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Transforming design education through an innovative human-centred design approach to game-based learning

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Abstract

Global society demands continuous modification and enhancements to traditional teaching and learning to prepare students for the complex 21st century world. Higher education (HE) instructors in South African institutions are faced with unique challenges as the student populace is often culturally, socially, and linguistically diverse and also comes from varying socioeconomic backgrounds. To ensure student success, HE instructors should employ innovative human-centred design (Human-Vogel and Du Plessis 2024) strategies to respond to diverse student needs, improve performance and knowledge retention, and to increase motivation levels. Problem statement – How can game-based learning (GBL) be applied through human-centred design to shape impactful futures for Extended Programme South African art and design students? The Extended Curriculum Programme (ECP) accepts students who are inadequately prepared for HE, providing them with the necessary disciplinary knowledge and skills to prepare them for the mainstream Design and Studio Art course. However, South Africa's education inequalities contribute to this under-preparedness, making it crucial to provide additional support and innovative teaching methods to improve the academic success of ECP students (Khumalo & Sibanda 2023 and Human-Vogel & Du Plessis 2024). Guided by a human-centred design approach, a History of Art and Design analogue GBL (Maratou *et al. 20*23 and Rye 2023) activity was created for ECP students at a South African university of techology. Human-centred design approach emphasises the prioritisation of the students' needs (Human-Vogel & Du Plessis 2024 and Landry 2020), hence the GBL activity was created with an empathetic understanding of our student's learning challenges, with a priority on student centredness. Students' performance in the History of Art and Design tests was assessed, revealing challenges with discipline knowledge, terminology, and language barriers. The GBL exercise aimed to address these learning barriers through tangible analogue game elements. Prior learning was considered to enable an inclusive learning environment. Therefore, students did not require prior competency in computer literacy. To make the workload manageable, game cards consisted of cognitive memory questions and convergent questions (Festo 2016 and Asking good questions 2008). This also reduced the cognitive load while facilitating the retention of knowledge (Rye 2023). Ethical considerations included student anonymity and the agreement by students to participate in the activity. This research study explored the impact of this GBL activity implemented as an active learning tool on ECP Design and Studio Art students guided by human-centred design principles. In this study, Human-centred design was employed as a theoretical framework merged with a social constructivism lens. Findings indicate that engaging with analogue game elements promotes active learning, allowing art and design students to relate theoretical knowledge to real-world contexts. The outcomes of the test written post the deployment of the History of Art and Design GBL activity showed improved student performance, knowledge retention, and increased motivation level. Therefore, this paper contributes to the larger discourse on the use of innovative pedagogical methods

to enhance teaching and learning in design education. By employing a human-centred design approach to game-based learning, this study demonstrates that GBL could shape impactful futures by effectively transforming traditional pedagogical strategies to enable active learning for ECP art and design students.

Keywords: Human-centred design, game-based learning, analogue games, extended curriculum programme, active learning, innovative pedagogical methods

Introduction

Student success is vital to institutions of higher learning globally as this sector has an imperative to produce a skilled workforce that can undertake leadership roles in the competitive 21st century workplace (Taneja *et al.* 2018). The South African Department of Higher Education and Training (DHET) responded to the imperative by initiating transformational education efforts and policies to increase HE access to students from disadvantaged socio-economic backgrounds. The DHET student support measures include the establishment of Extended Curriculum Programmes (ECPs) to accommodate students who are academically under-prepared for HE (CHE 2013). While enrolments of students from disadvantaged groups are on an upward trajectory, the challenge of under-preparedness has been noted as one of the major causes of low student success and throughput rates in South African HE institutions (Funmilola *et al.* 2023; Khumalo & Sibanda 2023; Human-Vogel & Du Plessis 2024). As a result, these at-risk students lack basic skills to cope with academic demands in HE, leading to low student success and high rates of attrition (Khumalo & Sibanda 2023).

