Virtual Game Jam: Collaborative Pathway to Serious Games for Health

Sarah Matthews[1], Rick Thomas[2]

[1]*Health Communications Consultants,*
sarah.matthews@healthcommunicationsconsultants.com
[2] *National Academy of Sciences, rthomas@nas.edu*

Abstract

Game jams are collaborative competitions where participants make games from scratch within a short period of time. Occasionally, these games aim to promote meaningful learning outcomes by embedding functional knowledge into entertaining and engaging gameplay. We wanted to understand if a game jam during a global pandemic could be used as an effective method to facilitate a collaborative, multidisciplinary team's ability to design, develop, and implement a serious game on a health-related topic (i.e., COVID-19). We examined the 2020 game jam hosted by the National Academy of Sciences to evaluate one method to organize a serious virtual game jam and provide a roadmap for implementation using qualitative and quantitative data collection methods to evaluate its efficacy. In addition to identifying best practices and lessons learned from our tools and processes, our results demonstrate that a virtual game jam can in fact be a powerful tool for creating a scientifically sound, population-level, big picture–thinking serious game used for health education, facilitate collaborative multidisciplinary teams and be a practical learning experience for game jammers.

Keywords: Game jam, Serious games, Games for health

1   Introduction

Health-focused video games have the capacity to implement behavioral change, learning, and effectiveness in improving health outcomes [1-4]. Video games can embed functional knowledge and change processes, as well as promote learning, social interactions, creative problem solving, and help a player think about the "big picture," in an entertaining, meaningful, and immersive environment [4]. Health-focused video games are referred to in the gaming research field as serious games.

Serious game design, development, and implementation trend toward targeted populations and are limited to population-level outcomes [3]. Interestingly, these games are typically the products of software programmers who rarely seek input from entertainment experts (i.e., game artists, writers) and behavioral change experts (i.e., behavioral scientists, content specialists, etc.). This is a missed opportunity, as Thompson et al. [4] demonstrates that these types of interdisciplinary collaborations can lead to games that are entertaining and therefore more capable of promoting behavioral change.

One promising pathway to fostering this type of collaborative game design process is through game jams. A game jam is traditionally a 24–72-hour contest where participants work together in groups to make a game (electronic, video, or board) from scratch. Game jams

traditionally take place at onsite location(s), usually educational institutions. The jams typically consist of a set of rules that include the injection of new ideas into the game industry, a general thematic focus, short time span, restriction of location and tools, and ad-hoc team formation [5]. Jams are used to help build industry-relevant skills and portfolios as well as connect developers, students, and industry representatives. Participants come from many different backgrounds with varying levels of expertise and skillsets [5-7]. Game jamming is a social experience with a sense of community, feedback, and motivation facilitated within the experience [1, 6]. Game jams have been shown to have pedagogical potential, [1, 6] enhancing teamwork, communication, project management skills, [7] and generating positive psychological responses [8]. However, measuring results of a game jam and the experiences of the jammers remains a challenge.

Arya et al. demonstrated that jammers were motivated to participate in a game jam because the event was fun, it had positive effect on their skills in game design and development, and because it created a sense of community [6]. Hrehovcsik et al. successfully measured collaboration in the terms of mutuality and learning behavior, showed noteworthy correlations in positive game jam attitudes, experience, learning expectations and learning outcomes [7]. Savvani showed that collaborative game creation has positive emotional and social experiences that contribute to a jammer's sense of growth and well-being [8].

We wanted to understand how game jam organizers could use a global virtual game jam as a collaborative, multidisciplinary method to design, develop, and implement a serious game on a health-related topic while identifying best practices and lesson learned. For this paper, we examined the 2020 game jam hosted by the National Academy of Sciences, which focused on health education for COVID-19. The game jam took placed during the COVID-19 pandemic and was completely virtual to maintain public health guidelines.

1.1 Game jam overview

Amid the COVID-19 pandemic, LabX, a creative communications and engagement program of the National Academy of Sciences, co-hosted *Jamming the Curve,* a 2-week game jam held in fall 2020 to create games that combat errors in risk perception and public misunderstanding and misinformation around the spread of the coronavirus disease. Specifically, *Jamming the Curve* aimed to create games that promote prosocial pandemic behaviors by translating data into stories, dispelling misinformation or misconceptions, and demonstrating the relationship between individual behaviors and large-scale impacts for the public. The game jam was a collaboration between LabX, IndieCade, Games for Our Future, Seattle Indies, Georgia Institute of Technology's Digital Integrative Liberal Arts Center, University of Washington EarthLab, European Cooperation in Science & Technology, and Northeastern University's Game Studio. These partners were chosen based on their prior experience running educational game jams.

