Empowering Students to Engage in the Design of COVID-19 Related Gamified Applications

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Abstract: COVID-19 related games have recently been developed to combat misinformation and raise awareness of COVID-19 protocols. COVID-19 related games or gamified apps were designed using top-down approaches (from company to players). The COVID-19 pandemic highlighted challenges in their uptake and usage. Strategies such as co-design may be leveraged to address these challenges, particularly for developing new technologies. This in-progress, exploratory mixed-methods study aimed to engage university students in designing gamified applications to address their needs amidst and post-pandemic. Its first step was to empower students to think of design ideas. The study's research questions were: What are students' goals for designing pandemic-related gamified apps? To what extent do students make use of gamification techniques in their design? A convenience sample of 20 third/fourth-year undergraduates expressed their ideas individually, in an online class, at a time of university closures (May 2021). A second sample of 37 first-year undergraduates engaged in the same activity in a face-to-face class (December 2021). The data were analyzed using a qualitative data analysis software. Thematic analysis was used, data were coded, and themes and sub-themes emerged. Qualitative analysis of all 57 students' responses revealed two main themes expressed by students as a goal for their app: a) increasing pandemic awareness and following hygiene protocols (24/57, 42.1%) and b) building resilience through different ways to cope with the pandemic, including physical exercise, social interaction, entertainment and education (31/57, 54.4%). Students maintained similar design goals for proposed apps despite increasingly less strict public-health measures from May to December 2021. The majority of students (52.6%, 30/57) used one to three gamification techniques, while 38.6% of them (22/57) did not use any. Third/fourth-year students used significantly more (t_{55}=4.65, p=0.000) gamification techniques (M=2.35, SD=1.31) compared to first-year students (M=0.81, SD=1.13). The first stage of this study showed value in involving students in the design of interventions that targeted themselves and revealed the need for training students who lack a design background in identifying relevant gamification techniques. Future research will aim to materialize students' suggested design ideas into design prototypes by involving them in the process through interdisciplinary collaborations.

Keywords: app design, gamification, design for social impact, gamified apps, COVID-19 pandemic

1. Introduction and literature review

COVID-19 related games have recently been developed for a broad audience, not necessarily targeting students. These games aimed to combat misinformation (e.g., GoViral) (Basol et al., 2021) and to raise awareness of COVID-19 protocols or address boredom during the pandemic lockdowns (e.g., Fauci's revenge, Survive COVID) (Balakrishnan, 2020). Recent COVID-19 related games have been designed using top-down approaches without having player voices/needs as the central design feature. The COVID-19 pandemic has highlighted shortcomings of existing technologies and challenges in their uptake and usage. Strategies such as co-design may be leveraged to address these challenges both in adapting existing technologies and developing new technologies (Cosco et al., 2021).

Recent studies showed the value of utilizing student-centered design, a participatory design methodology, in involving students in designing gamified apps that have them as a target audience as a way to address their needs (Nicolaidou et al., 2021; Nicolaidou et al., 2022). A few recent studies involved users in participatory design activities to design gamified apps or educational games (Cheng et al., 2018; Demirbas & Ogut, 2020; Literat et al., 2020). Different approaches were used, primarily based on participatory design workshops. For example, Literat et al. (2020) organized a full-day game design workshop, where 6 participants aged 10-14 brainstormed, developed, and play-tested educational games addressing news literacy (Literat et al., 2020). Cheng et al. (2018) conducted six participatory design workshops, each one of which lasted for 3 hours, with 40 participants aged 16 to 35 years in 3 different cities to identify the best way to present a gamified digital mental health intervention addressed to men (Cheng et al., 2018). These studies showed the potential of participatory game design to encourage and capture users' reflection, discussion, and participation around different topics.

The present in-progress, exploratory study aimed to engage university students in designing gamified applications to address their needs amidst and post-pandemic to examine a) their goals in these designs and b) their use of gamification techniques.

2. Methodology

2.1 Research questions

The research questions of the study were:

- RQ1: What are students' goals for designing pandemic-related gamified apps?
- RQ2: To what extent do students use gamification techniques in their design?

2.2 Sampling, participants, and context of the study

A convenience sample of 57 students in two cohorts (20 third/fourth-year undergraduates and 37 first-year undergraduates) from an EU public university participated in the study. In each cohort, the topic of gamified apps for social change was first introduced through a 3-hour meeting, which took place online at a time of university closures due to the COVID-19 pandemic for the first cohort (May 2021) and in a face-to-face class for the second cohort (December 2021). Students were asked to reflect on the following two questions:

- a) If you could design one gamified app for mobile phones to help people with any aspect of the COVID-19 pandemic, what would that be? Describe its potential goal and its potential users.
- b) Which gamification elements would you incorporate in the design of your app and why?

