiveness to the contemporary student.

Herein, gamification pedagogy (the application of game theory and mechanics to non-gaming contexts) is explored as a student-centric instructional design process which effectively applies gamified mechanics to motivate student learning and academic behaviour. This study explores whether a comprehensive application of gamification pedagogy to course redesign can effectively target the natural motivators of contemporary post-secondary students, address historical challenges within a specific course, the Child and Youth Care Professional (CYCP), and create an engaging and empowering learning environment. Operationalization of gamification pedagogy from transformation of course design and development to analysis of students' experiences is explored.

## Research Context

MacEwan University is an undergraduate post-secondary institution in Alberta, Canada offering 10 bachelor's degrees with 32 majors, and 40 diploma and certificate programs to approximately 20,000 students. The Bachelor of Child and Youth Care is a four-year degree program, with a two-year diploma exit, that equips students to engage therapeutically with children, youth, and families struggling with mental health, addiction, poverty, and conflict. Targeted for this study is the Child and Youth Care Professional course, an introductory first-year course traditionally taught in a lecture format. The course covered professional roles and responsibilities, scope and ethics, intergenerational cycles of abuse and neglect, developmental challenges, legislation, and ethical intervention approaches.

The potentially emotionally triggering content, diverse scope of information, and extensive assessment requirements of the original course presented challenges to student success. The subject matter changed with each 80-minute class, resulting in a lack of continuity and the need for multiple and frequent

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forms of assessment. The topics related to childhood trauma, addictions, marginalization, and intergenerational cycles of abuse presented potential mental health triggers for students, leading some to disengage and withdraw. MacEwan students' rates of anxiety, depression and stress were approximately 10% higher than the national average for post-secondary students (American College Health Association, 2019b), and these high rates of mental health concerns have been shown to be barriers to success, adversely impacting study focus, academic achievement, and retention rates among university students (American College Health Association, 2019a; Bruffaerts et al., 2018; Mental Health Commission of Canada, n.d.). A recent study by Adkins-Jablonsky et al. (2021) found gamification elements increased engagement and decreased perceived anxiety levels among post-secondary students.

Gamification pedagogy was explored as a course design approach to address these structural challenges, decrease anxiety, meet student learning needs, and enhance learning experience (Borrás-Gené, 2019; Litvin et al., 2020). The study sought to effectively define and operationalize gamification pedagogy and then answer the following questions: 1. Can gamification pedagogy increase learning engagement? 2. Can a comprehensive gamified redesign address historical course challenges? As the focus of this research was on gamification pedagogy rather than student performance, the MacEwan Research Ethics Board determined that ethics approval was not required.

## **Literature**

Gamification is the use of game theory and mechanics in non-gaming contexts to engage, motivate, stimulate learning, achieve goals, and improve user experiences (Helmefalk, 2019; Kapp, 2012; Koivisto & Hamari, 2019). In the last decade, gamification has been extended from an instructional design model used in the corporate training industry (Alsawaier, 2018; Helmefalk, 2019; Polyanska et al., 2022) to academic usage as an innovative pedagogy (Huang & Hew, 2021; Mustafa & Karimi, 2021; Nurtanto et al., 2021). Although the effectiveness of implementing select gamification mechanics in educational contexts is contented (Facey-Shaw et al., 2020; Kalogiannakis et al., 2021; Mekler et al., 2017), gamification is reported to increase students' intrinsic and extrinsic motivation, engagement, learning achievements, task completion rates, learning experiences, and outcomes (Aleksic-Maslac et al., 2018; Bouchrika et al., 2021; Huang & Hew, 2021; Krath et al., 2021; Mustafa & Karimi, 2021; Urh et al., 2015). The divergent results may be attributed to how gamification is conceptualized, as either the introduction of specific game mechanics into pre-existing courses, or as a pedagogical approach that integrates game theory and mechanics foundationally into course development.

Some frameworks broadly conceptualize gamification as having three components: affordances, psychological processes, and domain-specific outcomes (Helmefalk, 2019; Hamari et al., 2014). Affordances are the specific game mechanics (e.g., leaderboards and badges) that are used to induce psychological experiences (such as competence and empowerment motivators), which in turn drive behavioural changes (i.e., increased study activity and improved achievement). These frameworks orient motivation in the impact of gamification mechanics, and as such, are not user-centric as the players' unique characteristics and motivators are not foundational to course design (Hamari et al., 2014; Kapp et al., 2014).

A student-centric gamification design addresses motivational issues, increases learner engagement, interactivity, knowledge acquisition, and behaviour change (Kapp et al., 2014; Sailer et al., 2017). This comprehensive pedagogical approach involves course development that identifies student motivators, defines desired outcomes, selects effective course mechanics, and draws students into customized and purposeful success-driven learning experiences (Hamari et al., 2014; Helmeffalk, 2019; Kalogiannakis et al., 2021; Nurtanto et al., 2021). The intent to engage participants' intrinsic and extrinsic motivators to compel them to successfully complete a program is central to gamification theory (Kapp, 2012; Klemke et al., 2018; Nicholson, 2012; Xu et al., 2021). While motivation is a consistent component in gamification, divergence exists on how motivators are framed (Burke, 2014; Kapp, 2012; Reiss, 2013). In player-centric design, identifying player persona characteristics is foundational to determining which gamification mechanics are selected to "hook" players' distinctive motivators to achieve identified goals (Burke, 2014; Nicholson, 2012). The design elements must be driven by the players' intrinsic and extrinsic motivators, technological proficiency, goals, interests, and potential barriers to learning (Boller & Kapp, 2017; Nicholson, 2012).