More than 20 mentors were recruited across a wide range of fields including public health, emerging infectious diseases, social sciences, education, gaming, and more, as well as representing numerous sectors including governmental organizations, health-focused nongovernmental organizations, and academic institutions. Mentors advised the teams on how to best communicate the science, where it made sense to communicate specific messages through gameplay, and how to reach their targeted audience.

All mentoring, communication, and collaboration was facilitated on a Discord server. Discord allows for organized conversation via voice, video, and text. In addition to the mentors, jammers had access to other resources, including prerecorded talks by public health experts to

aid in the brainstorming process and an epidemiological model from the Georgia Institute of Technology [9] of how diseases spread through a population.

The jam kicked off with a welcome stream, where organizers showcased prerecorded talks from COVID-19 experts and answered questions. Jammers then had the opportunity to pitch ideas to recruit additional team members for their game. Teams ranged from individuals to groups of five or more, and included several first-time jammers as well as veteran participants.

Jamming the Curve attracted more than 400 participants who collectively developed 51 games. Pirker and Voll [5] characterize a game jam of this size as a "giant game jam." By opening the jam to international participants, *Jamming the Curve* ensured that there was a diverse range of ideas and approaches, which was especially relevant given the pandemic's global impact. Finished games were submitted on Itch.io, a popular repository for game jam content.

1.2   Judging

Once the jam ended, we opened a 2-week judging window. Submissions were first prescreened to exclude games that were not playable or that did not integrate accurate scientific information about COVID-19. The prescreening process left us with 44 games to evaluate.

To assist with this, we recruited more than 20 subject-matter experts to serve as judges (no mentors served as judges to avoid potential conflicts of interest). Each game was evaluated by a public health expert familiar with COVID-19 and two gaming experts. Games were assessed on six criteria on a 1 to 5 scale for educational content, innovation, gameplay (engagement and accessibility), and aesthetics (audio and visual). These scales were modeled off of scoring rubrics from previous serious game jams our collaborators had organized. Games were also judged with a binary Yes/No to whether its gameplay was scientifically accurate based on the current knowledge surrounding COVID-19. Of the 44 games judged, 15 were deemed to not be scientifically accurate by COVID-19 experts and were ineligible to receive cash prizes. Table 1 displays the judging criteria questionnaire supported as a Google Form.

A separate Discord channel was created for the judges, where they could calibrate with one another and ask questions. In the case of ties, special consideration was given to games that addressed key themes relevant to the pandemic, such as incorporating factors of increased risks for marginalized communities.

Scores (max=30) were averaged across the three judges and the top fifteen highest scoring games were identified. These games had scores ranging from 19.3 to 26.3. Eight of these games focused on Infection as a topic, one dealt with Vaccines, one dealt with Policy, and five spanned multiple topics. Fourteen were identified as targeting a "General Public" Audience with one specifically geared towards people under the age of 15. Only two of the games included content related to marginalized populations.

From this list of fifteen, a panel of representatives from IndieCade, Seattle Indies, and LabX selected five to win $1,000 and to compete for a $20,000 game development grant provided by LabX. The five games spanned multiple topics, were targeted to the general public and did not address marginalized populations. The panel based their selection on a game's potential to be built out over the course of the three-month grant window and whether it conveyed robust scientifically accurate information – the panel deliberated over Zoom until consensus was reached on which five games were best suited for the grant.

1.3   Grant and Grant Winner

While these five teams all took different approaches to game design, each employed several characteristic of effective serious games including rewards as motivational techniques [10], story immersion and narrative [2], likeable characters to be more persuasive [4], customizable features for tailoring and choice, problem solving, knowledge and skill development, and feedback to guide and shape behavior [4].

The purpose of the grant was to support the final stages of game development so that the receiving team could build out their game while continuing to work with experts to maintain scientific accuracy. The grant was also meant to ensure that the game would be available free of charge, thus eliminating access barriers. Each team submitted a grant proposal that highlighted the skillset of the team and what proposed additions they would make to their game if selected. The panel reviewed each proposal and interviewed the five teams over the course of a week.

The grant-winning game, *Cat Colony Crisis*, was created by Devil's Cider Games, a small independent game studio based out of Toronto, Canada. In their decision, the panel stated that Devil's Cider Games was selected because their team had the necessary programming knowledge, artistic skills, and operational bandwidth to best utilize the grant funding and thereby create the most impact with their game.

Cat Colony Crisis tasks players with helping a spaceship colony of cats deal with a mysterious disease outbreak. Players must watch for symptoms (i.e., sneezing, headaches, sweating, etc.), identify cats to test, and use contact tracing skills to isolate sick cats to prevent the spread of the respiratory disease. The game also requires players to consider a set of pre-existing conditions that mimic the disease, and take steps to limit the spread of the outbreak. Options include implementing a mask mandate, restricting incoming ships to the colony with a lockdown, and breaking up cat gatherings (i.e., catnip parties). Collectively, these gameplay features were meant to highlight the impact of an individual's everyday choices and the complex decision-making process that public health officials routinely undergo. Prior to the game's release, it was evaluated by three external public health reviewers during testing with an expert survey.