Student under-preparedness is a multifaceted challenge

To mitigate the challenge of low student success, Extended Curriculum Programmes (ECPs) were established to accommodate students who are academically underprepared for HE (Chetty & Kepkey 2023). The ECP cohort concerned in this study was enrolled in the Design and Studio Art department at a South African university. This programme is offered through an additional year of study meaning that ECP students obtain a Diploma after four years of study. ECP students are equipped with foundational academic knowledge and the necessary disciplinary skills to succeed in the Design and Studio Art mainstream course. Majority of students who enter HE through the ECP access route often come from poorly resourced education backgrounds and are inadequately prepared for HE (Chetty & Kepkey 2023 and Khumalo & Sibanda 2023). Under-preparedness manifests itself through students' inability to menage the demands of HE stemming from various personal and academic factors which include poor linguistic development and the lack of academic literacy skills (Moyo 2020; Khumalo & Sibanda 2023). Additionally, the student populace in South African HE institutions is often culturally, socially, and linguistically diverse and comes from varying socioeconomic backgrounds. Challenges that can emanate in classrooms characterised by varying levels of student under-preparedness, include lack of student engagement, declining motivation levels and poor performance (Lewin & Mawoyo 2014). Such diverse learning environments necessitates innovative pedagogical strategies to cater for diverse students' learning needs and to promote student success (Funmilola *et al.* 2023). Innovative pedagogical strategies refer to the various techniques and strategies employed by educators to enhance student learning in HE. These strategies include the facilitation of game based-learning, active learning, collaborative techniques to enhance student learning outcomes (Lisa *et al.* 2024).

Students are more vulnerable in their first year of HE, an encounter with academic challenges can hinder their progress and lead to early exits (Funmilola *et al.* 2023). For ECP students, first year of

university study forms foundational experience and shapes student perception of their academic career. Hence innovative pedagogies can be used as effective strategies in addressing diverse student needs and ultimately enhance their educational experiences while promoting deeper learning. Therefore, in addition to ECP being an access route to HE, underprepared students need academic support to develop sound knowledge of their disciplines of study, improve performance, knowledge retention, motivation levels and academic success (Funmilola *et al.* 2023). Therefore, the author identified the need to employ innovative pedagogical strategies guided by a human-centred design (HCD) approach. A game-based learning (GBL) activity was created and facilitated in the ECP Design and Studio Art department at a South African university of technology. The objective of facilitating a GBL activity was to improve student's retention of knowledge in the History of Art and Design module through an engaging playful method.

The human-centred design approach

Classrooms comprised of students with diverse learning needs can turn into challenging environments and considering the multifaced challenges hindering student success, facilitators can contribute towards improving student success by embracing non-traditional teaching methods to facilitate effective learning experiences. According to Human-Vogel and Du Plessis (2024, p. 859) *"educators are essentially designers of learning opportunities"*. This implies that instructors should see themselves as problem solvers that are able to identify challenges and can design learning solutions for positive learning experiences. Hence this study supports the notion that the implementation of innovative teaching methods should be informed by a design stance, particularly a human-centred design (HCD) approach to facilitate effective learning experiences (Garreta-Domingo *et al.* 2018). In educational practice, HCD methods place emphasis on the prioritisation of students' needs and empathises with their limitations (Human-Vogel & Du Plessis 2024; Garcia-Lopez *et al.* 2020; Landry 2020). Thus, a HCD method was preferred for this study with the hope that multifaceted challenges hindering student success at ECP level can be tackled through instructional methods created through HCD.

Application of human-centred-design methods

HCD perspectives asserts that to identify a problem, one needs to understand the needs of the people affected by it. Once a problem is identified, it must be viewed within context (Burns 2018). The author (lecturer) observed ECP students, paid attention to their lack of engagement in class, poor linguistic development, poor academic literacy skills, coupled with poor performance in termly tests all of which contributed to the declining pass rate. As a designer of 'learning opportunities', the author recognised the need to employ an innovative instructional method that would promote student engagement, motivation and improve learning outcomes. According to Ebralidze (2023, p. 1); *"Instructional practices that promote engagement include active learning strategies, such as group work, problem-based learning, and hands-on activities. These strategies provide students with opportunities to interact with their peers and the content in meaningful ways"* Games are increasingly being used in educational contexts to enhance pedagogical methods through engaging and interactive play and have been found effective in enhancing student retention of knowledge and skills (Maratou *et al.* 2023). Therefore GBL was chosen as a suitable intervention that involved the implementation of active learning, promotes interaction while facilitating deeper learning through gameplay.