In gamification, mechanics are the building blocks of gamified program design that define, structure, and interact with the players as they engage and progress through an activity (Helmeffalk, 2019; Werbach & Hunter, 2012). The seven most frequently used mechanics in education are leaderboard, points, badges, levels, progress bar, challenges, feedback, and rewards (Mustafa & Karimi, 2021). However, gamification in academia is often limited to points, badges, and leaderboards (Dichev & Dicheva, 2017; Nicholson, 2012). There has been a marked absence of explanations for the reasoning behind mechanic selection in educational contexts, leaving some to question whether these choices are random (Dichev & Dicheva, 2017; Krath et al., 2021; Mustafa & Karimi, 2021). The introduction of gamified mechanics unconnected to theoretical design frameworks may limit their value and effectiveness (Costa et al., 2021; Hamari et al., 2014).

Studies of gamification characterized by the addition of two or three mechanics into pre-existing courses (Gallego-Duran et al., 2019; Hung, 2017; Krath et al., 2021; Mustafa & Karimi, 2021) have shown limited or mixed success. For instance, despite research findings that badges were effective in recognizing knowledge acquisition and status (Botra et al., 2014; Collmus et al., 2016), a recent study by Facey-Shaw et al. (2020) found that when badges are adopted in isolation, they do not increase student's intrinsic motivation. Attali and Arieli-Attali (2015) found no increase in achievement with the implementation of the points mechanic, whereas, Hew et al. (2016) found increased engagement and results. Similarly, Landers et al.'s (2017) reported increased outcomes with leaderboards, contrasting with Mekler et al.'s (2017) findings that points, levels, and leaderboards did not increase intrinsic motivation. Dichev and Dicheva (2017) likewise found no positive outcomes for the use of badges and leaderboards. It is posited that the mixed findings obtained from studies focused on mechanics implemented in isolation (Facey-Shaw, et al., 2020; Mekler, et al., 2017) may originate from inaccuracies in how the pedagogy was conceptualized rather than in the effectiveness of gamification pedagogy itself (Mekler et al., 2017).

The present study explores the efficacy of a comprehensive, student-centric, motivationally based gamification pedagogical model as a transformative framework for course redesign and learning engagement medium in higher education.

## **Method**

The new gamification pedagogy for student-centric course design fundamentally diverges from traditional higher education instructional models where professors authoritatively disseminate knowledge via lectures and evaluate student learning through exams and research papers (McInnes, 2013; Miller et al., 2013). Gamification pedagogy shifts the starting point of learning to reconceptualizing course design in response to students' unique motivators to entice them to engage, learn, and succeed (Molina-Carmona & Llorens-Largo, 2020). This fundamental shift in course development may feel disruptive to some in the world of academia; however, this adjustment is vital if post-secondary education is to remain relevant and accessible to contemporary students, with specific learning preferences (Sarker et al., 2019) and higher levels of anxiety (Mohr & Mohr, 2017; Schlee et al., 2020).

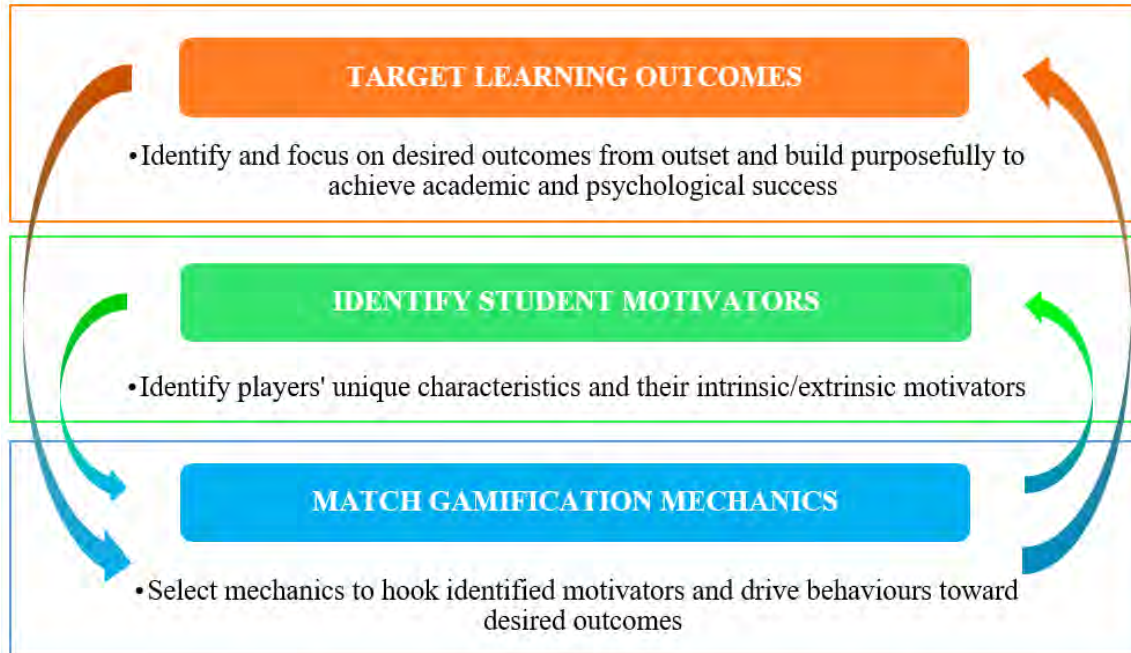
It was posited that redesigning the CYCP course to shift the learning paradigm, resituate the course content, restructure the course delivery format, assessment elements, and engagement strategies based on a student-centric motivational framework could provide a substantive context for examining the effectiveness of gamification pedagogy (Burke, 2014; Helme Falk, 2019; Koivisto & Hamari, 2019). The current study seeks to define and immerse course design and learning context in gamification pedagogy, drawing upon Costa et al.'s (2021) pedagogical design principles for gamified learning: analysis, design, implementation, evaluation, and revision. Principles learnt from this study could be applied to other student cohorts, courses, learning challenges, and disciplines.