The game was made with Unity and built on the Windows, macOS, Linux, and HTML5 platforms. Distribution of the game initial met with resistance on being hosted on the App Store due to policies combatting misinformation on COVID-19. The team sought letters of support to demonstrate that the game fell within the category of developers with reputable data sources and credentialed organizations rather than solely entertainment. The game deployed on February 8, 2021, in the category of entertainment and is available for PC and Mac on the platforms STEAM and Itch.io, for Android via Google Play, and for iOS via App Store.

2   Methods

Quantitative and qualitative data collection methods were utilized to evaluate both the winning game and the jam as a whole. These included a combination of self-report survey responses, game metrics, and participant interviews. Game evaluation tools were developed using known survey instruments for serious game evaluation [11-13].

A general feedback survey was placed on the platforms where the winning game is available for download and sent via email and social network links to mentors of the game jam and their networks over a 4-month duration until 30 responses were obtained. The survey

contained four demographic questions (age, gender, play frequency, and occupation) and seven questions with a five-point Likert Scale (ranging from Extremely Disagree to Extremely Agree) to evaluate player experience ("The game was easy to play;" "I felt involved in the experience;" "I would play again;" "I would recommend the game to a friend"), perceived learning ("Playing the game increased my knowledge of COVID-19;" "The game would be a useful tool for teaching COVID-19 prevention"), and motivation ("I was motivated to play through more than once").

Game metrics include repeat play, downloads, and game reviews for *Cat Colony Crisis*. Repeat play evaluates player experience, number of downloads evaluates population-level access, and game reviews evaluate player experience and enjoyment, knowledge improvement, immersion, feedback, and goal clarity. Data collection tools were anonymous, and the general feedback survey was not synced with the game metrics.

Observations were collected through the jam's Discord channel to better understand participants' experience throughout the jam. In order to dig deeper and gain additional insight, we also conducted qualitative interviews with three randomly selected participants 7 months after the jam ended.

3   Results

Participation in the feedback survey was voluntary and required respondents to be at least 18 years of age. The respondents' mean age was 35 years old with a range of 18 to 71 years. 63% identified as female (prefer not to say and other categories had 0 responses), 43% identified their occupation as being non-health care–related, and 43% responded that their frequency of playing games is daily (Table 2).

Most respondents expressed high levels of agreeability across all three metrics of player motivation, experience, and perceived learning (Table 3). The highest levels of dissent occurred in players' understanding of COVID-19, with 27% of respondents indicating that the game did not increase their knowledge of COVID-19. One explanation for the higher level of dissent is that 27% of players identified as having an occupation in health care or public health. In the free text responses, one player noted that "[*Cat Colony Crisis* is a] wonderful game for those not as well versed in public health policy. [T]he only reason I didn't learn something new about COVID is I am informed through my work already."

As of May 10, 2021, *Cat Colony Crisis* was downloaded a total of 57,402 times with 77% of downloads coming from Google Play. There have been 62,671 play sessions since the game launched on February 9, 2021, with an average number of 1.18 sessions per user, and an average of 54.38 seconds of play time. There are 43,600 monthly active users, with peak usage being in mid-March at 32,520 active users. Prosocial pandemic behaviors were highlighted in reviews such as "a fun little game showcasing the benefits of social distancing and what it's like herding cats," "fun little game which plays into things going on in the world," and "a very relevant and enjoyable simulation with kitties."

The negative critiques were in understanding the game, game functionality, instructions to play, or recommended modifications in comments such as "I understood the game much better during the second attempt," "interesting virus simulation, but not super fun as a game," and "I don't really understand the game."

Jammers used the Discord Channel for several purposes including recruiting teammates, soliciting feedback for their games, and asking the mentors questions. The Discord remained active throughout the jam, with an observable uptick in use at the beginning and end of the jam.

Our qualitative interviews found that while the jam's theme was not a driving motivation to participate, all three jammers were now more likely to join a scientific game jam in the future. Although they considered the jam rewarding, jammers did not place value further developing their game after the jam ended given the time-sensitive nature of the COVID-19 topic. The jam's 2-week timeline was well received, allowing jammers to meaningfully dive into the topic without feeling drawn out. Only one of the interviewees utilized the mentors; the other two felt that they had a solid grasp of the science. While none of the interviewees interacted with other teams, all three expressed some degree of team bonding as a result of participating and looked forward to future jams put on by the organizers.

