

Supplementary materials S4. Response of the experts

Table S9. Response of the videogames experts

Q1. What characteristics/elements should a video game about natural hazards have to raise awareness among users?
I think the most important thing is for a video game to be fun given that if this aspect isn't satisfactory no one is going to finish it. I think it would be important for the game to be fun and have an accompanying narrative in order to be able to introduce the topic through it.
Replicate its disaster film equivalent, with escape dynamics, where devastation is represented, in material and human life terms, and the dramatic consequences of both. Maybe show the player the protocols that exist for each natural hazard, but in a very subtle way integrated into the narrative. People need to empathise, in order to understand and become aware.
It's important to include it mainly when designing levels in adventure games.
Q2. Which do you think is more efficient for raising awareness among users, a cooperative or competitive video game? Why?
Cooperation involves collaboration for a greater purpose. It has components much more connected to socialisation and empathy.
In this case cooperative, because pressure should come not from what other players are doing, but from the possible catastrophe.
Q3. Which type of player would create more empathy among users? * Bartle's taxonomy presents 4 types of players: Killers (action with other players), Socializers (interaction with other players), Achievers (action with the world), and Explorers (interaction with the world) (Bartle, 1996).
Explorers, they could have a first person experience without searching for a specific objective.
I suppose if the aim is to raise awareness about climate hazards, interact with other users, requiring collaboration in order to help each other or others affected by these natural hazards it would help to generate more empathy (socializers).
Q4. Would including a reward system in a video game about natural hazards help engage users? Why?
In a video game there are always rewards, be they visual, auditive, prize related, etc. In this case I think that it would be enough for the game to be fun and for you to see a positive visual change that players find satisfying. Seeing that your actions create a positive change in an environment is a reward in itself, it wouldn't be necessary to add external prizes.
Yes. The reward system is one of the most effective methods for keeping users in a video game. It is important for the player to get to the end in order to transmit the complete message. Although this can be achieved with a good narrative, it is always recommendable to add a further element that can keep them engaged, such as a reward, either for using in the game itself (better weapons, special skills, collectables...) or outside of it, such as the well-known Trophy system, which allows players' friends to see what their colleagues have achieved.
I wouldn't include it, it would distort the message intended, making it somewhat secondary to the reward they want to obtain.
No. I would focus the game on a narrative experience without rewards or monetisation. Both would disconnect the player from what is truly important.
Q5. Do you believe that including levels, progress bars, etc., to track the progression and development of a video game about natural hazards would motivate users? Why?
Anything visual is better than text. It is essential to show player progress.
No. It is more or less the same for monetisation and progress. It can potentially distract the player from the intended message.
Q6. Does a system of positive feedback make a video game more appealing? Or would a system that combines positive and negative feedback be more suitable for raising awareness among users? Why? *Positive feedback is understood as the positive stimulus that the game displays to the player when they perform well, such as messages on the screen congratulating them. *Negative feedback is understood, predictably, as the opposite of positive feedback.
Preferably a system with positive feedback. In the majority of cases players need positive feedback on what they do.
Depending on the game concept. There are games that play with this moral duality, where acting in one way or another affects the story, playability and/or character skills.
Depends on the age of the target audience, from a certain age it is convenient for there to be both.

The game should provide positive and negative feedback, otherwise it's just a little distraction that won't be remembered.
As long as comments are constructive it doesn't matter whether they're positive or negative.
Q7. What would be the ideal duration of a video game to engage users?
Relative. But it always needs to be taken into account that the first 15 mins of a game are where the player-game synergy is defined.
For a game of this type whose aim is to raise awareness I'd say that a short duration may be more effective, and focused on the subject you want to deal with (2-4 hours) rather than a long game.
There's no ideal duration, it depends on many things such as re-playability, whether or not it focuses on the narrative, the desired topics... For a game of this type whose aim is to raise awareness I'd say that a short duration may be more effective, and focused on the subject you want to deal with (2-4 hours) rather than a long game.
It would be better to have a game for casual players that engages them to play for short periods over a number of days.
Q8. Is the level of interactivity of a video game about natural hazards crucial to achieving its objective? In what sense?
It depends, there are games with a considerable narrative component that don't need much interaction, they're more like visual novels, and the story itself can have a great impact.
Games where the narrative is secondary, interactivity is the most essential aspect. Generally all games with quick sessions. The story is almost non-existent and develops more outside the game via the online community than during the game itself.
Yes, as long as the video game is focused on showing these natural hazards and seeing the consequences of our actions.
It's normally easier to make an interactive game fun and motivating than a non-interactive one.

Table S10. Response of the natural hazard experts.