### **Pedagogical Model**

From the outset, the gamified course redesign involved a purposeful approach, built on knowledge of learning objectives, course content, and student motivators (Kapp et al., 2014; Klemke et al., 2018; Nurtanto et al., 2021). Kapp's (2012) nine elements of gamification (game-based; mechanics; aesthetics; game thinking; engagement; people; motivate action; promote learning; and solve problems) and Gallego-Duran et al.'s (2019) components of game-design-based gamification (autonomy, challenge, learning by trial and error, progress assessment, feedback, randomness, discovery, emotional entailment, playfulness enabled, and automation) were incorporated in the course redevelopment process to maximize student learning experiences. Drawing upon gamification theory and practice, a user-centric gamification design paradigm was developed (see figure 1). This design model became the context within which course objectives, content delivery, learning assessments, and learning experiences were realized.

### **Figure 1.**

*Student-centric, motivationally based gamification design model*







### Determination of Course Redesign Goals

The redesign process sought to structurally unify the course content and create understanding among students for the requirement of multiple assessments of mastery. Other goals were to engage students in an innovative learning environment that resonates with digital natives (Pařová & Vejačka, 2022), and increase enjoyment of their learning process (Molina-Carmona & Llorens-Largo, 2020). In the gamified redesign, the learning context expanded from on-campus classes to additional interactive online elements to engage students between scheduled classes (Pařová & Vejačka, 2022). Sensitivity to student's mental health needs was also considered to create a safe and successful learning context (Fleming et al., 2017).

### Creation of Player Prototypes and Identification of Motivators

Identifying and defining user types was crucial to this player-centric gamified design process as effective mechanics were selected to match students' motivational preferences (Andrias & Sunar, 2019; Smiderle et al., 2020). Using knowledge of program cohorts, personality tests, observed behaviours, and past academic performance, four distinct player personas were constructed to identify participant students' characteristics and motivators (see figure 2). As a foundation for course design, these player personas were representative of student demographics, interests, abilities, and motivators.

<p><b>SUSIE SOCIAL</b> (60% population) Gender: female Age: 18-22 years</p>		<p><b>ANGELA ACHIEVER</b> (20% population) Gender: female Age: 18-20 years</p>	
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<p>Education: high school</p> <p>Dreams and Goals: graduate, secure employment, satisfy desire to help others, happy marriage/family</p> <p>Interests: social activities, friends, family</p> <p>Fears &amp; Frustrations: rejection, disappointing others</p> <p>Background: healthy family, active in school, good circle of friends, works 8 hrs/wk</p> <p>Technology &amp; Training: cell phone, family computer, values in-person learning (consistent attendance)</p> <p>Motivators: acceptance, curiosity, family, social contact, status, tranquility</p>	<p>Education: honors high school</p> <p>Dreams and Goals: achieving high grades, acceptance into graduate school, successful career, successful family</p> <p>Interests: studying, excelling, family</p> <p>Fears &amp; Frustrations: academic failure, criticism</p> <p>Background: high achiever, professional parents, positive peers, works 8 hrs/wk</p> <p>Technology &amp; Training: personal laptop, cell phone, values all learning formats (perfect attendance)</p> <p>Motivators: beauty, competition, curiosity, family, honour, order, status</p>
<p><b>TANYA TRAUMA</b></p> <p>(10% population)</p> <p>Gender: female</p> <p>Age: 20-22 years</p> <p>Education: GED</p>  <p>Dreams and Goals: being the counsellor that she never had, finding happiness</p> <p>Interests: advocacy for abused youth, self-care</p> <p>Fears &amp; Frustrations: rejection, relapse, rigidity</p> <p>Background: unresolved attachment &amp; abuse issues from past involvement in Children's Services, works 20 hrs/wk</p> <p>Technology &amp; Training: cell phone, social media life, values in-person learning (inconsistent attendance)</p> <p>Motivators: acceptance, beauty, honour, idealism, independence, order, tranquility</p>	<p><b>COREY COACH</b></p> <p>(10% population)</p> <p>Gender: male</p> <p>Age: 18-22 years</p> <p>Education: high school</p>  <p>Dreams and Goals: balance between school &amp; personal life, recreational youth work position, enjoy life</p> <p>Interests: playing sports, social activities, hanging out, having fun with friends</p> <p>Fears &amp; Frustrations: disappointing others, rigidity</p> <p>Background: athletic, outgoing, fun-loving, easy-going, works 14 hrs/wk</p> <p>Technology &amp; Training: cell phone, gaming computer, values in-person learning (consistent attendance)</p> <p>Motivators: acceptance, competition, independence, physical activity, social contact</p>

(Adapted from Peters and Cornetti (2019), Learner Persona format)

The four player personas represented the broad interests and backgrounds of both class cohorts (88 students). Motivators repeated between player personas were *acceptance* (desire to meet



expectations, build self-confidence, and feel validated), *beauty* (desire for appealing aesthetics), *competition* (desire to excel and achieve greater than others), *curiosity* (desire to understand), *family* (desire to belong and care for others), *honour* (desire for integrity, knowledge of success criteria, and personal accomplishments), *independence* (desire to have control over actions, choices, and achievements), *order* (desire for clear structured expectations), *social contact* (desire for collaboration and engagement with peers), *status* (desire for respect based on accomplishments), and *tranquility* (desire to safely understand expectations, feel accepted, reduce risk, and experience peace) (Reiss, 2013). To ensure equity-centred design for academic success (Costa et al., 2021), the motivators of idealism (desire for equal distribution of resources and rewards), and physical activity (desire for action) were also considered in the re-design process.

