

Original Paper

Serious Games for Public Safety: How Gamified Education Can Teach Ontarians Emergency Preparedness

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Received: October 20, 2022 Accepted: November 15, 2022 Online Published: November 29, 2022

doi:10.22158/fet.v5n34p1

URL: <http://dx.doi.org/10.22158/fet.v5n4p1>

Abstract

According to the Canadian Emergencies act, a national emergency is an urgent, critical situation that threatens the health and safety of Canadians (Department of Justice of Canada, 2022). Emergencies can also take on many forms: pandemics, natural disasters, civil unrest, or armed conflict. Currently, the Provincial Emergency Response Plan implemented by the Chief of Emergency Management Ontario is the framework that keeps Ontarians safe, allowing for organizations and municipalities to organize disaster relief, send out emergency alerts, and educate Ontario residents on emergency preparedness (PERP, 2019). This paper explores how serious games can prepare the public for emergencies based on response frameworks currently in use in metropolitan Ontario, Canada (cities such as Toronto, Ottawa, and Hamilton). This example was selected because it represents modern urban settings that require response plans and provides a framework that can be used to elaborate on. This paper will present the positive features of serious game applications concerning public safety and emergency management education. Case studies of serious game applications currently used for public health and safety purposes will be examined. Serious games may be a useful instrument for public safety education to enhance existing emergency preparedness and public safety education frameworks.

Keywords

serious games, public safety, emergency preparedness, education, metropolitan, gamified learning

1. Introduction

Serious games are video games with applications other than enjoyment. Their primary purpose is to further training in fields such as healthcare, education, policing, finance, disaster management, and more (Chandross & Decourcy, 2018). They can target different demographics, from children to adults, from professional personnel to the general population. Serious games can carry significant value over traditional educational methods such as classroom instruction, reading texts, and memorization

(Chandross & Decourcy, 2018). Emergency preparedness, as a topic, is frequently presented through traditional forms of instruction, most often in brochures or classroom instruction formats, which can be challenging when it comes to attracting the attention of the public. Using serious games to teach the general public emergency preparedness can turn the learning process into a more enjoyable activity, encouraging the average person to effectively learn and retain the information necessary to prepare themselves for emergencies.

Even though emergency management in Ontario is a shared responsibility that includes municipal, provincial, and federal governments, as well as individuals and families, the Chief of Emergency Management Ontario oversees emergency management programs for provincial organizations and municipalities in Ontario. The educational content offered by Ontario on emergency preparedness (or even at the federal level through the Minister of Public Safety and Emergency Preparedness) stops at lists on online websites, PDFs, and printable guides. With the incompleteness of Ontario's public safety educational content at hand, serious games can contribute greatly to rounding out and enhancing this current system.

2. Literature Review

2.1 How Ontario Tackles Emergency Preparedness Education

As of now, the Provincial Emergency Response Plan, implemented by the Chief of Emergency Management Ontario, is the emergency response guideline that keeps Ontarians safe, allowing for organizations and municipalities to organize disaster relief, send out emergency alerts, and educates Ontario residents on emergency preparedness (PERP, 2019). The Chief EMO is also responsible for implementing the Provincial Emergency Response Plan (PERP), as well as running the overall provincial emergency response organization (provincial ERO). In other words, emergencies in Ontario are managed by Emergency Management Ontario (led by the Chief EMO), with further delegations to municipalities or ministries. EMO provides resources, guidelines, and even staff for municipalities to develop and implement emergency management programs, as well as materials to educate the public in these communities about emergency preparedness. When it comes to educating the public, and educating residents on how to keep themselves and their loved ones safe in the face of emergencies, EMO takes the lead in providing the resources needed for organizations to build programs for this purpose. EMO covers this on its main online platform through very limited avenues. Emergency management resources are provided through a list of to-dos, such as developing a plan, building an emergency kit, and how to stay informed. Instruction paragraphs explaining how one should make a family communication plan, an evacuation plan, as well as building an emergency kit are featured on the platform. The only non-text resource featured is an Emergency Kit Bingo game, which is a checklist of items in one's emergency kit (EMO, 2022).