While gamification and GBL methods are gaining prominence in the education sector, the two methods are different in format and deliverables. Gamification is defined as the incorporation of game elements in a non-gaming scenario to improve engagement or enhance motivation. Gamification elements may include incentive systems like badges, stars, points (etc.) to motivate students to participate in an activity (Plass *et al.* 2015; Qasim *et al.* 2024; Hu 2024). Whereas, GBL is defined as

the use of digital or non-digital games primarily as a teaching medium to facilitate learning and to promote the acquisition of new concepts and skills through play (Sugahara & Lau 2018; Stack & Bunt 2023; Qasim *et al.* 2024). Hu (2024, p. 91) stresses that, the main advantageous distinguishing feature between the two methods is that game-based learning *"includes an actual game that creates a learning experience that teaches or reinforces knowledge and skills*". While incentive systems may be included in game-based learning to motivate students, the distinguishing feature of GBL is in the mechanics of the game which are designed to facilitate acquisition of knowledge through play (Maratou *et al.* 2023; Qasim *et al.* 2024; Hu 2024). With the increased enrolments of non-traditional first-generation students, South African HE institutions can mitigate high failure rates through the implementation of innovative instructional strategies (Van Zyl, Dampier & Ngwenya 2020). Therefore, this study investigated the impact of an innovative GBL learning activity that was facilitated in the ECP Design and Studio Art department at a South African university of technology.

Literature review

In this study, the author employed an infusion of human-centred design (HCD) methodology and social constructivism theoretical framework. In HCD, the focus is on the needs of the people for whom you are designing a solution for to ensure the creation of design solutions that are attuned to the needs of users (Burns 2018). The HCD stance informed the data collection process which enabled the author to identify challenges hindering student success in the ECP. The HCD also informed the creation and the facilitation of a GBL activity that aimed at addressing ECP students' learning needs. The sections below will describe how these theories were merged to serve different purposes.

According to Burns (2018, p. 208). *"HCD is a design framework that aims to develop solutions to problems by involving the human perspectives in all steps of the process, via observing the problem within context, brainstorming, conceptualising, developing and implementing the solution".* Teaching instructors can apply HCD methods to address problems in the facilitation of instruction, curriculum or issues related to teaching and learning and to develop solutions to these. In educational context, HCD methods place emphasis on the prioritisation of students' needs and empathises with their limitations (Human-Vogel & Du Plessis 2024; Garcia-Lopez *et al.* 2020; Landry 2020). This framework places emphases on viewing problems in the context of people you are designing the solution for. Moreover, as a design philosophy, HCD *"provides professional designers with both a process and methods to address complex (wicked) design problems. HCD is practice-oriented, context-aware, empathetic and works incrementally"* (Garreta-Domingo *et al.* 2018, p. 1114). Hence upon identifying learning challenges, instructors can develop solutions tailored to meet the specific needs of their students. Therefore, HCD method was preferred for this study with the hope that multifaceted barriers hindering student success at ECP level can be tackled through instructional methods created through HCD.

Effectiveness of HCD methods

The implementation of HCD methodologies in higher education context has proven to be effective in enhancing student outcomes in various studies. The outcomes of a study conducted on students enrolled at first year module in Education at a South African showed improved student engagement and an increased pass rate after the implementation of HCD methods on curriculum and learning management system design (Human-Vogel & Du Plessis 2024). A separate study at a South African university recommends the application of HCD processes within design curricula to help prepare graphic design undergraduates for the real world of work where they can collaborate with end-users (Chmela-Jones 2019). Another study which investigated the connection between student academic

performance and online engagement metrics in engineering education at a United Kingdom university revealed that education experiences redesigned through HCD principles can enhance student learning (Covill *et al.* 2025). Therefore, the HCD framework informed the data collection method in this study and guided the author in the process of identifying barriers to ECP student success.

