Learning to design through character identification using a gamification learning app: Effects of learning quests on students' design behaviours and performance

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Abstract

Character identification occurs when game players adopt the identities of game characters to different degrees. Character identification can enhance identity development and learning of young adolescents but how higher education students in professional programs develop character identification using a gamification learning mobile app and use it to support their learning of professional skills and development of professional identities have not been examined. This study describes the design of a character-based gamified learning quest to support the learning of design skills. Through 13 learning quests, 4 3 tertiary design and media students used the professional media roles and 'power' attributes of their chosen characters towards the design of an innovative media product. The study investigates the developed character identification for their professional. Content analysis of students' video blog reflections indicated that more than half of them were able to establish deep identification with their chosen characters. Students who had deep identification enacted their character by actively ideating, prototyping and testing design ideas whereas those who had shallow or no identification largely focused on ideation. Regression analysis showed that deep character identification during design conceptualization predicted students' design project scores. How the study findings can inform the practical applications of character-based gamification in higher education professional learning programs are discussed.

Introduction

Character identification is a strategy used to create immersive experiences in digital video games and massively multiplayer online games (MMOGs) (Burgess & Jones, 2020a; Sierra Rativa et al., 2020). Just as one can develop one's character by imitating the characteristics of people that one identifies with, one can also imagine themselves as "becoming" media characters by temporarily giving up consciousness of their own identities (Cohen, 2001). The more that people exchange their perspectives of identity with the media characters, the more intense the level of character identification (Cohen, 2001). The use of character identification is seen in gamification for education (Jackson, 2016; Oxford Analytica, 2016) that adopt characters or avatars as the game design element (Deterding et al., 2011) to characterize and personalize student identities (Martin & Tyler, 2017). Cohen (2006) proposes that identification can bring about educational benefits such as better concentration and retention of the messages that characters bring. More importantly, character identification can help students to develop the positive attributes of the characters that they aspire to be. During gameplay, characters are agencies that support mental rapprochement between players and characters (Burgess & Jones, 2020; Klimmt et al., 2009). Students can possibly develop confidence, motivation, and direction as they identify with game characters (Hoffner & Buchanan, 2005) and this helps them to develop and transfer different knowledge and skills from games to reality (Barnett & Coulson, 2010; Erikson, 1968; Mazalek et al., 2013). However, in the education, character identification is the least common gaming mechanism and preferences as compared to badges, points and leaderboards (Gachkova et al., 2020; Jackson, 2016; Majuri et al., 2018). Identification involves psychological matching (Bandura, 1986). MMOG studies reveal that game players have different

kinds of character identification (Burgess & Jones, 2020b). Li et al. (2013) assessed player-avatar identification by the feelings during play, absorption during play, positive attitudes towards avatars and perceived importance to identity. It was found that primary and secondary students can develop conciseness of identity through gameplay. Other studies described different levels of identification. At a shallow level, players view themselves as being separate from their characters, having similarity identification, meaning, similar experiences, feelings and perspectives as their character (Hoffner & Buchanan, 2005) or wishful identification where they desire to match characters by reducing their psychological self-discrepancy (Bessière et al., 2007; Klimmt et al., 2009). At a deeper level, players unconsciously adapt their behaviour to characters to the point described as having embodied presence with characters (Van Looy et al., 2012). Some level of similarity or wishful identification can help game players to be more satisfied with their characters, have more enjoyable game experiences and better game performance (Ducheneaut et al., 2009, Klimmt et al., 2009). The more that game players perceived embodied presence, the more they internalized emotions and empathized with the messages delivered by the subject matter of the game (Van Looy et al., 2012).

Oksanen et al. (2013) called attention to the potential effects of character identification for learning. In an interactive educational game for learning programming, character identification improved the quality of programs created by students as well as their intrinsic motivation and self-efficacy for programming (Kao & Harrell, 2018). In an interactive serious game for civics and moral education that is set in the aftermath of the 2010 Haiti earthquake, high school students who have embodied identification with their playing character had higher levels of global empathy and interest in the subject matter (Bachen et al., 2012, 2016). Character identification can help students who are adolescents and young adults to explore and develop their identities as they play different roles with game characters (Li et al., 2013; Van Looy et al., 2012). As higher education institutions confront the need to produce industry ready graduates (Brennan et al., 2014), character identification can perhaps be used as another way of helping students to establish their professional identities, talents and potential before they enter the industry. Nevertheless, this is still an area needing more examination as serious games used in business and engineering courses have more often been evaluated in terms of learning outcomes (Bulander, 2010) but these have shown mixed findings (Bakhuys Roozeboom et al., 2017). The need for strong professional identity is critical for students who are entering creative industries such as design and media because their professionalism is highly intertwined with their ability to demonstrate unique creative voices that are driven from strong artistic identities (Lena & Lindemann, 2014). How character identification influences the learning and professional identities of higher education students still need to be further investigated.