Q1.How would you describe the current communication occurring in the media about natural hazards? Do you believe this communication effectively raises awareness among citizens about natural disasters? Why or why not?
No, Because it's too alarmist and focus and focuses on catastrophes when they happen, instead of enhancing collective and individual prevention.
1) I don't think the media do enough research and only transmit alarm and uncertainty. 2) No. 3) the fear and alarm generated by the media in general (there are outlets that do do this through specialist researchers) don't help to raise awareness in the population as regards seismic phenomena, they only create anxiety. If they were transmitting information on what to do in the event of an earthquake and what institutions are doing, it would be a different matter.
Highly lacking. Although many journalists take the time to contact academic or technical experts in the subject, there are many others who give a voice to politicians or members of the general public who lack knowledge, and who resort to erroneous topics such as the need to drag rivers, remove vegetation from their banks, etc...
Q2.Do you believe that structural inequalities determine the level of vulnerability to natural hazards? If so, how? What role could video games play in addressing society's vulnerability to natural hazards? (*Structural inequality is understood as a system of privileges created by institutions within an economy (Amadeo, 2020)).
Inequalities in society create different degrees of vulnerability because the means of life, housing, etc. of the most disadvantaged such as access to training and information is also unequal. Video games are an "attractive" format that can help to promote means of self-protection and knowledge of hazards.
I think inequality is directly related to vulnerability and it shouldn't be this way. The greater the vulnerability the greater the hazard. We can only reduce the vulnerability hazard, because the earthquake can't be removed from the equation. Video games could be good training in prevention, as they could provide information on self-protection, emergency planning and management.
Yes, obviously structural as well as social inequalities have a significant bearing on the vulnerability of a territory or society. An equal society will be much more resilient as a whole than an unequal society.
Inequalities do determine the level of vulnerability. · Video games can help to provide better knowledge of natural hazards and raise awareness.
Physical vulnerability can increase in the face of inequalities, but there are structural vulnerabilities that will affect everyone equally, telecommunications, lack of electricity, destruction of productive fabric, etc.
Q3. Should aspects of multiculturalism and gender be included in video games about natural hazards? If so, which ones and why?
Of course, different languages, including interracial, multicultural and gender related aspects. Without forgetting the inclusion of people with different disabilities.
Yes, all cultures and genders must be included in video games given that the whole of society, without exception, may be affected.
The level of exposure to hazards depends on awareness and investment. In terms of awareness, it depends on the age range that consumes video games.
Q4.How should the main character of a video game about natural hazards be represented? What characteristics should they possess?
A normal person.
A normal, responsible, coherent and supportive person.
They should be represented as an average person, with fears, who confronts them while learning at the same time. If they fail, they learn, that is they can fail and stop being afraid of failure. Nowadays it seems that failure is frowned upon in society and our lives must be shown as perfect and idyllic, creating personal frustration.
I don't think the best option would be for this character to be customisable, that is, that you could choose anything from gender to bodily characteristics so that both children and young people (although it is evident that any person can participate) were able to choose the one they identified with.
They could be a man and a woman who weren't excessively brave, fearful but calm and respectful towards the given recommendations. Look for characters the population can relate to and respect

for the recommendations given. Look for characters the population can relate to.
I don't think this is a determining factor.
Q5.What type of informational sources should a video game about natural hazards be based on? For example: academic sources, journalistic sources, etc.
Undoubtedly academic.
To create the video game I would use academic sources, science communicators and maybe science journalists so that between all of them a message is created based on scientific facts but in a language that reaches the target audience.
Academic and official institutions responsible for civil protection.
Historical and academic.
Q6.What type of narrative, what storyline that contextualizes the game, would be most effective in raising awareness about natural hazards?
It should be a simple, non-technical narrative, to make the message clear and concise for the population.
I suppose the player should be placed in a role of saviour from natural disasters, putting them in the face of environmental and social problems that arise.
Maybe speak about previous episodes, analyse them (what's happening, what needs to be done) and create an episode for carrying out that which has been learnt and making them see that natural disasters occurred in the past and could happen again.
Q7.What tone of message would be most effective to use in a video game to improve disaster risk management? For example: alarmist, informative, emotional, etc.
I imagine that the most effective message is the informative type, based on knowledge. In reality ecosystems undergo important fluctuations in their working, and only when humans (as ignorant or selfish creatures) interact with this territory inadequately, these fluctuations turn into natural disasters. In other words, if we understand the function of ecosystems and adapt to them (instead of wanting ecosystems to adapt to us) natural hazards cease to exist.
Alarmist and emotional tones should be avoided. As I said before, the message must be clear, concise and based on science. Society should know what could happen and how to act objectively depending on the circumstances. An alarmist message will only create panic and rejection.
Neither totally alarmist, which leads to rejection, nor informative, which produces indifference.
Informative and emotional, with messages based on science that have and impact and drive people to increase their impact and awareness.