Game-based learning (GBL) was a preferred pedagogic method for this study based on the premise that the element of fun in GBL can improve student engagement, encourage active learning (Taneja *et al.* 2018). Qasim *et al.* (2024, p. 25) concurs by stating that active learning *"occurs when students are actively engaged in the learning process. GBL promotes active involvement, leading to enhanced understanding and memory retention".* Interacting with educational content in a game scenario engages students in their learning, awakens curiosity, enhances their understanding, facilitates retention of theoretical content, and improves student output (Taneja *et al.* 2018 & Qasim *et al.* 2024). Games also convert the classroom into a relaxed learning environment where students can learn from success and failure in a relaxed stress free environment (Qasim *et al.* 2024).Moreover, the interactive nature of educational games fosters collaboration and teamwork in a classroom environment and this equips students with collaborative and critical thinking skills which are valuable in the 21st century workplace (Adipat *et al.* 2021; Stack & Bunt 2023).

GBL has gained popularity in HE and has captured the attention of researchers over the years. An increase in the incorporation of Digital GBL methods has also been noted in recent studies as HE instructors attempt to align their teaching strategies with the demands of the modern digital technology driven world (Stack & Bunt 2023; Muzuva 2024). Despite the growing popularity of digital GBL, this study maintains that analogue GBL can be designed strategically to enhance students' learning. Analogue games are played using tangible non-digital media and can include board games, card games, dice games, building games (etc.) (Rye 2023; Maratou *et al.* 2023). Hu (2024) and Balakrishna (2023) argue that, educational games do not have to be digital, the important aspect is in the game's ability to facilitate learning. This implies that analogue educational games can be designed to facilitate effective learning experiences.

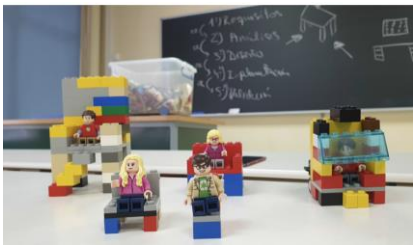
Moreover, recent literature posit that digital GBL activities are not always ideal for most educational settings as multiple obstacles may arise for both the instructor and the students thereby hindering the facilitation of learning (Maratou *et al.* 2023; Adipat *et al.* 2021). HE instructors may not be well equipped to create digital GBL activity as access to appropriate technologies and technical support is required to ensure successful integration of curricula content into digital game format. HE instructors would need to attain advanced level of digital literacy to create and administer educational digital games (Hu 2024). Moreover, a digital GBL activity would have created a digital divide in the ECP class. Owing to education inequalities characterising the South African education sector, majority of ECP students who attended poorly resourced rural and township schools have poor digital literacy skills (Funmilola *et al.* 2023). A digital GBL activity requires a certain level of digital literacy skills, this was going to cause frustrations and deprive students of an opportunity to engage with the actual learning in the game (Hu 2024). The pedagogical benefits of game-based learning would not have been realised by both the instructor and the students had a digital game format been utilised. Therefore, the author empathised with the ECP students and created an analogue GBL activity tailored to their needs.

Examples of educational analogue games

Educational analogue games have been used in the educational settings to facilitate learning in various ways. Some examples include (Table 1), Lego, board games, scrabble (to name a few) all of which

involved the use of tangible game element and which contributed to improved student success (Santos *et al.* 2020; Harahap *et al.* 2023).

Table 1: Examples of educational analogue games

	
Lego Serious play activity, teaching students the key concepts of Software Engineering in a playful and active way.	**Conquer the Work' board game** to teach students about public artworks linked to classicism, modernism and contemporary art

The analogue GBL activity created for this study was designed to foster group participation, allowing students to learn through social interaction within the ECP classroom environment. Propounded by Vygotsky (1962), the social constructivism theory states that knowledge is socially constructed through interactions with other students, teachers, and peers in the learning environment (Vygotsky 1962 and Akpan *et al.* 2020). This theory highlights the need for instructors to create a collaborative learning environments where students can interact with others in the application of knowledge as a means of achieving learning objectives (Akpan *et al.* 2020; Cassim 2020). However, Saleem *et al.* (2021) recommends instructor guided-collaborative learning whereby the instructor assumes a leading role and guides student through prompting questions or topics to direct them towards learning outcomes. The social constructivism perspective informed the facilitation of the GBL activity in this study. The author guided the process while enabling students to engage in peer discussions and collaborative learning in their groups.