In view of the extant research gaps, this study examines the character identification that 43 Design and Media students at a higher education arts institution developed through playing character-based learning quests using a gamification learning app. The following research questions are examined to develop implications for using character-based gamification for higher education professional learning:

(1) What kinds of character identification do design and media students adopt after playing character-based learning quests?

(2) Do students with different levels of character identification manifest different design behaviours?

(3) How is design performance influenced by character identification?

Materials And Methods

Study participants and module context

The study participants were 43 students majoring in design and media at a higher education arts institution in Singapore. Following ethics approval by the institution's research evaluation panel, students' informed consent was sought for study participation. All the students gave consent for study participation and there were 19 (44%) males and 24 (56%) females. The students were attending the Alternative Applications course during the August semester of 2019. The course duration is 15 weeks, allocated one lesson of four hours per week. It is a project-based course where students need to draw upon the ruins of the ancient Ayutthaya kingdom in Thailand, a UNESCO world heritage site, as creative stimuli to develop an innovative group-based design and media solution. A total of 12 teams with three to four students per team was formed. For this study, the learning tasks were designed with character-based gamification and presented to students in the form of learning quests that were driven by a meaningful storyline (Giakalaras, 2016) that is related to saving the Ayutthaya kingdom. The course activities were designed to first guide students to form their own team after understanding their own and peers' characters. The activities also support students to research, conceptualize, and develop their team projects. Students were free to express their creativity with different screen-based mediums, supported by the design thinking process to produce an alternative creation from Ayutthaya-inspired themes. The five steps of design thinking were used as a process to stimulate creative and alternative ways of thinking (Owen, 2006; Plattner, 2013, Plattner et al., 2014). In this process, design idea is first developed by having Empathy for the consumers of their design products prior to Defining their design problem, Ideating, Prototyping, and Testing their design ideas (Carlgren, 2013). In the study context, students learnt how to apply this design thinking to Ayutthaya as they must create a design and media product inspired by Ayutthaya. Thus, students need to develop empathy for Ayutthaya's history, the Ayutthaya kingdom and their citizens as a starting point of design.

Design of character-based gamified learning quests

The study was conducted during the first seven weeks of the semester where students conducted background research and developed their design conceptualization. The fictional narrative of the learning quests was about a group of newly chosen Treasure Makers who were on a mission to uncover the old treasures of Ayutthaya for inspiration to create new treasures (media-based applications) that could be used to save Ayutthaya from being demolished for urbanization. This was to impart the message about the universal value of conserving the historic city of Ayutthaya. Each student role-played a Treasure Maker with a character of their choice, made decisions and experienced the story through the character's eyes (Cohen & Tal-Or, 2017; Marache-Francisco & Brangier, 2013). The quests unfolded according to a storyline embedded with hints and strategies to support problem-solving for the quest challenges. Each

learning quest had gamified learning content and tasks (Kingsley & Grabner-Hagen, 2015) where students earned experience points and achievement badges to level up their character's status rank throughout the course. The quests were created using an existing commercial gamification learning mobile app (See Figure 1). It is suitable for the study as it allows educators to create their own quest video and students to submit their quest challenge video back for review and gain experience points.

Students chose their characters during the first lesson by playing the quest "Who Are You?" The 20 characters used in the quest were created and validated against the Personality-related Position Requirements Form (PPRF) (Raymark et al., 1997). These are Explorer, Mingler, Protector, Intellectual, Independent, Nurturer, Fighter, Communicator, Strategist, Idealist, Associate, Official, Celebrity, Champion, Creator, Controller, Investigator, Leader, Scholar and Founder. To foster professional identification, each character was further related to professional roles in the design and media profession such as illustrators, animators, media producer, manager, and writer. For example, the Creator character was related to the roles of artist, writer, mobile app developer, product designer, technologist etc. It also comes with a list of "powers" that describe its personality traits and abilities, such as optimistic, perfectionist, spontaneous, curiosity, and idealistic etc. (See Figure 2).

After choosing two characters, students also chose two roles and three "powers" from each of the two characters to represent themselves in their team (See Figure 3). A debrief was conducted with students after the quest to discuss how they could draw upon the roles and "powers" of their characters for their team project. After the debrief, the students continued to play another quest "Find Your Comrade" where they were to "speed date" to find their own teammates by introducing their roles and "Powers". They were guided in the quest to form a team of different yet complementary roles and abilities.