### **Selection of Gamified Mechanics**

The transformation to gamification pedagogy came from both a gamified structural overlay and the introduction of gamified mechanics into existing course components (content, instructional delivery format, and assessment), selected to hook identified student motivators towards successful course completion. Gamification mechanics were selected to drive students' natural motivators to engage in the immersive learning context, successfully complete course requirements and learning outcomes (Dichev & Dicheva, 2017; Molina-Carmona & Llorens, 2020). Aligning with Kapp et al.'s (2014) ideation of structural gamification, all content from previous years was presented and evaluated. Mechanic selection was limited by the instructor's ability to manage the course and the constraints of the university's learning management system (Blackboard Learn). The course transitioned from a traditional hierarchical linear progression format to a design that offered students choice and flexibility to engage with classmates towards content mastery and successful course completion (Pařová & Vejačka, 2022). The system of course assessments shifted from static one-time constructs to continuous mastery-based learning configurations. In addition, course elements were introduced designed to foster a supportive learning community and to mitigate potential barriers to success. Throughout this gamified redesign process, the endgame was to motivate students to learn (Buckley et al., 2018; Costa et al., 2021; Huang & Hew, 2021).

Table 1 identifies student motivators and matched gamification mechanics, followed by brief explanations for these selections and how the mechanics were realized.

**Table 1**

#### *Paired Student Motivators and Gamification Mechanics*

Student	Gamification Mechanics
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Motivators	Course Narrative	Aesthetics	Self-determination Points	Teams	Unlimited Attempts	High Score	Badges	Leaderboard	Bonuses & Rewards	Coins
Acceptance	✓		✓	✓	✓	✓			✓	✓
Beauty		✓								
Competition			✓		✓	✓	✓	✓	✓	
Curiosity	✓			✓	✓		✓			
Family		✓		✓						✓
Honour	✓		✓				✓	✓		
Idealism				✓					✓	
Independence	✓		✓	✓	✓	✓		✓		
Order	✓		✓	✓	✓	✓	✓			
Physical Activity			✓	✓					✓	
Social Contact				✓				✓		✓
Status			✓	✓	✓	✓		✓	✓	
Tranquility	✓			✓	✓	✓	✓			

Note: motivator and mechanic terms were adapted from Peters and Cornetti (2019) and Reiss (2013).

*Course Narrative.* In gamification, narrative introduces the character, storyline sequence, theme, and objectives of a program to make it coherent and meaningfully integrated (Pujolà & Argüello, 2019). The course narrative consisted of an Epic Adventure with Knight Aidan to explore knowledge, and complete quests and challenges, along the journey to become a Child and Youth Care Professional. This storyline structurally unified the diverse course elements and engaged students in an immersive adventure. Course components were also reframed within this themed medieval narrative (quizzes and assignments became quests and challenges; course expectations became an Epic Adventure; progression options changed to map directions; percentages became points needed to conquer the kingdom).

*Aesthetics.* Aesthetics in gamification enhance visual attractiveness, course navigation, and organizes information for the user experience (Hsieh & Yang, 2020; Schell, 2014). The attractive design of the knight avatar, rewards graphics, and colourful themed epic adventure map reinforced the narrative. These graphics were integrated consistently across the course outline, PowerPoints, assignment instructions, activity handouts, online course components, emails, and

themed awards. The character's name and appearance were gender neutral to be inclusive and relatable for all students.

*Self-Determination.* Autonomy is foundational to gamification design as it correlates positively to intrinsic motivation, psychological health, and enhanced learning experiences (Kam & Umar, 2018; Mekler et al., 2017). Students controlled their progression through course elements, including required and optional summative assessments with flexible deadlines. With the freedoms inherent in self-determination, students had to take initiative and responsibility to complete course expectations. The two major assignments for this course provided students with choices over topics, individual or group completion, presentation formats, and timelines.

*Points.* Points encourage focus on learning, task completion, and provide feedback on content mastery (Inchamnan & Chomsuan, 2021; Mekler et al., 2017). Rather than earning percentages for assessments, students accumulated up to a maximum of 1000 points throughout the course. This mastery driven design created a positive focus on building skills and competencies, as students' point tallies increased with course progression.

*Teams.* With a desire to establish a positive learning community, efforts to build social belongingness and learning through the teams mechanic were integral to this course (Borrás-Gené, 2019). In-class leadership activities and assignments included self-selected small group work that increased social connectivity and afforded collaborative learning. Assessments were constructed to encourage interdependence, problem-solving, and peer support.

*Unlimited Attempts Tests.* Utilizing test banks, knowledge acquisition was assessed throughout the term using eight randomly generated, automatically graded with immediate feedback, online quizzes (Krath et al., 2021). Students could attempt these 10-questions-in-10-minutes quizzes an unlimited number of times. This mechanic reinforced trial and error learning as a means to play, improve, and reduced single-attempt test anxiety (Molina-Carmona & Llorens-Largo, 2020). It rewarded engagement and incremental effort, not just successful completion (Alsawaier, 2018).

*High Score.* With the intent to increase points of contact with course materials, knowledge mastery, reward incremental gains without penalty, and decrease test anxiety, only the highest score was recorded for each quiz (Agapito & Rodrigo, 2018). Student success on the quizzes could potentially increase their confidence and competence to complete the larger scaffolded single-attempt check-point quizzes (midterm and final exams) that were unlocked once students met a threshold of 16/20 points on sets of four quizzes.

*Badges.* Badges often play into game-based learning to boost performance and recognize competency achievements (Inchamnan & Chomsuan, 2021). Within the course, virtual badges were awarded for task completion to provide visual online tracking of student progress.

*Coins.* In the second iteration of the course, medieval themed community coins were added as currency to recognize positive community building efforts within the classroom for demonstrations of kindness, support, and acceptance (Borrás-Gené, 2019). Three large silver-plated themed

coins were awarded on the final day of class for one instructor-defined and two student-defined recognitions.