4   Discussion

Our results demonstrate one approach to how a game jam can be organized to effectively and collaboratively create a serious game used for health education. The feedback from *Cat Colony Crisis,* specifically the high agreeability of the player experience, perceived learning, and motivation exhibited in the survey, supports the value of a cross-disciplinary approach to serious games. By embedding public health messaging into an engaging narrative, the game was simultaneously entertaining and informative, a finding that is further supported by the gameplay metrics collected. The number of downloads and positive reviews demonstrated this approach's ability to convey important public health information to large audiences in an engaging and entertaining manner.

While these insights are specific to the grant-winning game, the value of a collaborative approach to creating a serious game is also evident in the composition of winning teams; all five of the games identified by the panel as grant eligible came from teams with at least two members (the panel was blind to the teams' composition). Furthermore, the fact that nearly 2/3 of the judged submissions were scientifically accurate demonstrates jammers' commitment to developing serious games, even when they are not subject-matter experts in the topic.

Our observation that participants appear to largely halt all game development once a jam has ended unless there is some incentive in place suggests that jam organizers should be prepared to provide additional resources if they wish to reach the public with a game.

That being said, a game jam does not need to produce a polished game to be a valuable experience, as was evident in our participant interviews. All three jammers we interviewed remarked how the jam had benefited team morale or camaraderie to some degree and expressed a newfound interest in participating in science-driven game jams. This learning in prototyping, social and collaborative processes are well supported in the literature [1, 6, 7]. While these findings are based on a very small sample size, they are nonetheless encouraging and should be further studied in future game jams.

After the jam concluded, the organizers reconvened for a debrief conversation as to what worked well and what would be done differently if the jam were to be replicated. A couple of key facts emerged from this discussion. The most prominent was the value of having mentors available to interact with the jammers. Although only one of our three interviewees interacted with the mentors, the organizers observed several interactions between jammers and mentors through the Discord Channel. The inquiries focused primarily on nuances about COVID-19 and how to best convey them within the gameplay. These inquiries serve as good examples of the need of mentors with diverse backgrounds, as the questions often bridged the disciplines of infectious disease, science communication, and game design. We also found that 20 mentors was an appropriate number for this size game. This number ensured that several mentors of

different expertise were available each day throughout the entire duration of the jam without placing an undo time burden on any given mentor.

Providing jammers with an opportunity during the jam's kickoff to pitch ideas and recruit teammates was also an invaluable addition to this jam. Although we did not quantify how many teams formed this way, observations of the Discord channel suggest there were several, including one of the five prize winning games. Future interested jam organizers should encourage this type of flexible collaboration, as jammers are often looking to join a team.

While having so many collaborators run the jam helped raise the status of the event, it also resulted in a very diffuse set of responsibilities. This created a logistical burden of ensuring all collaborators were on the same page and made getting consensus somewhat difficult during weekly meetings. For this reason, future jam organizers should consider establishing a smaller team of core leaders and then delegate responsibilities from there.

This study was limited by its retrospective evaluation metrics. The decision to share the jam's methodology in the scientific literature was made after the jam had ended and had proven to be a huge success. As jams are used to help build industry relevant skills and portfolios as well as connect interdisciplinary industry representatives, it would have been relevant to collect background characteristics and skill levels of group members as well as target group characteristics. While we were able to observe interaction on the Discord server, targeted feedback on the sense of community, motivation, and experience would have illuminated the social interaction of game jams. Additionally, the server showed teamwork dynamics, but this was not captured formally. Future game jams could include questions on team dynamics (e.g., decision making processes, design and implementation strategy, teamwork, etc.). An additional limitation of the jam is that we did not control for differences across judges' assessments of games. Although all judges were given a clear rubric to follow, we did not have time to assess inter-rater reliability, something future organizers may want to consider when designing their judging process.

5 Conclusion

We wanted to understand how game jam organizers could use a global virtual game jam as a collaborative, multidisciplinary method to design, develop, and implement a serious game on a health-related topic game jam organizers as well as identify best practices and lessons learned. For this paper, we examined the 2020 game jam hosted by the National Academy of Sciences, which focused on health education for COVID-19. We found the jam to be an effective platform for serious game development and implementation, if organized correctly. Evaluation methods of the winning game demonstrated agreeable and positive player experience, perceived improved learning, motivation to play, and population-level access. We also found anecdotal evidence of big picture thinking and learning. We determined that providing jammers with access to mentors and a collaborative space in which to work throughout the jam increased the scientific quality of submissions and made the overall experience more rewarding.

While our approach was effective, prospective serious game jam organizers should consider consolidating responsibilities and be prepared to offer incentives if their goal is to continue game development and implementation once the jam has ended. We also recommend evaluation metrics be established prior to the jam's launch in order to better understand its impact.

Our work provides prospective organizers with a roadmap on how to implement a global virtual serious game jam to develop a serious game for health education, facilitate collaborative multidisciplinary teams and be a practical learning experience for game jammers.

Acknowledgements

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