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Gamification Based on User Types: When and Where It Is Worth Applying

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Abstract: Students' motivation is one of the most relevant factors when improving the quality of the learning process. In this context, gamification is a powerful tool for increasing motivation at all levels of teaching. Since gamification methodologies can be applied in many different ways, personalizing gamified activities as a function of gamification user types is a promising strategy. Knowing the user types is also an advantage to understand the nature of learners in the class. In this article, we present the findings from several pilot exercises, where we identified gamification user types among students from Spain and Finland, analyzing their prevalence as a function of age, gender, country, and field of study. We also designed a gamification experience where activities were designed to fit the preferences of different user types. From these pilot experiences, we found that gamification user types are only relevant when other variables, such as the difficulty of the tasks or the presence of students who do not work well in groups, are not present. Based on our findings, we conclude that distance learning and subjects where previous knowledge is not present are good choices when gamifying a subject.

Keywords: gamification; higher education; user types

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1. Introduction

Learning management systems (LMSs) are widely used by higher-education institutions to support student learning and improve organizational support. The COVID-19 pandemic dramatically increased the presence of distance learning in 2020, thereby increasing the use of self-hosted online learning platforms such as Moodle [1]. In this scenario, universities need innovative ways to engage students to make learning tasks interesting, personally relevant, and motivating. Nowadays, however, many LMSs offer little personalization and keep a standard design.

Gamification [2] applied to e-learning can increase motivation, interest, collaboration, and self-efficacy, among others [3,4]. It can also help users to finish learning tasks on time [5,6]. Gamification is related to self-determination theory (SDT) [7], the four-phase model of interest development [8], and self-regulated learning [9]. However, effective gamification often implies effective game design, game theory, and motivation [9]. In online learning [10], clear objectives and challenges are essential. Not all game design elements are suitable for everyone [11,12]. For this reason, player types or user type models are used [10].

This paper builds on the work presented in [13], where the frequency of different gamification user types among preservice teachers in a Finnish university is analyzed. However, there is a new dataset.

In this paper, we first analyze the frequency of different gamification user types [14] over others in a sample of bachelor's and master's students from two universities in Spain and Finland. Learning the user types in a class is a benefit for two reasons: First, we can adapt activities to their profiles. Second, it is interesting in the way of having a better understanding of the nature of learners in the group. In our pilot experiments, students participate in a course on Information Technology (IT) in Education (in Finland), a course on Aeronautics Management (Spain), and, finally (also in Spain), a course on Tourism. We analyze the different user types as a function of their nationality, gender, and studies as the main factors. This first study contributes to the work of educators and researchers who intend to develop personalized gameful learning platforms.

Secondly, we designed a pilot experience applied in Aeronautics Management and Tourism to evaluate the effect of gamifying the courses with activities designed to target different gamification user types. We analyze the results and propose the best scenarios where these activities can be more effective. The knowledge about "where" and "when" will be very useful for teachers to manage their effort when preparing the course and to design the most appropriate activities for students in all stages of their studies.

This article is structured as follows:

Section 2 describes the context of this work;
Section 3 explains the materials and methods used in the study;
Section 4 presents the results from the pilot experiences with real students;
Section 5 discusses the results;
Section 6 details the conclusions and future work.

2. Context

Gamification is extending nowadays, reaching many participants such as university students [12,14,15], users of specific game platforms [11,16], and also randomly recruited participants from online/social media platforms [15,17]. There are some success stories of gamification, such as [18,19]. However, some drawbacks exist, such as not having a long-term impact [19]. In these cases, a solution is to apply collaboration and personalization. Other studies, such as [20], suggest that gamification to the learning styles is similar to those of individual learners.

Several studies tackle the classification of gamification user types, such as Drachen et al. [11], who focus on customer behavior, Bartle's player types [21] based on player behavior in MUDs (multi-user dungeons), and the Brain Hex model [15]. However, none of them is relevant in gameful contexts. Several large-scale studies [10,12] found the Hexad model [22] of user types for gamified learning to be more appropriate for the personalization of gameful systems than other user type models that were limited in their scope and applicability. The Hexad framework lists six user types based on different motivational aspects, which are not exclusive [14]:

- 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;

3. Materials and Methods

This study analyzes and presents results from two pilots. The first one involved 254 students from Universidad Autónoma de Madrid in Spain. The other one involved 130 students from the University of Jyväskylä in Finland.