*Leaderboard.* The leaderboard was a dynamic online chart that revealed accumulated points to date for each student, confidentially comparing their standing with classmates, and engaging their desire for competition and recognition (Inchamnan & Chomsuan, 2021; Jia et al., 2017). Students received congratulatory emails at random intervals from Knight Aidan when they reached the top of the leaderboard and public recognition for this achievement was periodically given in class. At the end of the term, the reigning student at the top of the leaderboard received a certificate and prize.

*Bonuses and Rewards.* In-class participation, student engagement, and risk taking (answering questions) were encouraged and reinforced throughout the term with the reward of bonus points, praise, and small candy treats. Rewards were utilized to recognize incremental changes, significant achievements, and at times randomly to ensure that all students received recognition, inclusion, and experienced success (Adams & Preez, 2021). At the end of term, certificates were awarded to students for both instructor and student defined achievements.

### **Prototype, Evaluation, and Re-iteration**

A two-year implementation plan was designed (fall 2018 and 2019 terms) to afford course re-design, deployment, evaluation, and reiteration. As the student response was exceedingly positive to the first iteration, almost all elements of the initial gamified course redesign were carried through to the second iteration. Encouraging student feedback and implementing responsive revisions reinforced user engagement and investment in the redesign process (Barzola et al., 2021).

Based on student feedback and knowledge gained on the pedagogy, four adjustments were made to the second iteration. An on-boarding quiz was added to familiarize students with the quiz format and ensure they understood the structure of the gamified course (Kapp, 2012). Students also completed the Reiss Motivational Profile (Reiss et al., 2017) before the second iteration; however, the group data did not identify any new patterns of motivators other than food, which was already hooked with rewards. The badges mechanic was deemphasized due to perceived ineffectiveness and community coins were added to increase social contact.

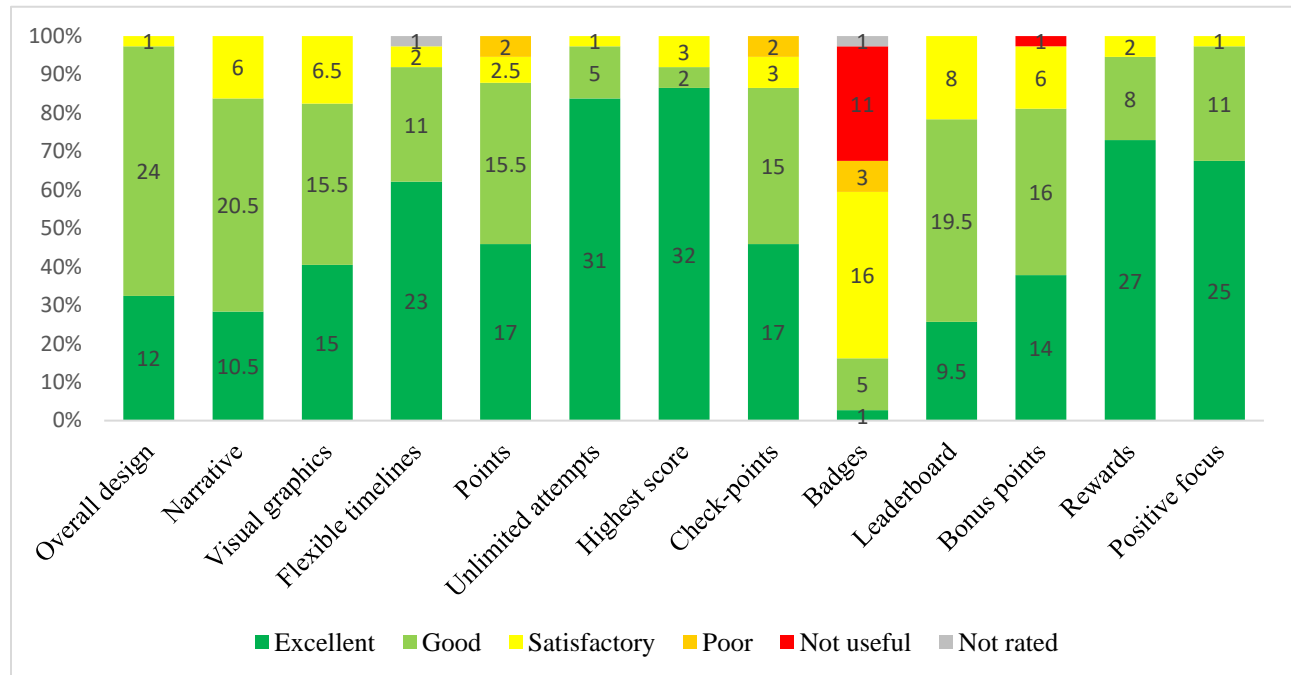
## **Findings**

Student evaluations were considered a logical form of qualitative assessment since the focus of this exploration of gamification pedagogy was user experience (Bai et al., 2020). Students completed anonymous formal written evaluations at the end of each term following debriefings on gamification pedagogy. Evaluation response rates were high, totalling 37/44 (84.1%) for the first iteration and 42/44 (95.5%) for the second iteration. In addition, some quantitative information was collected on behavioural indicators as a measure of gamification engagement (Majuri et al., 2018; Perski et al., 2017; Zainuddin et al., 2020).

Students assessed the overall structural gamification design and 12 gamified mechanics for their effectiveness in motivating learning engagement using a Likert scale. The formal course evaluation responses were consolidated in Figures 3 and 4.

