

School of Digital Wizards: Exploring the Gamification User Types in a Blended IT Course

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Abstract— In this Research to Practice Work-in-Progress paper, we explore gamification user types and related motivation factors through a gamified learning platform used in an Information Technology (IT) course. With the advent and increasing usage of self-hosted online learning platforms like Moodle, universities need innovative ways to engage students to make learning tasks interesting, personally relevant and, hence, motivating. Gamification or “use of game elements” in education is one such innovation that has been found to support motivation and completion of tasks in a timely manner. However, research reveals the increasing need to differentiate game experiences by personalizing game designs for different player typologies or “user types” based on different motivational orientations. This study is based on experiences of students in an IT course in education, where the learning platform in Moodle was modified by implementing certain game elements such as narratives, avatar development and thematic badges. Data were collected through online questionnaires filled by student teachers, which aimed at identifying their predominant gamification user-types using an instrument based on the Hexad Player Type framework for gamification design. Based on the information gathered from these questionnaires, the course material was designed to better fit the characteristics of the major user types, and relevant recommendations were provided to the students for approaching the course material. The results show the predominant gamification user types in this group of students to be Philanthropist (motivated by purpose) and Socializer (motivated by relatedness). Similarities and differences of the predominant user types in this group are discussed in relation to different participant groups from similar studies carried out in different contexts. The study calls for further investigation of purpose and relatability as motivation factors when designing IT-related courses for students in education. Collectively, these results could be used to inform the design of online and blended learning platforms to improve the interest, engagement and motivation of learners.

Keywords—gamification, user-types higher education, teacher education, blended learning

I. INTRODUCTION

Most higher education institutions at present make use of one or another Learning Management System (LMS) to support student learning and improve organizational support. With an increasing use of self-hosted online learning platforms like Moodle, universities need innovative ways to engage students in order to make learning tasks interesting, personally relevant, and motivating. Most LMSs offer little personalization and maintain a standard design, even if there is an attempt to use innovative approaches to engage learners.

Gamification is defined as the “use of game design elements in non-game contexts”, or the introduction of “gameful designs” [1]. When used as an approach to learning, gamification has shown to improve learner engagement by increasing motivation, generating interest, presenting the material in a different way, creating opportunities for collaboration, increasing self-efficacy, imparting a sense of control, and promoting learning by doing [2, 3]. It has also been found to support completion of learning tasks in a timely manner [4, 5]. The gamification approach in learning draws from various theories in learning and motivation such as Self-Determination Theory (SDT) [15], the four-phase model of interest development [25] as well as self-regulated learning [26]. However, mere gamification does not guarantee success in improvement of learning. An effective approach to game design that is in-line with principles of game theory [26], in addition to those of learning and motivation, is needed to achieve desirable outcomes. In the context of online learning, according to [6], a clear purpose for gamification is important, as well as being aware of the challenges due to differences in motivational orientations of students. In other words, certain game design elements that motivate one person might be counterproductive for another [7,8]. Personalization of gamified experiences using the player type or user type models is an effective way to tackle this challenge [6].

In this paper, we show the predominance of some user types over others in a sample of bachelor's and master's students who were participants in a course on Information Technology (IT) in Education through the identification of predominant user types in the whole group as well as the prime user type of each participant. The differences in predominant user types based on gender are also presented. We discuss the similarities and differences of these results by comparing them with similar studies carried out in different contexts with different participant groups. This study contributes to the work of educators and researchers who intend to develop personalized gameful learning platforms within IT as well as other study disciplines for university students, especially in education.

II. LITERATURE REVIEW

A. Research on Gamification within and beyond Teacher Education

An increasing research trend in gamification is evident in the prevalence of various studies conducted in different contexts with a variety of participants including a mixed group

of university students [8,12,14], users of specific game platforms [7,19], as well as randomly recruited participants from online/social media platforms [12,18] (results from these studies are discussed later in section V Discussion). Although the number of studies on interaction of student teachers with gamified learning experiences is limited [9], there seems to be increasing interest in the use of gamified learning in higher education in general as well as pre-service teacher education. Slamet et al. [9] reported that student teachers found a gamified platform adaptive, helpful and engaging. In a similar study focused on Wikis, student teachers had positive attitudes towards gamification, believing that it could positively impact the academic success of these future teachers as well as their students [10]. However, [10] did not notice any long-term impact of engaging student teachers with gamified learning platforms and suggests changing the gamification design to make it more collaborative and/or personalized. In yet another study [11] on the use of gamification as a teaching strategy as a part of a teacher education program, the authors related the mechanisms of gamification to the learning styles of individual learners. They found the adaptation of the gamified teaching/learning platform to individual learning styles of participants was a successful strategy in increasing motivation and engagement of the trainee teachers.