Methodology

Focus group

This current study was conducted in the Extended Curriculum Programme (ECP) in the Design and Studio Art department at a South African university of technology. This particular ECP programme introduces students to the Design and Studio Art discipline, and History of Art and Design is one of the modules taught at this level.

The main objective of the analogue GBL activity created by the author was to enhance student's grasp of the History of Art and Design subject content and to improve student success. Participant students assigned themselves to groups of five or six students. Ethical considerations included student anonymity and the agreement by students to participate in the activity.

Research design

The author used observation as a data collection tool to identify challenges hindering ECP student success. Satapathy (2023) describes observation as a method that provides researchers with a unique opportunity to collect ongoing and live data. Students' performance in the History of Art and Design

module was also assessed prior to the undertaking of this study, revealing challenges with discipline knowledge, terminology, language barriers and a declining pass rate. A 5 step HCD process (Figure 1) was employed during the creation and the facilitation of the GBL activity (IDEO. 2015).

Figure 56: A five-step HCD process

A five-step HCD process was implemented as follows:

1. **Empathise:** The author observed and empathised with ECP students.
2. **Define** their learning needs, e.g., lack of student engagement, poor grasp of subject content.
3. **Ideate.** How can their needs be met through an innovative GBL pedagogic method?
4. **Prototype:** The first implementation of the analogue GBL activity in the third term was part of the prototyping process. This step helped the author restructure some game elements which were not suited for this activity. The game was updated and restructured.
5. **Test:** The updated game was tested in the fourth term and the results were assessed. While the design and facilitation of study was conducted in a five-step HCD process, an iterative phase was implemented afterwards. The analogue GBL elements were refined for use in the new ECP student cohort (Ideo.org 2015).

Implementation of the analogue GBL activity

The analogue GBL elements comprised of a board (sheet of paper) with points per block, dice, and game cards (table 2). The main play elements were game cards bearing cognitive memory questions and convergent questions derived from the History of Art and Design content covered in the third and fourth term.

Table 2: An example of game cards used in the analogue GBL, cards were cut and pasted individually on black paper which was folded to conceal the answer

While these question types required low order of thinking skills, they were paired with an engaging analogue gameplay. Students were required to think critically about their answers and to consider viewpoints of their group members. Therefore, through an engaging analogue GBL activity, students applied both low order and high order thinking skills (Rye 2023, Fitriani *et al.* 2021 and Freire *et al.* 2016). Game structure was designed to foster interaction with peers. Students had to connect the task on the question card with learnt knowledge and had to communicate with peers in small groups and co-construct knowledge before providing an answer. Students received immediate feedback from the author during the GBL activity. Groups scored points and progressed after providing correct answers, two groups with highest scores competed in the final round.

Results

Collaboration and active learning

The analogue GBL activity transformed the classroom into a collaborative learning environment where learning was not a solitary activity (Børte *et al.* 2023). Students worked collaboratively, engaged in dialogue, shared knowledge perspectives with their peers while actively constructing knowledge through meaningful exchange of discussions and perspectives. This converted the classroom into an active learning environment. Active learning occurs when teaching methods are designed to actively engage students in their learning processes (Børte *et al.* 2023; Adipat *et al.* 2021). Børte *et al.* (2023, p. 601) further explains that:

> Students engage in reading, discussing, and writing, exploring their own attitudes and values, that more emphasis is placed on developing students' skills instead of transmitting information and that students engage in higher-order thinking such as analysis, synthesis, and evaluation.

Therefore the analogue GBL activity was impactful in enhancing students' knowledge through active learning which enabled students to engage more strongly with their learning thereby facilitating deeper learning by engaging their high order thinking skills (Adipat *et al.* 2021). This also promoted self-regulated learning because playful learning creates a relaxed learning environment (Rye 2023).