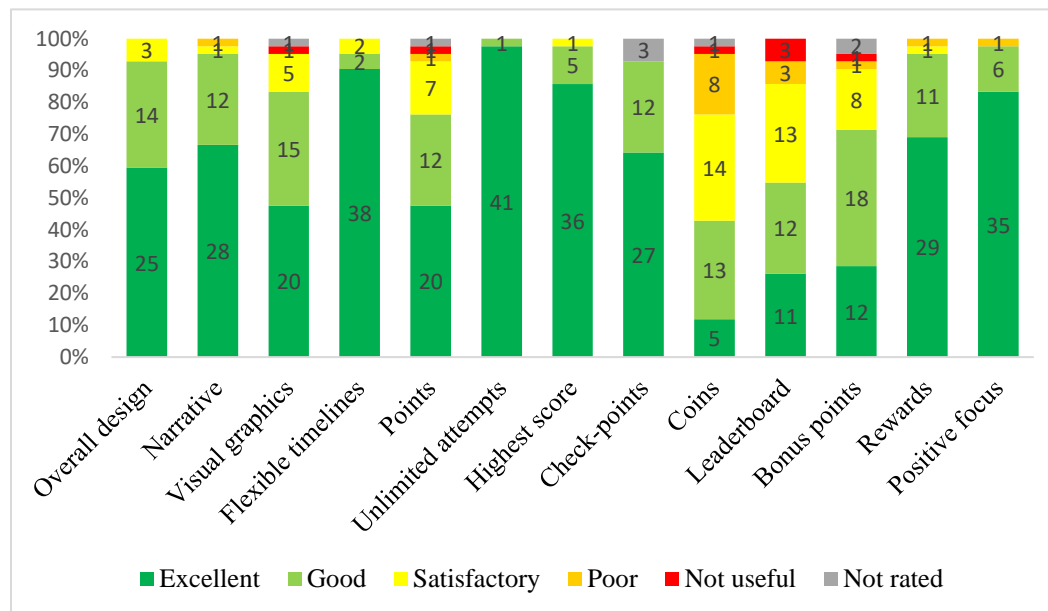
**Figure 3**

*Student Evaluation Results on Perceived Effectiveness of Mechanics for Learning Engagement (Fall 2018), n = 37*



**Figure 4**

*Student Evaluation Results on Perceived Effectiveness of Mechanics for Learning Engagement (Fall 2019), n=44*



The evaluations also elicited qualitative feedback with five open-ended questions that assessed perceived effectiveness of gamified course elements in engaging learning and achieving content mastery. The following summary of qualitative results represents student feedback for both iterations of the redesigned gamified course. (Note: descriptors were taken directly from student evaluations).

**Table 2**

*Summary of Student Evaluation Responses to Open-ended Questions (Fall 2018 and 2019)*

Mechanic	Student Feedback
Gamified Course Design	Students described the overall gamified design as fun, engaging, motivating, and interesting. Some students directly attributed their success in the course to gamification pedagogy, saying it made the class feel more relaxed, less stressful, and motivated students to complete their work.
Narrative	The themed narrative tied course elements together and provided comprehensive information on evaluation and rubrics. Students found periodic congratulatory emails from the course avatar reinforced and rewarded achievements.
Visual Graphics	Students enjoyed the graphics, found the colors exciting, the inclusion of an avatar fun, and they appreciated the continuity of graphics between the on-campus and online course components.

Flexible Timelines	Flexible timelines increased students' sense of autonomy and reduced anxiety by providing freedom to work at their own pace. They also noted that this flexibility promoted responsibility.
Points	Points helped build confidence, decreased stress, and points accumulation motivated students toward content mastery. Some student comments were more ambivalent; however, this decrease in perceived effectiveness may be related to one student "gaming the system" (see discussion).
Unlimited Attempts	Unlimited attempts encouraged and motivated students to learn, decreased test anxiety, promoted effective study habits, and gave students agency over their grades. This mechanic was highly valued by international students for additional learning opportunities in their second language.
Highest Points	Students reported realizing increased achievement without the risk of negative consequences to be motivating and reinforcing. Studying for and completing multiple attempts at quizzes also increased student contact with course content and enhanced knowledge mastery.
Check-Points	Two single attempt check-point exams were unlocked based on quiz results. Some students credited this mechanic for their success in the course, said the scaffolding value of repeating quizzes was an effective study strategy, and valued their format in terms of accountability.
Badges	In the first iteration of the gamified course, online badges tracked completion of quests and challenges. Only 16.7% of students rated this mechanic good/excellent and 38.9% rated it poor/not useful. Due to these poor evaluations, badges were removed from the second iteration.
Coins	Medieval themed community coins were introduced in the second iteration to promote positive community development and recognition. Students commented this element was cool but needed more emphasis during class to encourage them to physically bring coins to participate.
Leaderboard	Competition motivated students enjoyed leveling-up, becoming a master, and said this mechanic drove them to get higher marks. The leaderboard was motivating, valuable in checking individual and classmates' progress.
Bonus Points	Although the bonus points only amounted to 1% of students' final grade, some students were highly motivated by this mechanic, arriving 15 minutes early for class to request opportunities to earn bonus points. They recommended increasing this mechanic's weighting in future iterations.
Rewards	The reward treats encouraged students to overcome previous inhibitions about public speaking and contribute to class discussions. Students expressed appreciation for the immediacy of the reward system, stated it promoted a positive learning culture, and fun learning experiences.
Positive Focus	The positive approach helped balance the seriousness of course content and promoted a supportive learning environment with a manageable workload. Students attributed part of the positive focus and their success to the instructor's openness, effectiveness, and relational style of teaching.

Teams The in-class self-selected processing groups, small group assignment, and the group research assignment promoted engagement, inclusivity, and made students feel that their voices mattered and were heard. Students learnt from each other's experiences and developed leadership skills.

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## Discussion

This study explored whether gamification pedagogy could be effectively conceptualized and operationalized in higher education to address historical issues within an identified course and enhance student learning engagement. The discussion section will explore students' responses to the redesigned gamified CYCP course in terms of these research questions and situate their experiences within recent research.