Although this is a good first start when it comes to the provincial effort to keep the public informed through more engaging means, it does not do much when nestled into a long, wordy online guide. The

search for more in-depth and engaging public safety education materials at the municipality level was unfruitful: since the EMO oversees municipalities and further delegates emergency preparedness to cities, most city websites on emergency preparedness were a repeat of EMO's content. An examination of the official websites for the three largest cities in Ontario-Toronto, Ottawa, and Hamilton confirmed the suspicion that EMO's efforts in public safety promotion stop at wordy online guidelines, and provide nothing interactive to the public (City of Hamilton; City of Ottawa; City of Toronto). According to EMO, materials available to promote emergency preparedness within the community include lesson plans, to-do lists, posters, as well as infographics (2022). In terms of keeping the public informed, Alert Ready is employed, a mobile alert system that sends notifications of emergencies to residents' mobile phones (Alert Ready, 2022). It is also important to note that these alerts are meant to inform the public of the status of the emergency, and contain little to no instruction on how to prepare for or tackle these emergencies themselves. This incompleteness may be reflected in the Canadian population's low levels of emergency preparedness, where only 47% of Canadians have a home emergency supply kit, and a smaller percentage of Ontarians indicate possessing alternative resources in the home in case of emergencies (Government of Canada, 2014). This is despite 81% of Ottawa residents, 62% of Toronto residents, and 58% of Hamilton residents indicating that extended power outages were among the most common emergencies to occur within their community (Government of Canada, 2016).

Table 1. Precautionary Measures Taken in Case of Emergency, by Province (Government of Canada, 2014)

	Canadians whose household has an alternative heat source	Canadians whose household has a backup generator	Canadians whose household has an alternative water source	Canadians whose household has other emergency precautions employed in the home
Ontario	46	20	44	22
Quebec	48	22	38	20
Nova Scotia	57	36	55	28

Further considering what the federal government offers the public in terms of emergency preparedness education also yields limited results. Public Safety Canada, led by the Minister of Public Safety and the Minister of Emergency Preparedness, offers similar materials to EMO when it comes to educational materials: checklists, brochures, and word paragraphs. There may be a gap to be filled with more interactive and up-to-date learning materials for the public.

2.2 *Serious Games as a Learning Tool*

To see how serious games can enhance Ontario's existing public safety education framework, a close look into what constitutes a serious game is necessary to understand why they are great educational tools specifically for the nature of emergency preparedness. There exists literature already examining the benefits of serious games as an educational tool on their own. This paper will focus on these benefits and show the educational link between them and public safety or emergency preparedness education.

According to Chandross and Decourcy, educational games are games in non-entertainment contexts (2022). In other words, they can be used to train professional personnel in different fields: military, healthcare, finance, policing, etc. They can also be incorporated into educating the average person on different skill sets: how to manage one's health, how to navigate the legal system, and even how to prepare for disasters (Tseklevs et al., 2014). In addition to games being an enjoyable activity, games often demand from players focus and decision-making mindsets that are also present in learning pursuits (Tseklevs et al., 2014). Educational environments often require teamwork, socializing, and decision-making, as well as the focus needed for information retention (Chandross & Decourcy, 2018). According to Chandross, games offer similar things, in addition to providing a high-engagement environment that improves upon traditional education formats (reading and memorizing or classroom instruction) (2018). In addition, according to Adachi et al., problem-solving is the core of game design: games usually feature problems that players can solve with existing resources (2013). According to Tseklevs et al., serious games also provide great avenues to turn any learning experience into collaborative work, since their digital nature easily allows players to engage with each other and interact without being physically in one room (2014).

In terms of education, public safety is a topic that targets audiences of all demographics, as an emergency directly influences all demographics, requiring everyone who lives on its path to know how to prepare for it. According to Chandross and Decourcy, traditional classroom instruction, or the "cookie cutter approach" to learning does not provide a large enough learning experience to engage and cater to all learning types (2018). Games, on the other hand, are customizable and can be designed to suit a wide variety of learners (Chandross & Decourcy, 2018). It can also provide real-time feedback to the learner based on gameplay progress, allowing such an environment to be further tailored to the individual learner (Chandross & Decourcy, 2018). Through story plots and possible customization, games can also maximize the feeling of relevance and the ability for a player to relate to the topic of discussion, which has been shown to greatly enhance the learning process (Fuchslocher et al., 2010). In addition, immersive serious games can provide simulative scenarios that mimic emergencies and disasters, training learners to make good decisions and experience situations of disasters that would be impossible, too costly, or too dangerous to arrange for in real life (Chittaro, 2015).

According to Emergency Management Ontario, the core competencies of emergency preparedness surround having specific solutions for specific emergency types, working together as a household and as a community, as well as being resourceful (2022). Games are great tools to promote problem-solving,

collaboration, as well as thinking outside of the box (Chandross & Decourcy, 2018). In addition to being an excellent educational tool on its own, serious games can also hit the checkmark as a tool for public safety and emergency preparedness education.