The pilot from Spain related to gamification involved 67 students from the Aeronautics Management grade (second year) and 42 students from Tourism grade (fourth year).

Courses were designed with a blended learning method that includes face-to-face sessions combining theoretical contents and computer-assisted activities. Tasks that students are expected to complete at home are gamified and always follow a system of weekly goals that students can finish voluntarily.

The pilot from Finland included 130 students from teacher education grade, with 76 first-year bachelor-level students and 54 master's students. These two pilots were carried out within a course on IT in Education context. In both cases, it was designed with a blended learning methodology that included face-to-face sessions and tasks that students completed on Moodle. The general structure of the course included ten demo sessions with different topics for each session (using Google tools, word processing, introduction to programming, and information security, among others). Each session included a teacher initial briefing, practice, and online student tasks.

The pilot experience performed in Spain had the objective of analyzing the influence of the user types in the priority of students when choosing different gamified tasks. For that reason, we did not base our designs on user types. Instead, we designed activities that could fit with different user types with the objective of giving students the opportunity of selecting by themselves the activities that they wanted the most. In other words, instead of designing some activities directly related to the user types identified as predominant among our students, we designed a larger amount of activities with different designs and gave the students the chance to choose between them. In doing so, we can demonstrate that different user types prefer different kinds of activities.

For this experience, every week of the semester, students had the opportunity of finishing two goals from a pool of three. These three goals can be included in one of the following categories:

(1) **Working in groups.** From the beginning of the course, students are divided into groups of 3–4 students. Tasks in this category must be solved by the group, and a reward is given to all of them (if they perform it correctly) or none of them (if they do not finish it well). Due to their collaborative nature, these tasks are expected to be chosen more often by philanthropists and socializers.

(2) **Individual tasks.** These tasks must be performed individually and only depend on the student themself, without any influence of their coursemates. In other words, there is nothing that others can do to improve or alter the result. These tasks are expected to be chosen more often by free spirits and achievers, as they emphasize independent challenge.

(3) **Competitive tasks.** These tasks are also performed individually, but they are related to the overall result of the class. For example, these goals can only be achieved by the best 50% of the students. In this case, other students have a strong influence on the chances of reaching these goals. These tasks are expected to be chosen more often by players and disruptors, as they relate to competition and include an element of uncertainty stemming from others' results. It is worth noting that disruptors may not be adequate for any kind of task since their nature is more destructive than creative in gaming contexts.

At the end of the semester, students will receive prizes for completing several goals. If students achieve 33% of their goals, they will receive 30 extra minutes in the final exam. If they complete 66%, they receive the opportunity of changing one question in the final exam. Finally, if they reach 90%, their score will be rounded up from 4.5 to 5 (i.e., they will pass the course with any score over 4.5). The prizes do not imply any disadvantage for students who do not complete any of the goals because the course is designed to be perfectly balanced before any of these prizes. In other words, without the goal system, the subject would just be the same as any other previous year.

In all pilots, and for the analysis of gamification user types, which is the first part of this article, we collected data through an online questionnaire which included questions about age, gender, frequency of playing digital games, familiarity with online learning platforms, opinion about online learning platforms, preferences of characteristics of games,

and motivation factors when studying. This questionnaire was finished by the students before any gamification activity started in the course. At the beginning of the survey, the students were presented with information about the purpose of the study and the use of personal data, and they were asked to give informed consent. If they wished, students could allow their data to be used only for purposes related to course design and not as research data.

In the case of the pilots performed in Spain, we extended the application of the questionnaire to 254 students. However, only 67 and 42 students from Aeronautics Management and Tourism, respectively, participated in the gamification experience.

Demographic information, included in the questionnaire, is 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 system [15], consisting of 24 statements (four statements per user type) that would be answered on a seven-point Likert scale ranging from 'strongly agree' to 'strongly disagree'. Every participant can score any value between 4 to 28 for each user type. Cronbach's alpha (24 items) was calculated to be 0.80 (good reliability).