B. Personalized Gameful Designs and User Types

Personalizing gameful designs require the designers to understand the specific traits of learner personalities with respect to their motivation factors, i.e., designers need to understand individual users in terms of what motivates them to learn as well as to play. Multiple attempts towards classification of gamification user types have been made including Drachen et al. [7] who divided players according to customer behavior, Bartle's player types [27] based on player behavior in MUDs (Multi-User Dungeons) and the seemingly more promising Brain Hex model [14] that was found applicable in game contexts. However, none of these user type models have established their relevance in gameful contexts. Several large-scale studies [6,12] found the Hexad model [13] of user types for gamified learning, to be more suitable for personalization of gameful systems than other user type models that were limited in their scope and applicability. Tondello, Mora, Marczewski & Nacke [14], having demonstrated the structural validity of the Gamification User Type Hexad Scale through three large-scale survey studies in different languages, recommend the use of the Hexad user type survey to explore player typologies and develop personalized gameful designs for learning. The Hexad model is based on Self-determination Theory (SDT) [15] and dwells on factors that internalize motivation for different individuals. The user types in the Hexad framework take into account 'meaning' in addition to autonomy, competence and relatability as essential pre-requisites to motivation. They are also based on research on player types and practical design experience [12]. The Hexad framework lists six user types based on different motivational aspects [12]:

- Philanthropists — motivated by purpose
- Socializers — motivated by relatability
- Free spirits — motivated by autonomy
- Achievers — motivated by competence
- Players — motivated by rewards
- Disruptors — motivated by change

In the same paper, [12] point to overlaps between the user types, however, they can be significantly differentiated despite the overlaps. Individuals are motivated by multiple factors to differing degrees, so the categorization does not imply an exclusive motivation factor for one person [12].

III. METHODOLOGY

A. Research Context and Participants

This study analyses and presents results from two pilots involving a total of 130 teacher education students, with 76 first-year bachelor level students in Pilot 1 and 54 master's students in Pilot 2. We carried out both the pilots in the context of a course on IT in Education. In both pilots, this course was designed with a blended learning method that included both face-to-face sessions and tasks that students were expected to complete on Moodle 3.6. The overall structure of the course consisted of ten demo sessions with different topics of focus for each session (e.g., using Google tools, word processing, introduction to programming, information security). Each demo session included a teacher briefing, practice and an online student task.

We introduced three gamification elements on the platform with using tools available on Moodle:

- 1) A **narrative** whose theme was also reflected in the visual appearance of the platform to encourage immersion
- 2) A **digital avatar** that progressed from one level to the next as the student progressed in their tasks to encourage immersion as well as visualize progress
- 3) An award of **badges** when a student completed a non-compulsory task to meet the preferences of achievement-oriented user types

B. Participant Demographics

We collected information on the demographics and gaming background of the participants. Data on gender, age and frequency of playing digital games are shown in Table I. A majority (83%) of participants were women, 70.8% participants belonged to the age group 20-24 and most participants played digital games either weekly (20%), monthly (27.7%) or a few times in a year (26.9%).

TABLE I. BACKGROUND DATA ABOUT THE PARTICIPANTS

Demographic attribute	Number of participants	Percentage
Gender		
Male	19	14.6%
Female	109	83%
No information	2	1.5%
Age Range		
<20	13	10%
20-24	92	70.8%
25-30	17	13.8%
>30	8	6.1%
Frequency of playing digital games		
Daily/almost daily	21	16.2%
Weekly	26	20.0%
Monthly	36	27.7%
Few times a year	35	26.9%
Never/ almost never	12	9.2%

C. Data Collection and Analysis

In both pilots, we collected data using an online questionnaire which gathered information about age, gender, frequency of playing digital games, familiarity with online learning platforms, expectations regarding the use of online learning platforms, participants' preferences of fun game features as well as their motivation factors in study activities. Demographic information of the participants was considered important to relate the findings to any peculiarities relating to age, gender or background in gaming. In addition to these, the questionnaire included a user-type identification instrument, consisting of 24 statements (4 statements per user type) to which the participants answered on a seven-point Likert scale, ranging from 'strongly agree' to 'strongly disagree'. Each participant, then, could score anywhere between 4 to 28 for each of the user types. Cronbach's alpha for the instrument (24 items) was calculated to be 0.80, ensuring good reliability.