Students then played two other learning quests designed to help them develop and pitch their individual design ideas to their team members. The quest "Are You Taya?" guided students to research on the historical background of Ayutthaya based on one out of the four themes of their choice: cultural and lifestyle, architecture and landscape, economic and trade, and technology and innovation. This quest was narrated by a fictional non-player character, named "Taya", a local Ayutthaya citizen. The students were led by "Taya" to research deeper into one theme. After completing the quest, students had to do a blog post on the course blogsite to present their findings to their team. The second quest "Tuk Tuk" helped students to prepare a creative concept for a new treasure for saving Ayutthaya that is developed from the Ayutthaya values of pride, enterprise and adaptability. This treasure seeks to use inspiration from the old world to develop a new screen-based creation that could benefit today's generation. The students were again guided by the "Taya" character. After completing the quest, students had to integrate their concepts as a team in order to pitch their final concept to the lecturers. To stimulate thinking about design processes, students made two individual reflections as video blogs (vlogs) with a duration requirement of within five to nine minutes. In vlog 1, they reflected upon their processes for design research and how they planned to contribute to their team project. In vlog 2, they reflected upon how they developed design concepts to support their team project. The vlogs were graded as part of their individual weekly progress marks.

Students made project submissions during week 7 which constituted their mid-term assessment. The weightage of the assessment includes 60% based on team deliverables which include team project proposal and team concept poster artwork, and, 40% based on individual deliverables which consists of individual presentation slide deck as well as creative process journal and vlogs. The students spent 28 on-course hours to work on their project and majority of them spent additional off-course hours to complete the project.

Data collection and analysis

The following data sources were used to answer the research questions.

Research question 1 – character identification

Research question 1 was answered through content analysis (Weber, 1990) of the vlogs that students submitted. Out of the 43 students, 39 of them submitted vlog 1 while 35 of them submitted vlog 2. Thus, a total of 39 vlog 1 and 35 vlog 2 were collected. Each vlog constituted a unit of analysis. The videos were watched repeatedly and students' utterances as well as critical gestures (e.g., pointing a specific part of their artwork) were transcribed into text. Van Looy et al.'s (2012) framework was used as a starting point for coding, but constant comparison (Creswell, 1998) revealed the need for adaptation. Some students expressed no specific identification whereas those with embodied identification also shared ideas for enhancing embodiment of desirable character attributes. A second rater coded a random selection of 40 vlogs (54.05%) and a Cohen's kappa of 0.84 established the reliability of coding through which the coding protocol with three categories was established (See Table 1). The frequency distributions of students expressing different categories of character identification for vlogs 1 and 2 were analysed to answer the research question.

Table 1. Categories of character identification

Type of identification	Definition	Example
None	No application of character attributes	It was quite fun as [I] did not know about Ayutthaya and now I know. In the future, I will do a more in-depth research.
Shallow	Observed similarities to their character	The roles that I chose are Director and Coach. The powers that I used for this quest is organized and love to had fun. I like to organize my research and doing it in a fun way, so it does not get too boring.
Deep	Describes self as character or ways to become the character	The role that I used is being [a] Journalist because I wrote a lot of things that I got from the research.

Research question 2 – character identification and design behaviour

Content analysis (Weber, 1990) of the vlog transcripts was used to answer research question 2. The transcribed text for each vlog was broken down into messages in the form of unique ideas as a unit of analysis (Daniel & Harland, 2017). A total of 100 units of analyses were derived. Each unit of analysis was coded with the five steps of design thinking (Plattner, 2013; Plattner et al., 2014) to understand the creative processes that students used to research and create their design concepts. Two new categories, Plan and Reflect emerged from the analysis as students also revealed what they did before and after applying the design thinking processes. A second rater coded a third of total units that were selected randomly to derive a Cohen's kappa of 0.84. Adequate reliability was established, and the coding protocol was set up (see Table 2). The units of analyses were organized according to students' character identification that was established in research question 1. Thematic analysis (Braun & Clark, 2006) was used to identify the common features of students' design behaviour by their character identification.