In our experiment, we worked with two different datasets from a Finnish and Spanish university, respectively. The demographic data of the participants of the study are shown in Table 1. The most relevant difference is gender, with 83% of female participants in Finland versus the more balanced 59.4% of female participants in Spain. This is mainly due to the kind of studies since all students from Finland came from Teacher Education, which is a field of studies that has a high percentage of female students in many countries (including Spain).

Table 1. Demographic data of the participants (N_Finland = 130, N_Spain = 254).

		Finland		Spain	
Attribute	**Category**	**Number of Participants**	**Percentage**	**Number of Participants**	**Percentage**
Gender	Male	19	14.6%	97	38.2%
	Female	109	83%	151	59.4%
	No information	2	1.5%	6	2.4%
Age	<20	13	10%	80	31.5%
	[20, 24]	92	70.8%	160	63.0%
	[25, 30]	17	13.8%	9	3.5%
	>30	8	6.1%	3	1.2%
Frequency of playing digital games	Daily/almost daily	21	16.2%	51	20.1%
	Weekly	26	20.0%	49	19.3%
	Monthly	36	27.7%	36	14.2%
	Few times a year	35	26.9%	53	20.9%
	Never/almost never	12	9.2%	64	25.2%

Before students face the first weekly goals, they must complete the user type survey to avoid any potential alteration of the results by students who start the gamified activities and perceive that they perform better in one task or others. In other words, we do not want the survey results to be influenced by the perception that our goals may give to the students about themselves. For example, a student could be starting many group goals under the pressure of their peers (as we will propose in the discussion section) and think that they are team-oriented in terms of their user type when they would actually prefer individual tasks.

The methodology described so far includes two stages: the first one, where analysis of user types is performed (including the whole dataset of students both from Finland

and Spain), and the second one, where students perform the gamification activities. There is, however, a third stage that includes a questionnaire and discussion with the students related to the facts that made them choose some activities even when these activities do not match their player type. In this case, we intensified with the students the appearance of the following reasons:

- **Difficulty:** I have chosen an activity because it was easier for me, even if this activity is not my favorite.
- **Social Pressure:** I have done group activities instead of individual tasks because the rest of my group wanted to do them.
- **Work done by others:** I actually did not work so much in group activities, but my partners did, and I was included even without working on it.
- **Forced:** I was forced to make individual tasks because my group did not want to do the group activities (my favorites)
- **Personal (Negative):** I usually work well in a group, but in this case, I had personal issues with some of them, and I did not want to collaborate.
- **Help Friends:** I wanted to help my friends and decided to do group activities to work with them.
- **Personal (Positive):** I am happy to work with somebody in my group for personal reasons.

4. Results

4.1. User Type Analysis

In Table 2, we can see the distribution of user types among participants of all the pilots, using different columns for different countries. As we can see, the absolute values of the factors that have an influence on user types give similar results in all the categories. However, a much higher number of students give maximum value to philanthropist and socializer user types in Finland. On the other side, we find a higher number of students from Spain with maximum category of free spirit, achiever, and player. The differences in the absolute values in all these categories, even being small, also point in that direction.

Table 2. Distribution of user types among participants (N_Finland = 130, N_Spain = 254).

Country	Finland (N = 130)			Spain (N = 254)		
User Type	Predominant User Types		Prime User Types	Predominant User Types		Prime User Types
	Mean Score	SD	No. of Participants Who Had the Highest Score in the User Type [a,b]	Mean Score	SD	No. of Participants Who Had the Highest Score in the User Type [b]
Philanthropist	24.4	2.11	75	22.7	3.2	53
Socializer	24.3	3.03	61	21.4	4.3	40
Free Spirit	22.2	2.9	18	23.3	2.7	70
Achiever	21.2	3.01	6	23.8	2.9	100
Player	20.8	2.78	4	23.4	3.1	94
Disruptor	13.6	3.36	0	15.8	4.6	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 the disruptor user type. [b] Note that the total number of participants in the last column of Table 2 is not equal to 130 (for Finland) or 254 (for Spain) 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.