We performed a statistical analysis using SPSS 27 to examine the user types amongst the participants. The score of a participant for one user type was calculated out of 28. Two kinds of results were deduced from these scores: the prime user type of each participant as well as the predominant user type/s amongst all participants. The prime user type of a participant was determined by looking at the user type where a participant scored the highest. To report predominant user types in the group, a mean of sums of scores of all participants for a particular user type was calculated.

IV. RESULTS

A. Overall Distribution of User-Types

Table II presents the predominant user types, i.e., the mean scores of all participants for each user type (min=4, max=28) along with their standard deviations. The mean score of each user type indicates the degree or extent to which the participants show traits of that user type as gamers. Philanthropist and Socialiser user types were found to have high mean scores, followed by Free spirit, Achiever and Player user types respectively. Disruptor type scored significantly lower than all other user types.

We also determined the prime user types for each participant, i.e., the type in which a participant achieved the highest score. As shown in Table II, the most common user types as prime user types among student teachers were found to be Socializer and Philanthropist, whereas Free spirit, Achiever and Player were less common as prime user types.

TABLE II. DISTRIBUTION OF USER TYPES AMONGST PARTICIPANTS

User Type	Predominant User Types		Prime User Types
	Mean score	SD	No. of participants who had the highest score in the user type (N=130) ^{ab}
Philanthropist	24.4	2.11	75
Socializer	24.3	3.03	61
Free Spirit	22.2	2.9	18
Achiever	21.2	3.01	6
Player	20.8	2.78	4
Disruptor	13.6	3.36	0

a. 1 participant did not respond to questions related to Philanthropist, Free Spirit and Achiever user types and 4 participants did not respond to questions related to Disruptor user type

b. Note that the total number of participants in the last column of Table II is not equal to 130 because there were participants who were assigned more than one prime user type, i.e., they had the same highest score for more than one user type.

Although a few participants had high scores on the Disruptor user type, however, it was not present as the prime user type for any participant, i.e., no one scored the highest on Disruptor user type.

B. Genderwise Distribution of User Types

Since the sum variables of user types were not normally distributed, a Mann-Whitney U-test was carried out to test the difference between the predominant user types between men and women [20]. The test indicated that Player, Achiever and Disruptor user types were significantly more predominant in men than in women (see Table III), whereas there was no statistically significant difference found between men and women in the predominance of Socializer, Philanthropist, and Free Spirit. Effect sizes were only calculated for gender differences in the user types where the results were statistically significant ($p < 0.05$), i.e., Achiever, Player and Disruptor. Using Cohen's criteria¹ [21], we found a small to medium effect size for gender differences in all three user types. The results in Table III should be interpreted with caution since there are other factors at play when calculating these differences in predominance of user types by gender, such as age, frequency of playing digital games, the conclusions drawn here might have other hidden factors at play that were not controlled while calculating these results.

TABLE III. MANN-WHITNEY U-TEST FOR DISTRIBUTION OF USER TYPES BETWEEN GENDER

User Type	Median		Z	Effect size (r)	p value
	Male ^c (N=19)	Female ^c (N=109)			
Philanthropist	24.00	25.00	-.270	-	.164
Socializer	26.00	24.00	-1.213	-	.787
Free Spirit	21.00	22.00	-1.392	-	.225
Achiever	23.00	21.00	-2.428	0.215	.015
Player	22.00	20.00	-2.584	0.229	.010
Disruptor	16.00	13.00	-3.320	0.294	.001

^c Only two genders were considered in this analysis, e., male and female, since the number of responses for other genders in the data were negligible

¹ For Cohen's (1988) criteria,
0.1: small effect, 0.3: medium effect >0.5: large effect