Table 2. Categories of design behaviours

Design process	Definition	Example
Empathize	Demonstrate empathy through observation and understanding	We come out a Royal Tuk Tuk [taxi concept], giving it a Royal look to let the riders feel more special and exquisite about it.
Define	Form an actionable design problem statement	[The] problem is [that royal-like clothing] is too expensive for the general people thus we are solving the problem to make it more affordable.
Ideate	Generate idea for the established design problem	One way to do that probably is [to make] boats collect garbage like garbage trucks.
Prototype	Express design ideas with quick sketching and low-resolution artifacts	These (show the sketches of royalty Tuk Tuk on his creative process journal) are the things that we did.... there will be a comfortable couch to spice up the royalty experience.
Test	Evaluate and validate prototypes for further development	(Show their concept layout plan sketch) We combined board games and VR projections to let people learn about history. There will be a game table, a projector and physical game cards. Lecturers and classmates' feedback [were] to have big game cards.
Plan	Reflect upon own feelings and experiences before empathy	I like to organize the research and I try to manage my research on what to do first - the priority that I want to focus on.
Reflect	Reflect on one's work to find out aspects to improve and redefine one's point-of-view informed by testing	I feel that I really enjoying doing this kind of [card] game because it gives me a positive aura. We want to bring card game and recipe together into one app. We want it to be very fun and can gain knowledge.

Research question 3 – character identification and design performance

Each students' project submission was graded with the five dimensions from the course assessment rubrics – (1) creativity and innovation (2) application of knowledge, skills, research, and experience (3) amount of effort (4) execution competency, and (5) unification of cohesiveness, coherence, and relatedness. Stepwise regression was used to answer the research question with project grade as the dependent variable. The three levels of character identification that emerged from research question 1 for each vlog were converted to dummy variables and used as independent variables.

Results

Research question 1 – students' character identification

Table 3 shows students' character identification that were expressed through each vlog.

Table 3. Students' level of character identification by vlog

Level of identification	Vlog 1 Reflection on design research on Ayutthaya		Vlog 2 Reflection on development of design concept	
	N	%	N	%
None	9	23.08	11	31.43
Shallow	10	25.64	5	14.29
Deep	20	51.28	19	54.29
Total	39	100	35	100

Vlog 1

In vlog 1, students reflected about how they carried out background research for their design. Table 4 shows that about 23% of the students did not mention character identification and they made general comments about their research findings. For example, Student 1 reported that, "There are the eight temples that one has to visit in Ayutthaya." Slightly more than a quarter of the students had shallow identification. These students used the roles and 'powers' that they desired to draw out interesting insights about Ayutthaya, as Student 2 shared:

The role I used is Social Media Trendsetter. The powers I used were setting high standard and positivity because I felt that I needed to have a positive mindset on researching. I found interesting art and culture in Ayutthaya period such as Khon dance and [the] Lakhon nai performing arts during those times and

[are] still relevant today. The experiences that I have was memorable because I did not know [what] Ayutthaya was until [I] researched into it.

Students who had deep identification went further to describe how they manifested their character's role and 'power' in their design processes. Student 3 said:

I used my Journalist role. I took down information from various websites like a Journalist would and asked my Thai friends' questions on Ayutthaya. I was creative in my findings and used my 'love to joke' [power] where I found a humorous side story of the King Naresuan that I believe not many know i.e., King Naresuan's father was an elephant. I thought that it would be quite funny as a headline in my blog post...

Vlog 2

In vlog 2, students reflected on how they and their team developed their design concept. Slightly more than one third of the students did not draw upon character identification. These students described their design concept through random items or subjects, one of their interests, one real-life problem to solve and one of the four themes of Ayutthaya. Students had to associate them together to form a new creative concept. Student 4 explained:

We chose [the] floating wet market in Ayutthaya for our treasure. The problem is environmental pollution. The theme is lifestyle and culture, our interest is travelling. Random word is "NASA" (National Aeronautics and Space Administration). We combined all of them to derive the [idea that the] littering problem in Ayutthaya can be solved by the data generated from the space satellite where we can see the littering in the river of Ayutthaya. We [will] share these data with the local and tourists in Ayutthaya so that they aware about the littering.

About 14% of the students expressed shallow identification. These students articulated more details and had clearer vision about their design concept as compared to those without identification, as shown in Student 5's reflection:

We want to do an interactive animated storyboard website to spread awareness around the world so that they know about the flooding problem in Ayutthaya... Many do not know how bad it is and how it [has] affected the historical temples. My role in the group is a conceptual artist, and I am the one to do most of the drawing for the website. It is going to be amazing as the story will let people realize and spread awareness to save Ayutthaya.