### Gamification Pedagogy and Course Redesign

The comprehensive student-centric, motivationally based model of gamification pedagogy was effectively operationalized for course design, met contemporary students' learning needs, and resolved pre-existing course challenges. The results support previous findings that gamification design increased student engagement, academic success, study behaviour, and learning experience (Aleksic-Maslac et al., 2018; Bouchrika et al., 2021; Huang & Hew, 2021). In addition, students reported experiencing increased empowerment, agency, and decreased anxiety, likely demonstrating an effective matching of motivators, mechanics, and learning outcomes (Dichev & Dicheva, 2017; Molina-Carmona & Llorens, 2020). Gamification pedagogy also effectively addressed historical challenges with the course content, structure, and assessments, and provided an engaged, success-driven, and enjoyable learning environment. The generalizability of these results lies not in the specific redesign of this course, but in how it's methodology can be applied to other users, content areas, and objectives.

While the course content and academic rigor were preserved, the learning culture, course structure, and student experience were transformed. Building on Aleksic-Maslac et al. (2018) and Huang and Hew's (2021) findings on gamification, students reported increased motivation to engage with and learn course content, and enhanced learning experiences. The consistently high survey results suggest that the motivators identified in the player prototypes effectively "hooked" students to engage, learn, and succeed (Dichev & Dicheva, 2017; Molina-Carmona & Llorens, 2020).

This study reinforced findings that gamification heightened student experience, engagement, behavioural changes and learning outcomes (Fleischmann & Ariel, 2016; Jo et al., 2018; Nurtanto et al., 2021), and that a systematic framework for gamification design resulted in targeted behaviour change (Epstein et al., 2021; Molina-Carmona & Llorens-Largo, 2020), as opposed to mixed results from only introducing gamified mechanics (Gallego-Duran et al., 2019; Hung, 2017).

The course design appealed to contemporary students' values, interests, and learning needs, resulting in the course elements and teaching approach being perceived as relevant and responsive (Mohr & Mohr, 2017). The motivator-mechanic pairings built an inclusive learning



context replete with agency, community, engagement, inclusion, recognition, enjoyment, and success (Cretu et al., 2020; Henley, 2019). Students described a positive learning culture that embraced support, challenge, and capacity. They found the learning strategies effective, practical, varied, and valued developing trusting and supportive relationships.

The student-centric design process afforded opportunities to expand definitions of success beyond traditional high grades. Supporting Guay's (2016) study, student motivators reflected cultural constructs of achievement and success and were incorporated into the embedded mechanics of the gamified design. By engaging with diverse student motivators, a broader definition of academic success was created, valuing a greater range of students' real-world attributes and abilities. This range of acknowledgement created room for students to recognize and celebrate each other's strengths, and built a supportive, inclusive, and empowering learning community (Kumar et al., 2018).

### **Enhanced Student Engagement**

Throughout the course, students expressed and displayed enthusiasm for the immersive gamification pedagogy. The flexibility of the mechanics provided opportunities for course design elements that met contemporary students' learning preferences, such as digital assessments, micro-chunks of learning, responsive and casual communications, knowledge-sharing, choices, and a relational style of instruction (Cretu et al., 2020; López-Santacruz & Guízar-Mendoza, 2022; Mohr & Mohr, 2017).

Students identified the narrative and thematic graphics across on-campus and online course components as innovative, unifying, and fun, supporting previous findings that integrated visual graphic mechanics created an immersive learning context that enhanced user experience (Hsieh & Yang, 2020; Majuri et al., 2018). Congratulatory emails from the course avatar were also highly valued, confirming the value of 'juicy' feedback (Perryer et al., 2016) and Roche et al.'s (2018) findings that completion emails increased student engagement.

The use of the points mechanic over percentages motivated students to positively focus on completing assessments, reinforcing points motivational impact on learning engagement and increased performance (Helme Falk, 2019; Saran et al., 2018). Points built into the leaderboard mechanic, which most students reported highly motivational, reaffirming Sun and Hsieh's (2018) findings that interactive and competitive mechanics increased student attention and learning; however, one student found this mechanic discouraging as it reflected how far they were falling behind their classmates.

The relatively lower ratings of leaderboard and points in the second iteration were contrary to studies on its effectiveness (Aldemir et al., 2018; Ortiz-Rojas et al., 2019) and may be related to one student "gaming the system" (Kapp et al., 2014, p. 235) near the end of the second iteration by learning modules and completing quests ahead of the course schedule in order to stay on top of the leaderboard. This impacted the motivational capacity of the competitive mechanic for other students. In future iterations, adaptive release of quizzes could prevent this anomaly.

Contrary to studies supporting the efficacy of badges (Hamari, 2017; Helmfalk, 2019; Xu et al. 2021), 38.9% of students rated badges poor/not useful. Part of the lack of this mechanic's success may lie in how it was undervalued in the course in terms of lacking any extrinsic reward or recognition system. Interestingly, Kyewski and Krämer (2018) also found that student activity was unmotivated by badges and Facey-Shaw et al. (2019) determined that as external motivators, badges decreased intrinsic motivation. The coins mechanic was also not well received by students. The relative failure of these two mechanics might be due to improper motivator-mechanic pairings, a lack of emphasis by the professor, or a satiation of motivators matched to other mechanics.

Students stated the combination of unlimited attempts, high score, and check-points created a safe and positive learning context. Consistent with Hung's (2017) research, students reported realizing increased achievement without the risk of negative consequences to be motivating and reinforcing. Students with high anxiety and second language learners credited this combination for their academic success, affirming Petrovic-Dziedz's (2019) finding of benefits for retrieval-based learning activities.