Interactive engagement and the motivational aspect of the game

The added advantage of analogue GBL was its facilitation of interactive engagement. Unlike passive didactic teaching methods, interactive engagement method promotes conceptual understanding through interactive engagement of students with activities. This would involve discussions with peers and or instructors (Børte *et al.* 2023; Hake 1998). The analogue GBL activity comprised of tangible game cards with questions that students could engage with. Upon reading question cards, ECP students had to connect the task on the card with learnt knowledge and had to communicate with peers in their small groups and co-construct knowledge before providing an answer. The engaging mechanics of analogue GBL allowed students greater involvement in their learning (Adipat *et al.* 2021). This is supported by the engagement theory which posits that engagement is a key factor in the facilitation of learning and that instructional practices that promote engagement "*provide students with opportunities to interact with their peers and the content in meaningful ways, which can enhance their cognitive, emotional, and behavioral engagement*" (Ebralidze 2023, p. 1).

When students engage with content in small groups and are involved in discussions with their peers before providing a correct answer, they were not only thinking about the content they are learning but they also experience positive emotions and taking actions that reinforce their learning (Ebralidze 2023). This in turn fostered cognitive engagement which refers to the level of mental effort that students invest in their learning, such as thinking critically, analysing information, and making connections between concepts (Ebralidze 2023). All these learning benefits can be attained when students interact with instructional activities and when collaborative group activities are used as was the case in the GBL activity.

The competitive nature of the GBL activities was also a motivational tool which helps improve student engagement through playful stealth learning (Rye 2023; Maratou *et al.* 2023). Students prepare themselves by studying their notes to win the game. Preparing for the game means they are stealthily learning module content and have an opportunity to demonstrate their knowledge during the game.

Author's reflection

I noticed behavioural changes in the ECP group during GBL, particularly when students encountered challenging questions and could not respond with correct answers. Incorrect answers prevented them from earning points. But ECP students were not deterred by lack of progress. They remained resolute, waited for their next round and continued to participate in the game by engaging in discussions with their peers and by responding to question cards. This illustrated that enjoyment and motivation to compete in GBL instilled resilience in ECP students.

Resilience fostered a growth mindset in students, improved their confidence and the motivation to accomplish difficult tasks (Adipat *et al.* 2021). As a result, students developed a positive attitude towards subject content. When students have a positive attitude towards their studies, they are motivated to absorb more information and can take charge of their own learning (Rye 2023; Maratou *et al.* 2023; Ebralidze 2023; Hu 2024). This became evident when ECP students were no longer crippled by failure, but were rather, motivated to engage deeply with lesson content during GBL. Therefore, based on these observations, I believe that the GBL was effectiveness in enhancing learning experiences of ECP students.

Improved test scores

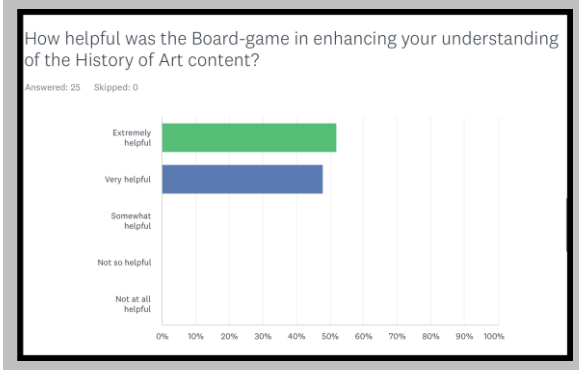
Table 3: Improved History of Art and Design test scores in term 3 and 4 after the enactment of the analogue game

Term	Total of Students who wrote HAD the test	Number of passes %
Term 2	59	31 (52,5%)
Term 3	62	49 (79%)
Term 4	58	46 (79%)

Improved test scores (Table 3) indicate that students absorbed and returned History of Art and Design Test (HAD) subject content in the third and fourth terms. In the second term before the enactment of the GBL intervention, 59 students wrote the HAD test and only 52,5% passed it. There was drastic improvement after the deployment of the game in the third term; 62 students wrote the test and 79% passed it. The percentage of passes in the fourth term remained static after second iteration of the GBL; 58 students wrote the test and 79% passed it. These results illustrate that the analogue GBL activity was effective in improving student performance. The HCD approach helped in the identification of ECP students' needs which were catered for in structure and procedure of the game. Therefore, it can be deduced that analogue GBL activities can shape impactful futures of ECP students by effectively transforming traditional pedagogical strategies to improve student performance.