Slightly more than half of the class had deep identification with their character. These students emphasized how their roles and 'powers' helped them to contribute to their teams. Student 6 described:

Being a journalist and writer, I contribute through these roles by attending the group discussion. During the discussion, I always write key points. By doing so, it helps me to catch up with the discussion, further improve and develop the points so that the concept can become more innovative. The 'powers' that I used during the discussion were 'positive' and 'optimistic' because in the process of doing the creative

proposal, I felt that our group seemed to be discouraged. We haven't gotten the perfect idea about the innovation that we want to create... so by using the powers that I have, I encouraged my team members and myself to persevere and continue thinking of [the] innovation that we can create by doing what we can. Eventually, our group had our own creative idea which made me feel relieved and proud...

Shifts in character identification

From the 34 students who submitted both vlogs, it was found that the level of character identification remained consistent for slightly more than half of them (n=18, 52.9%). Seven students (20.6%) shifted towards deeper levels of identification during vlog 2 (from none to shallow or deep; or from shallow to deep). The rest used shallower forms of identification (from deep to shallow or none; or from shallow to none). Analysis of the vlogs showed that the congruence between the design task and roles selected by students may influence their character identification. For example, Student 7 chose the roles of Designer, Artist and Musician and the 'powers' of 'creative' and 'original'. She did not apply these roles to the research design task of vlog 1 but was able to find shallow identification for the design conceptualization task of vlog 2. Students who maintained some form of character identification were flexible and imaginative in manoeuvring the attributes of their character. For example, Student 5 switched from the role of Writer to Artist in vlog 2 as this was more applicable for design conceptualization.

Research question 2 – students' design behaviour with respect to character identification

Design behaviour for vlog 1

Analysis of results from table 4 shows that students with different kinds of character identification approached the task of researching their design problem differently. A total of 140 occurrences in all vlogs were identified.

Table 4. Design thinking process in vlog 1

Design Thinking Process	None (9 Students)		Shallow (10 Students)		Deep (20 Students)		Total (39 Students)	
	N	%	N	%	N	%	N	%
Empathize	1	9.09	9	27.27	16	16.67	26	18.57
Define	3	27.27	6	18.18	15	15.63	24	17.14
Ideate	7	63.64	11	33.33	19	19.79	37	26.43
Prototype	0	0	3	9.09	22	22.92	25	17.86
Test	0	0	2	6.06	21	21.88	23	16.43
Plan	0	0	2	6.06	2	2.08	4	2.86
Reflect	0	0	0	0	1	1.04	1	0.71
Total	11	100	33	100	96	100	140	100

No. of students who submitted vlogs = 39

The nine students who did not mention their characters in vlog 1 tend to jump right into Ideation where they extracted literal ideas from their research. For example, Student 8 shared that:

Ayutthaya is the ancient capital in Siamese Kingdom. It was strategically located on an island surrounded by three rivers connecting the city to the sea, so it was a good trading point for the traders. [The treasure found is] the hand-weave fabric for trade...

The ten students who had shallow identification made more attempts to Empathize, Define, and Ideate. For example, Student 9 shared:

I decided to blog on the symbology and features of the Ayutthaya temples. I read up on chedi (a Buddhist stupa) and why it is bell-shaped? (Define). It was interesting. It is so old and so much history behind it…. It is important to us because this is our past (Empathy). I found out that chedi is inspired by Hindu, I mean from India. I am interested in reading up architecture as it explains the culture and traditions, [for example], temples as a record of who and what they are, and how they are before (Ideate).

In comparison, the students who had deep character identification had a more holistic design approach. For example, Student 10 explained the 'powers' that helped her to move from Ideation to the stages of Prototype and Test. As she designed the blog post of her research presentation, she drew upon the 'power' of 'sensitive' in her role as Project Manager. She prototyped her solution by being sensitive "towards how readers are reading my blog post." She prototyped her blog design with "clear subtitles and pictures to engage them to make reading more enjoyable." She also tested her prototype by drawing inspiration from the power of "pursing goals." The achievement of her "goal in mind to save Ayutthaya" became her way of testing if she has made a "good blog" that could pitch her ideas well to her team.

Some students with deep character identification also explained how they drew upon their characters to Plan their design processes with their team. For example, Student 11 said, "The 'powers' are leading team, organizing... I hope to be useful to the team and organize things for the team to get better. ... I tried to manage my research on what to do first."

Design behaviour for vlog2

Analysis of results from table 5 shows that the general trend of students' design behaviours was largely consistent with those reported during vlog 1 when they reflected about their design conceptualization processes in vlog 2. However, there was more evidence of engagement in Reflection.