In Table 3, we analyze the distribution of user types between genders in both countries. Effect sizes are only calculated for gender differences in the case of user types where results are statistically significant ($p < 0.05$), i.e., achiever, player, and disruptor in Finland and philanthropist, free spirit, and achiever in Spain. Using Cohen's criteria [23], we found a small–medium effect size for gender differences in all user types. Results in Table 3 must

be interpreted with caution since other factors at play when calculating these differences can appear in the predominance of user types by gender, for example, age or frequency when playing digital games. It is also very important in this case that the field of studies is different in Spain and Finland, with the female population percentage of our sample being much higher in Finland for that reason. This is a factor that cannot be controlled, and we cannot know if we are studying a sample that is not representative of the general population or if we are studying a very specific subsample with unique characteristics. For that reason, we believe that we cannot be sure if the differences by gender can be taken into account. We can conclude that the differences in user types found in Table 2 are only related to the kind of studies, in agreement with [13].

Table 3. Mann–Whitney U-test for distribution of user types between genders.

Country	Finland				Spain			
User Type	Median		Effect Size (r)	*p*-Value	Median		Effect Size (r)	*p*-Value
	Male [c] (N = 19)	Female [c] (N = 109)			Male [c] (N = 97)	Female [c] (N = 151)		
Philanthropist	24	25	-	0.164	22	23	0.279	0.016
Socializer	26	24	-	0.787	22	23	-	0.252
Free Spirit	21	22	-	0.225	23	24	0.215	0.046
Achiever	23	21	0.215	0.015	25	24	0.255	0.027
Player	22	20	0.229	0.010	23	24	-	0.157
Disruptor	16	13	0.294	0.001	16	15	-	0.092

[c] Only two genders were considered in this analysis, e.g., male and female, since the number of responses of other genders in the data was negligible.

4.2. Gamification Based on User Types

We found that students were highly motivated to finish the weekly goals (mainly due to the prizes). This first result implies that the weekly goals methodology worked very well and is highly recommended to improve students' continuous working. In Figure 1, we show the quartiles in pilots 1.1 and 1.2 (Aeronautics Management and Tourism, respectively). As we can see, the highest percentage of students are placed in the first and second quartiles. In both pilots, at least 70% of students are located in these two quartiles (70% for 1.1 and 76% for 1.2). In the case of pilot 1.2, 62% of students finished more than 75% of the goals (quartile 1). Moreover, in pilot 1.2, all the students finished more than 25% of their goals. In principle, we could think that the experience was better accepted for students in pilot 1.2. However, there are some circumstances in pilot 1.1 that imply that some students did not make use of the weekly goals system. In Aeronautics Management (1.1), students have the option of following a noncontinuous working path, which means that their final score in the subject will only be related to the final exam. Although this option is not preferred by the students, some of them choose it if they are not able to attend face-to-face classes (because of work, disease, etc.). This very small percentage of students justifies the presence of students in pilot 1.1 in the fourth quartile (<25% goals achieved).

In Table 4, we show all the Pearson coefficients for activities in group and individual tasks related to the six user types. The highest value corresponds to socializers and group goals (0.4). Although it seems reasonable that socializers enjoy these kinds of activities, the Pearson value, even in this case, is too low to suggest a strong association. We calculated Pearson coefficients between the six user type factors and the individual and group activities, and the highest value was r = 0.4, which is a weak (almost moderate) correlation, i.e., we could not find a single strong correlation between any user type and any kind of activity. From these results, we could conclude that the nature of the activity is not relevant for any kind of user or, at least, these are factors that are much less important than others.

Since we did not find clear evidence pointing to the user type as a significant factor for choosing specific activities, we also explored other explanations for students' preference

for certain activities. As shown in the methodology section, we identified seven potential reasons that could be important to the students and are not related to user types.