Students expressed their ideas individually as part of a second meeting that took place online for cohort 1 (n=20) and in a F2F meeting for cohort 2 (n=37).

2.3 Data collection and analysis

Students' responses were anonymized and input into a qualitative data analysis software (NVivo12). Thematic analysis was used, data were coded, and a total of three themes and ten sub-themes emerged. A quantitative data analysis software program (IBM SPSS Statistics 25) was then used to calculate frequencies and percentages and perform an independent-samples t-test analysis.

3. Results

3.1 RQ1 What are students' goals for designing pandemic-related gamified apps?

Qualitative analysis of all 57 students' responses revealed two main themes expressed by students as a goal for their app: a) building resilience through different ways to cope with the pandemic (31/57, 54.4%) and b) increasing pandemic awareness and following hygiene protocols (24/57, 42.1%). As can be seen from Table 1, the majority of students' ideas (31/57, 54.4%) from Cohort 1 (10/20) and Cohort 2 (21/37) fall under the theme of building resilience using different ways to cope with the pandemic, including ways to manage or reduce anxiety, engaging in physical exercise or maintaining social interactions.

Table 1: Students' goals for designing pandemic-related gamified apps

Theme	**Sub-theme**	**Cohort 1** (n=20)	**Cohort 2** (n=37)
1. Building resilience through finding ways to cope with the pandemic	a. Physical exercise or/and social interaction	3	12
	b. Reduce anxiety	4	8
	c. Entertainment	2	0
	d. Education	1	1
2. Increasing pandemic awareness and following hygiene protocols	a. Awareness for COVID19 using quizzes and games	2	1
	b. Informational for covid19 effect (safety app, hygiene practice/protocol)	3	8
	c. Game to defeat COVID or to follow health protocols	2	5

Theme	Sub-theme	Cohort 1 (n=20)	Cohort 2 (n=37)
3. Other	a. Mindfulness/meditation	1	
	b. Helping the elderly	1	
	c. Boost creativity		1

An example excerpt from a student's answer that falls under theme 1. b. (Table 1) is the following:

> *"If I could design one gamified app for mobile phones to help people with any aspect of the COVID-19 pandemic, it would be an application that will help people reduce their anxiety. The application will organize their daily program in order to make their days full and productive. Based on their tasks […], the app will remind them what they must do in their day to succeed in their goals. […] Also, the app will give them ideas on how to spend their days, so they won't feel the anxiety and the boredom that Covid-19 caused". [Student 3, Female, Cohort 1].*

A second central theme focused on increasing pandemic awareness and following hygiene protocols (24/57, 42.1%). An example excerpt that falls under theme 2. b. (Table 1) is the following:

> *"An idea of a Covid-19 pandemic application would be an app reminding people to get their masks before leaving their homes using location tracking technology. […] The app can also get data from google analytics about Covid location outbreaks (reports of the location where a Covid positive person was) to protect other people from going to that location. Also, a good idea would be to have a tab in the app to show credible news about Covid-19 because there is a lot of misinformation and fake news on the internet during these times […]". [Student 10, Male, Cohort 1].*

Students maintained similar design goals for proposed apps despite increasingly less strict public-health measures from May to December 2021.

3.2 RQ2 To what extent do students use gamification techniques in their design?

The majority of students (52.6%, 30/57) used one to three gamification techniques, while 38.6% of them (22/57) did not use any (Table 2). Third/fourth-year students used significantly more (t_{55}=4.65, p=0.000) gamification techniques (M=2.35, SD=1.31) compared to first-year students (M=0.81, SD=1.13) as shown by an independent-samples t-test.

Table 2: Number of gamification techniques used by students in their app design

Number of gamification techniques used	Cohort 1 n=20	Cohort 2 n=37	Total
	N (%)	N (%)	N (%)
0	1 (5%)	21(56.8%)	22(38.6%)
1	5 (25%)	7(18.9%)	12(21.1%)
2	5 (25%)	5(13.5%)	10(17.5%)
3	5 (25%)	3(8.1%)	8(14.0%)
4	3 (15%)	1(2.7%)	4(7.0%)
5	1(5%)	0 (0%)	1(1.8%)

An example of a student's answer in which two gamification techniques are identified (the use of scoring and the use of badges) is provided:

> *"In my application's idea, I would give badges to people for reading the news in the "news" tab and by staying at home protecting themselves. Also, it would be nice to keep a score on the number of times that a user grabbed their masks before they left home. Maybe the app can send popup notifications questioning the user if they are socializing using video calls and give them a "socializing" badge". [Student 10, Male, Cohort 1]*

4. Discussion and future research steps

The first stage of this study showed value in involving students in the design of interventions that targeted themselves and revealed the need for training students who lack a design background in identifying relevant gamification techniques. Future research will aim to materialize students' suggested design ideas into design prototypes by involving them in the process through interdisciplinary collaborations.

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