These quantitative results were substantiated by an anonymous student survey (table 4) where more than 50% agreed that the analogue GBL was helpful in improving their retention of the History of Art and Design content. The survey also revealed that students developed good collaborative relationships with their peers.

Table 4: Anonymous survey responses

Retention of subject content	**Collaborative learning**
	
More than 50% agreed that GBL was extremely helpful in enhancing their knowledge of the History of Art and Design subject.	Students agreed that the GBL enabled them to develop good collaborative relationships with their peers.

Discussion

The integration of games in education environments promotes student engagement and helps enhance learning outcomes especially in subjects that students consider to be too abstract or too complex (Maratou *et al.* 2023). The findings of this study demonstrated that an analogue GBL activity

designed and implemented through a HCD process contributed to improved student outcome in the ECP group.

The analogue GBL format employed in this study enabled students to collaborate with peers in their learning. The valuable impact of the collaborative nature of the game is supported by the responses to the anonymous survey, revealing that ECP students developed good collaborative relationships during the game. Collaboration and teamwork skills are important in their academic careers and these skills are also essential in the 21st century workplace (Maratou *et al.* 2023).

In their small groups, ECP students analysed and connected GBL tasks with the History of Art and Design content. The GBL activity placed ECP students at the centre of their learning, transforming them from passive recipients of information to co-creators of knowledge. Furthermore, ECP students leveraged collective strengths, engaged in dialogue, shared knowledge perspectives with their peers while actively constructing knowledge through meaningful exchange of discussions and perspectives (Børte *et al.* 2023; Adipat *et al.* 2021). This promoted self-regulated learning (Ebralidze 2023). Improved test scores in the third and fourth terms attest to the effectiveness of the analogue GBL activity in enhancing retention of the History of Art and Design subject content. This further demonstrates that innovative instructional strategies can help under-prepared students reach their academic potential.

The author's reflection highlighted the significance of the analogue GBL activity in instilling behavioural changes in ECP students. Enjoyment, motivation, resilience, and a positive mindset further motivated the ECP group to invest mental effort in the GBL activity and the subject content (Hu 2024).

Challenges experienced during the GBL activity

The creation of gameplay elements and the facilitation of the analogue GBL was a time-consuming process. Analogue games comprise of tangible game elements and the creation of each aspect requires one to invest a large amount during the designing and preparation stages. Time is a scarce resource and educators may not have enough time to commit to developing effective analogue game experiences. Furthermore, the author worked with a large ECP student cohort, and participants each took turns responding to game questions. As a result, the analogue GBL activity went beyond the allocated timeframe. Conducting GBL on lengthier timeframes may impact on student engagement and this may hinder their learning during. Hence, this finding agrees with various studies that highlighted the need for the allocation of human resources for support and time in the creation of efficient implementation of GBL activities (Maratou *et al. 20*23).

Conclusion

This study investigated the impact of an analogue GBL activity that was implemented through a HCD process in the Design and Studio Art ECP class at a South African university of technology. In a country where the basic education sector is characterised by education iniquities manifesting as student under-preparedness, South African HE instructors need to explore alternative pedagogic means to unlock student potential (Funmilola *et al.* 2023). To create effective learning experiences, instructors should see themselves as designers of learning solutions for their students (Human-Vogel & Du Plessis 2024; Sloep 2013; Conklin 2005). This would entail designing innovative teaching methods to meet the diverse students' learning needs. Hence the imperative to employ innovative teaching strategies guided by HCD perspectives to improve students learning outcomes (Human-Vogel & Du Plessis 2024; Garcia-Lopez *et al.* 2020; Funmilola *et al.* 2023; Van Zyl, Dampier & Ngwenya 2020).