Table 5. Design thinking process in vlog 2

Design Thinking Process	None (11 Students)		Shallow (5 Students)		Deep (19 Students)		Total (35 Students)	
	N	%	N	%	N	%	N	%
Empathize	7	24.14	3	15.79	12	14.81	22	17.05
Define	7	24.14	5	26.32	14	17.28	26	20.16
Ideate	13	44.83	5	26.32	19	23.46	37	28.68
Prototype	0	0	4	21.05	12	14.81	16	12.40
Test	0	0	2	10.53	19	23.46	21	16.28
Plan	0	0	0	0	0	0	0	0
Reflect	2	6.90	0	0	5	6.17	7	5.43
Total	29	100	19	100	81	100	129	100

No. of students who submitted vlogs = 35

As students worked on their design conceptualization, those who did not draw upon character identification still focused on Ideation but also made attempts to Empathize and Define. Referring to the issue where many did not know Ayutthaya's traditional foods, Student 12 defined their group's proposition for promoting Ayutthaya through a food recipe app for foreigners at Ayutthaya to "feel at home even at foreign country." The team empathized with the fact that foreigners would desire to "cook their home food and able to taste international food" while at Ayutthaya and their idea was for their app to "provide recipes from all round the world and sent the ingredients to their doorstep which they ordered from us."

Some students with shallow character identification made attempts to Test and Prototype. For example, Student 7 reflected how she created the design sketches that were shared with her team-mates and the lecturers for feedback:

I use my roles as Artist and Designer to make new sticker design. I also design tote bag. This is the sketch (showing her sketch of tote bag), this is the colour sketch (showing her colour sketch), and this is the final design (show her final sketch of used water bottles collage into a whale). This week, I used my 'power' of creativity to create the sticker and [tote bag] designs.

In comparison, Student 13 who had deep identification Defined why his team chose to produce a game app to spread knowledge about Ayutthaya through Empathizing with the need of people to have fun because, "for us, we want to bring card game and recipe together because the problem is that many do not know the treasures in Ayutthaya. You can have fun playing the card game and gain knowledge at the same time." Drawing upon his role as Product Designer with the 'powers' of 'focus', 'one-of-a-kind' and 'friendly', he took initiative to develop a prototype of the card game concept in Adobe XD that was tested with his team-mates. The positive reception from his team-mates affirmed his efforts to manifest his 'powers', "because I tried my best to being one-of-a-kind to bring the best of me to everyone around me." He also reflected on the positive effects of drawing upon his "power" where, "I really enjoy doing this kind of card game because it gives me a positive aura …"

Research question 3 – students' design performance by character identification

Stepwise regression found that only a deep level identification in vlog 2 significantly predicted project score which explained 42% of the model variance (See Table 6).

Table 6. Stepwise regression model

Model	Predictors	B	Std. Error	Beta	Significance	Adjusted R2
1	(Constant)	71.25	1.26		***	.42
	Vlog2_Deep	8.60	1.73	.66	***	

*** p<0.0001

Discussion

These findings reveal the following about using character identification in educational contexts:

Character identification process

Bandura (1969) asserts that students could pattern their characters' actions through active identification that have resultant behaviours in real-life. The results show that the use of character-based learning quests has been effective in motivating some form of character identification among majority of the students and this is in line with studies of game players' identification with game characters (Ducheneaut et al., 2009; Klimmt et al., 2009; Yee et al., 2009; Yee & Bailenson, 2007). The study results also reveal that the level of students' character identification may not remain constant and there was slightly less than

half of the students shifted their identification according to congruence between their character attributes and the design task. As compared to the results of character identification study from Bachen et al. (2016), this shows that the development of character identification in educational contexts cannot be assumed as the kinds of learning tasks and how students align themselves professionally with their characters can influence the level of their character identification (Hoeken et al., 2016).

Character identification influences design behaviour

Character identification can help students to translate character behaviours into professional practice (Barnett & Coulson, 2010). The study results show that students' professional behaviours could vary according to the extent of their character identification. Analysis of students' vlogs reveal that when they did not establish character identification, they focused on creating design ideas with little problematization, which is typical of novice designers (Lawson, 1997). With shallow identification, students were able to draw upon some desirable character attributes to support design problematization through applying Empathize and Define of the design thinking process. Deep identification appears to encourage positive action as students sought to translate character attributions into action. Like good designers who spend more time developing artefacts and exploring ideas (Lawson, 1997), these students were more able to move their ideas forward by making Prototypes to Test their ideas as part of design thinking.