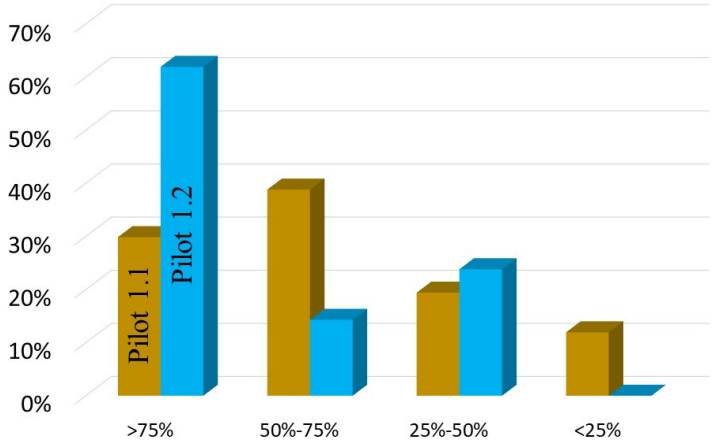

Figure 1. Percentage of students who finished the weekly goals. Results are divided into quartiles.

Table 4. Pearson coefficients for user types vs. kind of activities.

User Type	Group Goals	Individual Goals
Philanthropist	0.05	0.085
Socializer	0.4	0.34
Free Spirit	−0.3	−0.19
Achiever	−0.16	−0.14
Player	0.06	−0.07
Disruptor	−0.28	−0.38

Figure 2 presents the answers of the students when asked about the main reasons for choosing a task. As we can see, 86.8% of the students agree that the difficulty of the tasks was the most important factor when deciding to finish a task. Easier tasks were chosen more frequently than difficult ones regardless of their format. The second factor detected as very relevant (62.3% of the students) is the notion that some students did not contribute very much to group activities but were still included as coauthors. In this case, students did not have the opportunity of choosing one activity or another since their partners finished the tasks already, including them as coauthors. The rest of the options had some relevance for the students but were mentioned by fewer than 30% of the students, which implies that their influence may not be as relevant.

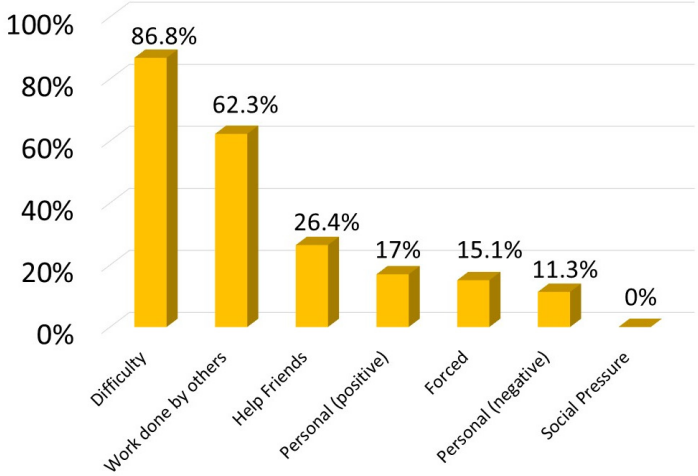

Figure 2. Percentage of students who considered relevant the 7 factors not related to user types.

5. Discussion

We found that gender is the only demographic attribute that differs in our pilots. We also found some significant differences in user types by gender. However, since the gender distribution differs in Finland and Spain, and the field of studies is different too, we cannot be sure if the gender differences in user type is directly related to the influence of the field of studies. The main reason for not being sure is that the differences found by gender correspond to different user types in Spain and Finland, where different fields of study are included. For that reason, we can conclude that the differences found in user types between pilots from Finland and Spain are mainly due to the field of study. We found that students who choose teacher education are more related to philanthropists and social behaviors, which is a reasonable argument. This fact is important because it demonstrates that the nature of the studies can be a relevant factor in selecting the nature of the gamification activities to include in a course. Based on our results, gender, age, or country are not relevant, which is important too, since it demonstrates that our results can be extended to a wider audience.

Regarding the gamification experience, the weak correlations found between the kinds of tasks and the kinds of players can be related to two concepts.

The first one is the presence of other variables that can have a strong influence on the motivation of students when facing a task, even stronger than the gamification user type. For example, students recognize that the perception of a task that can be easier to solve is the main factor in their selection. In other cases, some students find some individual tasks easier because they have specific knowledge about the contents.

Another factor that may contribute to the results and reduce the correlations between tasks and user types is the presence of students that would tend to work individually but their partners have a collaboration-oriented profile, and therefore they also ended up working in a group. In this case, the whole group works together, pushed by the students who enjoy the group task. The others accepted it because of social pressure.