The objective of conducting a GBL activity was to enhance student learning through an engaging playful method and to improve retention of knowledge and success rates in the History of Art and Design module. The author merged HCD strategies with GBL to leverage the transformative potential of educational games as GBL engages students in their learning, awakens curiosity, enhances their understanding, facilitates retention of theoretical content, and improves student output (Taneja *et al.* 2018; Qasim *et al.* 2024). The most significant aspect of GBL was in its ability to transform the classroom into a relaxed environment where students were no longer passive recipients of information but rather, were actively engaged in their learning (Taneja *et al.* 2018; Qasim *et al.* 2024). The successful outcomes of the analogue GBL learning activity were clearly demonstrated by their improved History of Art and Design test scores.

A five-step HCD process was a central guiding perspective which informed the creation and the facilitation of the analogue GBL activity in this study. Observation and empathy were crucial steps, enabling the author to identify learning barriers hindering ECP student success, the principal factor being the diverse levels of student under-preparedness (Khumalo & Sibanda 2023). Upon identifying these learning barriers, the author empathised with ECP students and designed an analogue GBL solution. Therefore, HCD was an effective process and method that enabled the author to create an analogue GBL that was attuned to the diverse learning needs of ECP students (Burns 2018; Lisa *et al.* 2024; Hu 2024).

The findings of the current study concur with existing literature postulating HCD as an effective framework in enhancing educational practice (Garreta-Domingo *et al.* 2018). This is corroborated by a study that investigated the impact of iterative HCD process in the designing and creation of Open Educational Resources at a university. The outcomes revealed that the effectiveness of newly designed Open Educational Resources was achieved having employed HCD methods to meet the needs of end users.

Furthermore, HCD methodologies proved to be effective in enhancing student outcomes at a South African HE context. A study conducted on students enrolled at a first-year module in Education at a South African university employed HCD methods in adapting curriculum design, learning management systems and support strategies in an attempt to improve student success rate. Participants comprised of first year students from diverse education backgrounds, with varying degrees of preparedness for HE. Findings revealed that embedding HCD framework in curriculum design and learning management contributed to improved student engagement and an improved pass rate (Human-Vogel & Du Plessis 2024).

The current study and the previous studies mentioned above are evidence of the effectiveness of HCD strategies in HE context. The above study that conducted at a South African university is particularly important in illustrating the transformative potential of HCD strategies in enhancing educational experiences of the current generation of non-traditional students with varying degrees of preparedness for HE. While student under-preparedness remains a major contributing factor to low student output rates in South African HE institutions, perhaps innovative pedagogical strategies merged with HCD frameworks can be good starting points at address learning challenges emanating from our country's education inequities. The current study proposes GBL as an effective innovative pedagogical strategy that can unlock student potential and address learning barriers if implemented through HCD framework. Therefore, based on the outcomes of this study, it can be concluded that a HCD approach to GBL can shape impactful futures for ECP Art and Design students.

Suggestions

The author believes that the full potential of game-based learning can be realised through the combined use of analogue and digital GBL activities in the classroom. While lack of access to digital and technological resources can be an obstacle for some, HE instructors can use low-tech digital GBL activities that do not require the use of complex technical skills. Low-tech education digital games such as those found on 'educaplay' website (www.educaplay.com) can be adapted with preferred subject content. If students are introduced to low-tech digital GBL at the beginning of their, they can be familiarised with the digital GBL elements. Low-tech digital GBL can be played interchangeable with analogue GBL activities as each game format has its own benefits. Whereas the advantages of analogue GBL are: improved engagement and motivation levels, awakened curiosity, facilitates retention of theoretical content, and improves student output, etc., students can use low-tech digital GBL to revise subject content beyond the classroom environment. Low-tech digital GBL activities built on 'educaplay' website are accessible through a website link shared by the lecturer. Students can play the game at their own pace and in their own time on mobile devices. Therefore, the author suggests for analogue and low-tech GBL activities to be implemented interchangeably for students to reap benefits of both pedagogic methods.

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