Character identification influences design performance

Several studies have indicated that character identification enhanced learning performance (Bachen et al., 2016; Cohen, 2006; Kao & Harrell, 2018; Oksanen et al., 2013). However, the study results suggest that these relationships are not straightforward in the context of design learning. The regression analysis suggests that design performance is determined by how students engage character identification for different design tasks. It appears that character identification during design research does not predict design performance whereas only deep identification predicts design performance during design conceptualization. This could be because design conceptualization has more direct linkages with students' project deliverable whereas deep identification supports students to engage in more comprehensive design behaviours. The combination of these factors in turn improves their design performance. These findings support and build upon existing evidence of the previous research on character identification whereby students must identify their own identity and personality with similar roles and attributes of the character to order achieve deep identification. Furthermore, this study affirmed that imagination (Kusuma et al., 2018; Bal, 2019) is needed for gamification which leverages on game design elements to create engagement and imagination (Kapp, 2012). This can be hypothesized that imagination is needed to assume deep identification (Cohen, 2006).

Implications for higher education

The findings of this study suggest the following implications for the adoption of character identification as a strategy for higher education learning and application into educational technology.

Design characters to support professional identification

Character identification can be used as a gamification strategy to help students identify professional roles and identities. The study findings suggest that in order to foster professional learning, game characters need to be designed in ways that are not only identifiable to the personality traits of students (Hoffner & Buchanan, 2005) but also relatable to their professional roles (Bandura, 1986; Klimmt et al., 2009). These kinds of relatedness help students to develop interest in learning (Bachen et al., 2012) as well as deeper understanding and identification with their professional roles.

Create imagination with character attributes

Cohen (2001) suggests that the intensity of character identification is highly dependent upon one's capacity for imagination. He defined identification as an imaginative process through which one assumes the identity, goals, and perspective of a character (Cohen, 2006, p. 261). Through gamification, the students can attach, project and experiment with the characters. Getting "into" the character did not appear challenging as slightly more than half of the students were able to develop deep identification even from the first design task. For these students, character identification served as a creative stimulus for their design thinking. However, there is also another half of the students who were not able to connect their character attributes to the design tasks. These results suggest that students' capacity for imagination cannot be assumed. When designing lessons with character identification, strategies to help students customize and fantasize (Van Looy et al., 2012) ways to exploit characters in professional thinking need to be considered.

Discover students' identity and talent

Talent is one's self-perceptions of one's goals, interests and talents in one's career (Ibarra, 1999). Ricoeur (1992) believes that character, personality and identity coincide. The study results show that character identification helped students to articulate and activate positive attributes that can be a way of helping them to discover their identity (Martin & Tyler, 2017), thus, forming their talents. The ability to form deep identification with characters gives students direction and confidence to enact character attributes through their design work. This in turn improved design performance as students did not learn and design blindly but were consciously rationalizing their design thinking. Character identification can be used to trigger talent awareness among higher education students, giving them direction to exhibit their talents in their learning projects. It can also help lecturers to understand students' profiles and aspirations and provide better individualized support.

Develop characters into gamification educational technology

Character identification can be designed into character-based gamification educational technology and learning environments such as mobile and desktop apps and Massive Open Online Courses (MOOC). Students can easily identify and continue develop their professional roles and talents throughout their

studies with these platforms. Lecturers can also easily access students' profiles to better guide students with their projects.

Limitations and Future Research

There are several limitations in this study that could constitute areas for future improvement and research. Firstly, the study examined students' one-time selection of roles and 'powers' of the characters at a point in time whereas their desired roles and characters may change over time (Bialystok, 2009). While some insights on students' character identification shifts have been uncovered in the study, further study into the factors and reasons for identification shifts are needed. Secondly, the study examined students' reflections and self-described design processes. In future studies, student interviews could be carried out to further probe why they identified with characters and the character design elements that supported their identification. Thirdly, the study did not consider in team-based contexts even though the module did require teamwork among students to complete a project. Future studies could investigate the effects of teamwork on character identification as well as how game elements shape character identification. Finally, this study focused on design and media students. The applicability of the findings to other fields of study in higher education can be further examined.

Conclusion

In this study, there is evidence that character identification can influence the learning processes and learning performance of design and media students. Character identification seems to be an important yet overlooked component in gamification design. The types, levels and shifts of identification are factors that need further consideration for better character identification experiences and effectiveness in educational gamification.

Declarations

Compliance with Ethical Standards

Disclosure of potential conflicts of interest:

The authors have no relevant financial or non-financial interests to disclose.

The authors have no conflicts of interest to declare that are relevant to the content of this article.

All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

The authors have no financial or proprietary interests in any material discussed in this article.

