

## ***Interactive comment on “Using video games for volcanic hazard education and communication” by L. Mani et al.***

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This paper describes a pilot study that aims to examine the effectiveness of a computer game (St. Vincent's Volcano) in communicating volcanic hazards to residents of St. Vincent Island. Several studies have explored the use of video games as a learning approach in the context of geohazards. However, as pointed out by authors of this paper, there is often a lack of empirical evidence concerning the effectiveness of this method for teaching and learning about geohazards. The authors provide a good overview of the game design and the background knowledge on virtual reality environment and its potential in disaster risk reduction. The assessment approach, however, is not rigorous enough to evaluate the effectiveness of the video game as a learning technique. The only data discussed in this study are from pre- and post-quizzes. It is not clear what questions were asked and what objective(s) each question seeks to ad-

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dress. Without this knowledge, it is difficult to state what the learning gain represents (for instance, rote memorization or deep understanding?). I suggest to the authors to make all quiz questions available, describe their objectives, and discuss results in relation to each question and what it may represent. I also recommend inclusion of data from video recordings as this often captures information that cannot be collected using quizzes. Data collected via in-built analytics could help answer questions concerning participants' performance and technical difficulties they might have encountered. Taken together, this paper touches on an important topic but without a systematic and rigorous assessment method, it would be very difficult to make a meaningful conclusion about participants' learning and the effectiveness of this method in communicating hazard-related information.

Here are some recommendations:

Page 1 line 37- Delete the extra semicolon.

Page 1 line 38- Define and spell out N-Gen or Net-Gen. Not everyone is familiar with these terms.

Page 2 line 71- Be consistent with the usage of 2-D/3-D. Sometime it is shown as 2D/3D in this paper.

Page 2 line 89- Insert a comma in the reference.

Page 2 line 95- Delete 'of' in '...we can use of virtual reality...'

Page 3 line 98- Place the period before the quotation mark (...learning.”).

Page 4 line 153- Be consistent with how you spell St. Vincent. Sometimes it is shown with no dot after 'St' in this paper.

Page 4 line 168- What kind of instruments? Be more specific.

Page 5 line 201- It says later sections identify technical improvements for future iterations of the game. These technical improvements, however, are not stated clearly in the

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paper. What kinds of data were collected to highlight technical difficulties? In Page 8, you mention the built-in analytics malfunctioned. Perhaps, this is an example of a technical issue that can be discussed? In Page 7, you mention students were able to ask questions throughout the session. Perhaps, some of their questions highlight technical issues associated with the game? Were these questions collected and processed?

Page 5 line 210- It would be really useful to know what questions were included in the online questionnaire. Perhaps this can be added as an appendix or supplementary information?

Page 5 lines 209-210- Please state who the end users are.

Page 5 lines 217-227- This paragraph describes the concept of the game based on the information received from focus groups and stakeholders. There is no mention of 'community response' in the concept despite being identified as something that should be covered in the content by the focus groups (see Table 1, Page 15). Please explain if and how this component (i.e., community response) was added to the content of the game.

Page 5 lines 229-235- Is it possible to have an image or a flow diagram that explains this paragraph in a visual way? It is a bit hard to follow.

Page 6 lines 242-243- The game follows Kolb's model with 4 stages of learning cycle that are mentioned on line 242. If this study uses this model, it would be useful to clearly connect each learning cycle (e.g., reflective observation) with the game design and implementation.

Page 6 – General question and a comment: Is this game open access and available online? It would be incredibly useful if it can be accessed online free of charge. Users can be asked to complete a feedback form to share their experiences and help with improving the game.

Page 6 line 269- Specify the type of elevation data and satellite imagery used in this

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game.

Page 6 line 271- The game scene is said to be highly interactive. I suggest deleting 'highly' since it appears that it only allows users to add a hazard map and identify their location.

Page 6 lines 279-281- An example and/or image would be useful when describing the five clickable icons in each scene and the information each reveals.

Page 6 lines 282-283- What kind of questions were asked in the multiple-choice quiz? How were these questions designed? In other words, what are the objectives behind each question? It would be useful to include this information as supplementary information.

Page 7 lines 302-303- Change to "(based on the volcanic hazard map of Robertson, 2005). Delete the extra parenthesis.

Page 7 section 4.1- Mention the number of students who participated in this study (68 students?).

Page 7 line 302- Participants are mostly from schools located in the 'green hazard zone'. Does this affect your data and how?

Page 7 section 4.2- What is the age and background of the adult learners? Was this information collected? It would be useful to describe your adult learner population since this may play a role in explaining your results.

Page 7 line 328- It says 25 participants, but map shows 23 participants.

Page 8 Figure 3- I suggest deleting these photos as they do not add much to the paper. If you decide to keep them, I suggest showing one photo of the student session and one photo of the adult session, if possible.

Page 8 line 339- It says 'assistance was given to those that found difficulty with using the game'. It would be very interesting to know what kind of difficulty participants

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experienced. This could help with identifying technical or other types of issues that can be fixed in the next implementation of the game. Were such data collected? If so, please consider including them.

Page 8 section 4.3- It might be useful to know the amount of time between the end of each session and when the post-quiz was administered. Was the post-quiz administered immediately after the session was over or a week later for instance? This might affect the results.

Page 8 section 4.3- Please consider discussing the data collected by video recording.

Page 8 section 4.3- Please explain the data recorded by in-built game analytics for the adult participants since the paper states that these data were collected successfully.

Page 9 line 382- Data sets for 19 female and 4 male student participants were used for analysis. Please report this number for the adult participants too.

Page 9 line 394- What are Quiz A and Quiz B? Are you referring to pre- and post-tests? If so, please use consistent terminology.

Page 9 line 400- It would be useful to know what questions require or reflect deeper knowledge. An example would be useful.

Page 9 lines 417-419- Report the significance for each correlation value and what it may indicate.

Page 10 line 437- Consider changing ‘...indicating a greater improvement in learning gains’ to ‘...indicating a slight improvement in learning gains’ since average learning gains are only slightly higher when comparing different data sets.

Page 10 section 6- Did the second presentation mentioned in the second paragraph contain identical content as the presentation used in the piloted educational session? If no, how did it differ and how does this difference affect the results?

Page 10 lines 462-463- There is no evidence in this paper to suggest that this statement

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is true, especially when data from video recording are not included. I recommend deleting this statement if you do not plan to explain it with relevant data. That being said, it would be interesting to find out why these participants showed no improvement or even negative gains. Is it possible to state in what area(s) of knowledge (i.e. what questions) they showed no improvement? For instance, did they consistently provide wrong answers for questions of similar knowledge level?

Page 11 line 486- Change this sentence to “...suggest that serious games may have the potential...”

Page 11 line 502- Change this sentence to “...computer games might hold some promise for hazard...”

Page 11 line 515- In “...overcome some of the problems commonly encountered in conventional...” I suggest adding a few examples of these common problems.

Page 11 line 519- Change sentence to “our data suggest that the game could...”

Page 16 Figure 2- Consider adding an inset map to this figure to help readers with island location. I also suggest removing data not relevant to this study (e.g., peak names and names of towns not mentioned in the text). Label the volcano mentioned in the text by using the same name as the one used in the text (i.e., La Soufriere).

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., doi:10.5194/nhess-2016-23, 2016.

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