V. DISCUSSION

This initial study has shed light on the potential of gamification as a part of curriculum design and implementation in education programs applying IT. The results are consistent with SDT as they highlight relatedness (a motivating factor for Socializers) and autonomy (a motivating factor for Free Spirits) as requirements for intrinsic motivation. SDT also suggests that meaning/purpose (a motivation factor for Philanthropists) leads to internalized regulation of externally important tasks. In all the studies based on Hexad user types including the present study, scores on Disruption have been the lowest, which could possibly suggest that motivation for change is less prevalent [14]. The findings are also in line with [14], who found evidence for a stronger correlation between Philanthropist and Socializer user types, suggesting that people who are motivated by philanthropy are also likely to be motivated by socialization to a certain extent. Tondello et al. [12], in their study with a sample of graduate and undergraduate students from Canada, also found Philanthropist to be the most common user type followed by Achiever, Free Spirit, Player, Socializer and Disruptor respectively. Similarly, in other studies that used the Hexad scale to show the distribution of user types in their sample [14,16], Free Spirit, Achiever and Philanthropist were the highest scoring user types. When compared to this study, the only difference from the aforementioned studies is the comparatively higher prevalence of the Socializer user type. Moreover, the student teachers' sample in this study has much lower scores for the Disruptor user type. These comparisons point to the student teachers' inclination towards socialization as well as a respect for rules and structures. A significantly smaller proportion of the sample was found to have Achiever and Player as their prime user types as compared to 24 percent and 10 percent in Tondello et al.'s study [12], indicating that student teachers are motivated by purpose and relatability more than by competence and rewards [13].

In order to design effective learning experiences for student teachers through gamification, information about the overall distribution of user types is surely valuable but not sufficient, since existing research has shown a clear difference in the preferences of people of different genders and ages. Most game designs acknowledge the differences in gender, and some are even targeted for a particular gender [17]. In a study on undergraduate university students [17], it was found that women enjoy badges more than men. Another interesting study [18] found that men consider competition, collaboration and social pressure more relevant in games than women. The findings in this study are contrary to those of [17] and [18], in that the user type Achiever (motivated by progress) as well as Player (motivated by rewards) are both more predominant among males than females (Table III).

Tondello, Mora, Marczewski & Nacke [14] also investigated the distribution of user types by gender and found that women scored significantly higher on socializing as well as philanthropy and men scored high on disruption. Results on gender differences between Disruption scores in this study are in line with [14]. The study concluded that women tend to score higher on user types based on intrinsic motivators of purpose, relatedness, autonomy and competence. In a related finding in [19], from their research

on "demographic differences in perceived benefits from gamification", the authors revealed that women perceive the social aspects of games more positively than men, who value the social communities formed in the process of gaming less than women. Although these findings do not directly relate with the results of this study, the distinctly skewed male to female ratio (1:5.7) of the participants in this study is a possible influencing factor on the overall results.

VI. IMPLICATIONS, LIMITATIONS AND CONCLUSION

Identification of the preferred motivation factors based on identified user types amongst student teachers can have significant implications for learning design within teacher education. From a practical point of view, the results highlight the need to consider user types when designing courses on online learning platforms. The findings support the call for **online learning solutions with affordances that bring the social, collaborative and purposeful dimensions to the forefront** [22]. Game elements such as **teams, social networks, competition and social pressure** are preferred by Socializer user types. For Philanthropists, game designs that include **elements of meaning, caretaking, gifting, sharing** etc. have been recommended [13]. At a more practical level, we need a shift away from current educational technologies towards more flexible pedagogical solutions for social knowledge construction and intense engagement, for example, **the use of extended reality, such as social virtual reality, its immersive affordances tapping into the need for social presence** [23,24].

The aim of the study was to determine the distribution of user types in a selected sample of student teachers, so that learning designers and course instructors can take into account the gamification and motivation preferences of the user types predominant amongst student teachers, when designing gamified tasks. Although the participants in this study represent the interests of student teachers, the limited sample size makes the results difficult to generalize. There is also no fully integrated system of applying the user profiles to design learning platforms yet. Hence, it paves way to further develop this paper with follow-up work that can strengthen and validate the use of personalized gamified learning platforms based on user-types, by re-designing the learning platform based on the results of this study to assess any changes in the achievement of desired learning outcomes. Moreover, this study brings out the need of further research on exploring the potential of gamification focusing on Socializer and Philanthropist user types as well as investigating purpose and relatability as motivation factors in course designs for student teachers. And lastly, we also intend to explore and enhance our understanding of appropriate game elements and motivation factors related to the identified user types of the participating student teachers.

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