2.2.1 Case Studies of Serious Games in Public Health and Safety

An example of a government public safety promotion game is Ready Kids!, a for-kids version of Ready!, a platform belonging to the U.S Department of Homeland Security (Ready Campaign). Developed as part of the National Strategy for Youth Preparedness Education program, the game was part of the department's realization that even though children make up about 25% of the population of the United States, emergency preparedness education programs do not cater to this demographic (Ready Campaign). Ready Kids! provides emergency preparedness content to children in game form with story-driven games about recognizing signs of wildfire, tornadoes, tsunamis, and more (Ready Campaign). We can see that Ready Kids! is part of the US government's effort to extend public safety education to children. Its counterpart Ready!, provides similar traditional public safety education content similar to Emergency Management Ontario. Even though it can be argued that gamified learning, in this case, should also be extended to meet the adult populations as the benefits of serious games are not constricted to age, Ready Kids! is a great start to encourage younger populations to learn how to prepare themselves for emergencies.

Another noteworthy serious game application is Balance, a health game developed by Alberto Fuchslocher, to teach teenagers to self-manage diabetes. Although not specifically a government game application, Balance still does a great job at demonstrating how games can be used for serious learning contexts. In addition, the educational benefits of Balance's game design have definite potential when it comes to educating the public on preparing for medical emergencies or pandemics. Balance is a platformer that teaches teens and children to manage diabetes by reinforcing good food and insulin intake choices (Fuchslocher et al., 2010). In Balance, the main character has to travel through game levels and get through obstacles to rescue their friends. With each challenging level, the player has to get through, they also have to maintain optimal blood sugar levels by eating certain foods at certain times, as well as taking insulin. If the player neglects this or makes poor choices, the main character will slow down and become impossible to control (Fuchslocher et al., 2010). Diabetes patients, as part of diabetes management, must have the right balance of food intake and insulin (Fuchslocher et al., 2010). By incorporating exactly these challenges, and reinforcing these habits in a young player, Balance teaches players the self-care skills of managing diabetes through an enjoyable game-playing experience. Not only is there a clear reward (when good food choices are made, the player's score goes up) and consequence system, but the game also resembles real-life rewards and consequences when it comes to diabetes mellitus, greatly enhancing the gameplay experience, according to the youth groups the game was tested amongst (Fuchslocher et al., 2010).

This paper also looks at Trillion Games, a game application developed by the EU Research Project to help involve citizens in community peacekeeping and crime prevention (Sorace et al., 2018). Trillion

games contain two separate curricula or levels: one dedicated to law enforcement officers, and the other for citizens, both to acquaint these two groups with the concept of community policing (Sorace et al., 2018). The games also teach both groups to interact with each other through a Trillion platform (a real-life crime-reporting platform), which citizen players are encouraged to download and use after the game (Sorace et al., 2018).

The serious game's version for citizens puts heavy emphasis on awareness and communication. Its scenarios are designed to train the average citizen to discern whether or not a situation warrants attention, and encourages them to connect with law enforcement agencies, as well as the rest of their community (Sorace et al., 2018). In terms of gameplay, Trillion Games for citizens allows players to collect items, encounter characters and events and require actions, and also encourages collaboration of players. In short, the levels go through a series of *to-report-or-not-to-report* (on the TRILLION platform) scenarios (Sorace et al., 2018). After every level, a reflection session ensues and assesses the player's performance, evaluating their actions to steer them toward what is the "preferred behaviour" in each scenario (Sorace et al., 2018). The goal of the game for citizens is to firstly increase their knowledge of public safety, as well as strengthen their trust and connection with government agencies.

3. Result

Among what is offered by Emergency Management Ontario in terms of public safety education or emergency preparedness education, there is still a lack of engaging educational content, or materials that transcend the traditional reading, memorizing, or classroom instruction formats. When dealing with public safety, an important topic that is directly relevant to all, a flexible, engaging education along with a solid promotion system is key. It is paramount that people feel enthusiastic about educating themselves on emergency preparedness so that learning becomes consistent and manageable. The above case studies show that using serious games to promote public health and safety is possible, and that gamified learning might allow for the education of these topics to be more successful and efficient.

4. Conclusion

Serious games provide a fun and interactive experience that retains participants (due to the activity being enjoyable) and caters to a wider demographic than traditional education does (Chandross & Decourcy, 2018). Leveraging the existing framework offered by Emergency Management Ontario, serious games can integrate into the existing system without any elaborate adjustments or replacement. Guidelines about building an emergency survival kit can be incorporated into simple click-and-drag games where the player collects existing things in a home environment into an emergency kit. Similarly, the ability to recognize signs of natural disasters can be taught with similar gameplay, where players click on elements in a game scene to identify tornado or blizzard signatures or wildfires. Planning and following through emergency routes are intimately similar to what a platformer game can look like. In cases of dealing with medical emergencies, such as the national emergency event of COVID-19, players can be taught

emergency management protocols through roleplaying patients and family members, practicing safety habits, and seeking help when needed. These are simple game scenarios as well as game design structures, and more intricate gameplay such as immersive VR of training emergency scenarios can be brought into the conversation to deal with more complex emergency preparedness training. However, these are great simple avenues for Ontario to start incorporating serious games into its existing public safety education system.

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