Research involving human participants and/or animals:

The questionnaire and methodology for this study was approved by the Research Evaluation Panel of Nanyang Academy of Fine Arts (Ethics approval number: REP-190805-005DM)

Informed consent:

Informed consent was obtained from all individual participants of the study and archived at the Research Evaluation Panel of Nanyang Academy of Fine Arts.

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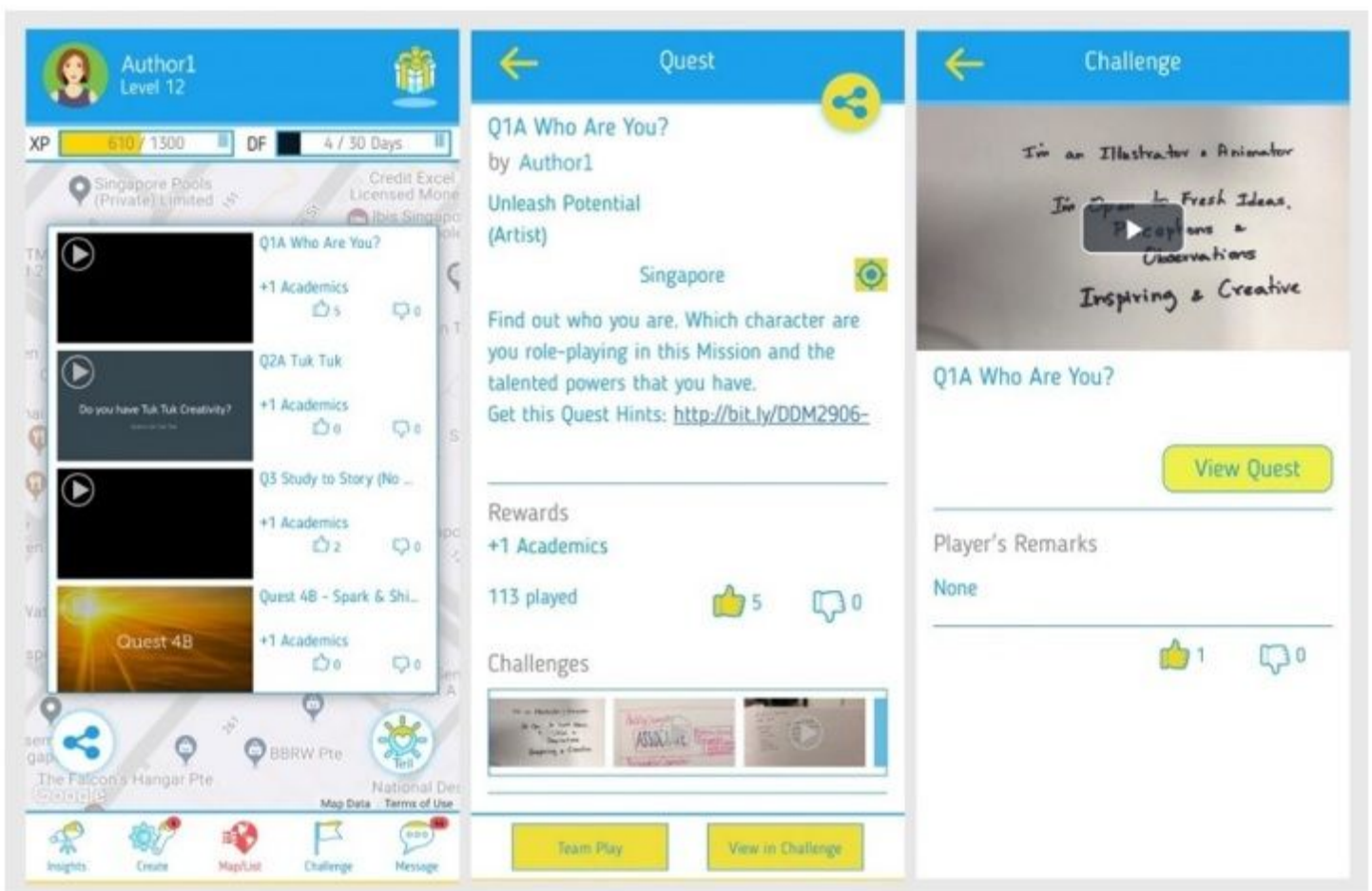
Figures

Figure 1

Learning quests and students' quest challenges – Created and submitted using a gamification learning mobile app

Figure 2

The 20 characters - Each having its own set of roles and "powers" that students can choose

Figure 3

Associate-Intellectual characters - A student's chosen characters, roles and "powers"