The system of playful incentivization, bonus points, and peer-defined awards were seen to be socially motivating and fostered prosocial learning (Borrás-Gené, 2019; Hwang & Choi, 2020; Roche et al., 2018). Supporting Antonaci et al.'s (2019) research on gamified community-building, students stated the small groups promoted engagement, inclusivity, and made them feel their voices mattered and were heard. Student evaluations also supported findings that student perceptions of a caring and supportive professor reinforced a positive learning culture and increased student satisfaction (Geier, 2020; Mendoza et al., 2021).

### **Resolution of Historical Course Challenges**

Supporting Palomino's (2019) findings, the unifying narrative engaged students and empowered them to successfully control their progress through the course. The necessity of multiple assessments was readily accepted as part of the narrative and digitally enhanced gamified design. Students on average chose to complete each quiz six times, contributing to higher final grade outcomes, supporting findings that systematic gamification frameworks result in behaviour change (Epstein et al., 2021).

In terms of scope of course content, the points mechanic created a positive focus on building skills and competencies and reportedly encouraged content mastery (Venter, 2020). Flexible timelines increased students' sense of autonomy and reduced anxiety by providing the freedom to self-pace, encouraging responsibility and accountability (Atmaja & Mandyartha, 2020). A strengths-based context for diverse platforms of learning and assessment emerged. Students reportedly felt empowered to successfully manoeuvre through the potentially triggering scope of the course content.

The gamified design empowered students struggling with anxiety to surmount previous barriers to success. They reported a combination of gamified mechanics (unlimited attempts, high score, flexible timelines, points, positive focus) allowed them to manage their anxiety more effectively,

to the point that no student with approved accommodations requested any additional supports. Pitoyo (2019) similarly found that access to repeat online quizzes increased students' motivation, confidence, and decreased test anxiety.

## Conclusion

This research is significant in that it creates room for innovative pedagogy in post-secondary education, while maintaining existing learning objectives, course content, and academic rigor. It also presents a new educational standpoint that realigns course design with contemporary students' natural motivators, requiring a shift from the traditional power structure of academia (McInnes, 2013; Miller et al., 2013) to a student-centric course design process (Nurtanto et al., 2021).

While all students may not have been motivated by all mechanics in this study, the comprehensive gamified design was inclusive enough to engage every student throughout the course. Although these results are promising, further study into the specific motivator-mechanic matches is needed (Kocadere & Çağlar, 2018). A rigorously designed scientific methodology could assess the effectiveness of specific motivator-mechanic pairings at a granular level.

The successful implementation of gamification as a comprehensive pedagogy necessitated the development of operational expertise in gamification, in addition to the area of academic study. This need for proficiency in gamified design was also identified by Mellor et al. (2018) when they ran into design and development challenges that their academic teams could not address. Cross-disciplinary knowledge is needed to reorient the academic course designer's standpoint to reconceptualize course development from an instructional design perspective (Yamani, 2021).

As gamification pedagogy is student-centric, it also requires knowledge of learner characteristics and their motivators (Barber, 2021). A purposeful and thorough strategy must be employed to acquire this knowledge, and courses must be redesigned in response to cohort changes. This requires faculty to invest significant energy and time in course development to plan for student success. As gamified design is based on targeted learners' motivators, periodic reassessment of students' player prototypes and adjustments to course mechanics would be required.

The pedagogy of gamification in course design holds some limitations in terms of applicability, development, and sustainability. Gamification is not indicated for every subject and may not align with every faculty member's teaching philosophy (Geier, 2020; Palmquist, 2021). In addition, gamified projects take significant time to develop and facilitate effectively. Even when course content, instructional philosophy, and design considerations align, subsequent iterations of a gamified course remain dependent on whether this pedagogy resonates with future faculty.

By design, student-centric, motivationally based gamification pedagogy should theoretically be equally effective with any targeted group of students and any subject matter to achieve desired outcomes. As such, it shows great potential to energize and modernize education, as well as design empowering, successful, and enjoyable learning experiences. The inclusive design can

afford tailored learning opportunities to hook divergent student groups' motivators within a single learning context.

This pedagogy could be used to explore whether traditional post-secondary education aligns with the natural motivators of marginalized people (Haigh, 2020). Could an unappreciated mismatch in motivator-mechanics be contributing to poor engagement, academic outcomes, and the perceived inaccessibility of education among racialized, Indigenous, and immigrant people (Banks & Dohy, 2019; Connauton, 2020; Dari et al., 2021; Nichols et al., 2020)? If this were found to be the case, then could operationalizing a comprehensive gamification pedagogy redress this?

Similarly, for students that have been unsuccessful in traditional classrooms, could a comprehensive gamification approach hook the natural motivators of special needs students in either resourced or integrated classroom settings? Often the cognitive and physical developmental needs of such students are assessed in program design (Hargreaves, 2020), but what about consideration of how they could be intrinsically motivated to learn and succeed both academically and socially?

Gamification has been applied to engage online learners (Borrás-Gené et al., 2019) and address issues of student engagement and retention (Bornschlegl & Cashman, 2019). Could effective motivator-mechanic pairings increase engagement with course content, sense of learning community, and academic success in distance delivery educational programs? In addition, could mechanics such as unlimited attempts, high score, and unlocking, offer unproctored assessment options for online courses that support academic integrity and maintain academic rigor?

Finally, in light of the adverse mental health impacts on students from the recent COVID pandemic (Rudenstine et al., 2020; Wang et al., 2020), further research into whether gamification pedagogy could help alleviate student anxiety and re-engage them positively in a learning community could be valuable (Xu et al., 2021). As universities pivot to bring students back on campus following the realities of disrupted modalities of teaching, could gamification pedagogy be a useful pedagogical tool to bridge student re-engagement between online and on-campus learning contexts?

### **Conflict of Interest**

The author discloses that they have no actual or perceived conflicts of interest. The author discloses that they have not received any funding for this manuscript beyond resourcing for academic time at their respective university.

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