These results are in line with the study of [24] that clusters these empirical effects of gamification into six areas: performance, motivation, engagement, attitude towards gamification, collaboration, and social awareness. They also align with the conclusions of [25], whose findings suggest the importance of gamification affecting only quantity and not intrinsic incentives, and [26], who show that tangible rewards can undermine intrinsic motivation.

All of these possibilities are included in the seven reasons shown before that are not related to the user type that were asked to the students. From their answers, we can see that the difficulty of the tasks is the most important factor. In the second position, we found that some students were included in the group activities without actually working.

Regarding teachers' method of action, the difficulty is a factor that can be modified and adapted in order to reduce differences. However, in the case of students who do not work in a group, little can be done in the design of the experiment. In this case, the solution is related to having better control of the work performed by the students. A specific division of subtasks within the group activity might be a way to solve it.

The second concept that justifies the weak correlations between the tasks and the user types is that we did not find profiles with a clear orientation. Instead, most of the students scored equally high in several user types. This means that many students do not have a clear orientation and they are more flexible in performing tasks that may not be their first choice.

The combination of these two concepts is enough to understand why the correlations found are weak; however, it does not mean that applying different gamification techniques adapted to user types is ineffective. The question is to define the environments where this effort is more efficient.

In general, the best scenarios to exploit the gamification user types will need to reduce the effect of other magnitudes such as the ones described before. Friendship, for example, is a key factor to working better in groups, and user types are likely to have a higher impact

in distance learning environments where students do not know each other as well as in face-to-face classes. In distance learning, students need to divide the work in a clear way, and those who do not collaborate are easier to detect. Moreover, students will declare more readily if a partner is not working because they do not know each other and there is no conflict of interest. Another relevant factor related to difficulty is their previous knowledge of some tasks, which could make them face an individual task if they feel confident with their knowledge even when they would enjoy group tasks more. Taking this into account, subjects where previous knowledge is not easier to achieve are a better choice to design tasks based on user types. For example, Computer Science is a subject where some students usually know some content by previous experience or self-learning. In this case, some students will choose tasks as a function of their ability instead of gamification user type. On the other hand, Quantum Physics would be an example where previous knowledge is not easy to find. In this case, we might find more students who select tasks only by their user type (since they do not have other criteria for selecting it). This is a factor to consider in the science of gamification together with other issues explained in [27].

6. Conclusions

In this article, we analyzed the user types as a function of several demographic categories and demonstrated the importance of knowing the user type for preparing gamified activities directly linked with different kind of users. We did not find any strong associations between a specific user type and either age, gender, or country. The only factor that can justify the differences found in our experiments is related to the field of studies, where preservice teachers showed higher values in the philanthropist and socializer categories. By comparing results from two different countries, Spain and Finland, we found that all the differences can be justified by the kind of studies as the main reason over the nationality, which implies that the results of this article can be applied in transnational programs.

We analyzed the kind of tasks that students prefer and we did not find a clear correlation with user types. In other words, there are other factors that are more relevant and not related, in principle, to their preferences based on their gamification user types. We identified two relevant factors: the difficulty of the tasks and the fact that some students are included in group activities without having worked on them. If we want to take advantage of user types to increase students' motivation by gamifying a subject, we must be careful first with these other factors that will be extremely relevant to the students when choosing an activity.

Based on our findings, we can conclude that distance learning and subjects without previous knowledge are the best scenarios to exploit gamification user types in order to increase students' motivation. This finding is in line with [28], who state that small rewards enhance autonomous motivation.

In addition, in these cases, the presence of other variables has little impact and it is easier to isolate the influence of user types.

In the future, extending this study to other degrees and subjects would be a relevant contribution in order to understand and detect the variables that have a higher influence on other scenarios. A study where the difficulty of the tasks is homogeneous will also be of great interest for checking if user types become more relevant. More research on the scenarios found in this article, such as distance learning, will also be important to demonstrate whether user types are more relevant there. Finally, another relevant contribution in the field would be expanding the study with other types of competitive activities, such as forum-type tasks where it would be necessary to help, criticize, debate, etc., in order to better assess the socializing and philanthropic component.

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