Developing a Web 2.0 technology for hazard response simulation

Dr Servel Miller and Prof Derek France
University of Chester, Department of Geography
and Development Studies.
Parkgate road Chester, CH1 4BJ
s.miller@chester.ac.uk
d.france@chester.ac.uk

Abstract

Students studying disaster/hazard management in UK Higher Education institutions (HEi's) traditionally focus on hazard mapping and process analysis, but have limited opportunities to develop their risk communication skills which are required during emergency response situations. These skills are vital for the real world and employment. Opportunities to develop risk communication skills are not readily available to students during their studies as employers are reluctant to offer placements due to legal barriers. Therefore, universities have to develop tools to provide students with this vital 'real-world' experience. Over the last two years, the department of Geography & Development Studies at the University of Chester has begun to explore and evaluate the role of the Web 2.0 tool, Yammer (microblogging/communication tool) for natural hazard (volcano) simulation exercises. This paper highlights the continuing development of the natural hazard simulation exercise through input from external emergency/contingency practitioners locally and internationally to enhance its usability. Input from practitioners has resulted in the adaptation of the tool to flooding hazard emergency response and to other geographically based scenarios (e.g. crime analysis). The input from professionals in the field has enhanced the quality of the exercise/tool as well as providing students with vital employability skills currently used in the workplace of hazard management. Feedback from students highlighted their feeling of a 'real-life' pressure situation in which 'real-time' decisions have to be made in response to a rapidly changing environment. At the same time they indicated that their experience was stimulating, fun, innovative and enabled networking and interactive opportunities between tutors and students. The development of the Web 2.0 simulation tool through contributions from practitioners and an assessment as to whether the use of such technologies enhances student-learning experience is the focus of this paper.

Keywords

Web 2.0, hazard, simulation, blogging, Yammer

1. Introduction

For effective mitigation of the impact of a potential disaster and/or to reduce the impact of an existing disaster, risk communication is a critical skill which practitioners in this field acquire and frequently utilize (Smith and Petley, 2009; Alexander, 2002). As such, it is important that students studying disaster/hazard management develop such skills and that Higher Education institutions (HEi) facilitate this skill by embedding it within the teaching curriculum (France and Miller, 2011). Risk communication, which gained popularity in the 1990's, is now an integral component of managing the risk posed by natural hazards (Faulkner and Ball, 2007). Communicating risk can be very challenging as for example; volcanic eruptions are characteristically both spatially and temporally variable in their mode and intensity, making their prediction uncertain (Cohen, White and Hughes, 2007). It is this level of uncertainty in predicting natural hazards that makes communicating the risk difficult. The challenges to effective risk communication are compounded as risk needs to be communicated to and between a variety of stakeholders, including: professionals (e.g. scientist/policy makers); the public; the media etc. As risk posed to society is highly dynamic, risk communication needs to be a reflective process in order for it to be effective (Faulkner and Ball, 2007).

Students studying Hazard Management in HEi's have limited opportunity to develop this key skill, which is vital for the real world and employment (Alastair et al, 2010). During their studies employers are generally uncomfortable in entrusting students with such a critical role due to legal implications and decision making, which in some case has to potential to significantly impact people's lives. Universities, therefore have to develop tools to provide students with this vital experience. One such tool is the use of Emergency Response Simulation exercises (Alexander, 2002). Kos (2009) demonstrated the effectiveness of their in-house developed Web based 'e-Scenario online Geographical Information System (GIS) use for natural hazard simulation' which they concluded enhanced students understanding of a hazardous environment in the Swiss Alps. Alastair et al (2010) utilized and evaluated the use of emailing and Short Messaging Service (SMS) messaging for real-time hazard management simulation. This is ongoing research but initial findings highlighted the benefits of such tools and simulation exercises in enhancing student learning.

Whilst emphasizing the value of simulation exercises on the student learning experience, Alastair et al (2010) also highlighted some of its challenges. These include: working with multiple interfaces (e.g. SMS and emailing); working with unfamiliar tools/interfaces; cost associated with the simulation tool and dependence on external providers (e.g. SMS); length of the simulation time (e.g. more than one day) and lack of flexibility in the simulation exercise. If students are to benefit significantly from simulation exercises, it is important that such challenges as outlined above are addressed where possible. Practitioner's inputs are vital in helping to overcome some of these challenges. Additionally, the input from professionals in the field will enhance the quality of the exercise/tool as well as providing students with vital employability skills currently used in the workplace. The input from practitioners also provides good networking opportunities for students and as such can potentially improve their employment prospects.

2. Development of the simulation exercise.

Effective risk communication is the major focus of the Yammer simulation exercise. As such it was essential that the chosen communication tool meets industry standard. Initial consultation with practitioners indicated that the communication tools ideally should be; cost-effective, relative easy to use, accessible to users with variable IT capability, easy to learn (too much time should not be spent learning to use the tool), real-time, easy to manipulate (change the simulation scene) incorporate graphical elements, incorporate sound and text elements, be reliable and have the capability to record an activity log. However, rarely is there one tool that satisfies these requirements due to nature of specialized emergency management organizations, which usually have bespoke systems. Some commercial communication tools are more highly flexible (ability to change the scenario) and focused on the visual element (e.g. RescueSIM) but lack sufficient text-based messaging capabilities. Others (e.g. HYDRA) are very good at text- based messaging but less flexible in changing the scenario and outcome. Most of the commercially available tools are extremely expensive (£10,000-£50,000), which proves prohibitive, particularly for a small university department. The challenge was therefore to find a cost effective medium, which would offer most of the requirements outlined above.

2.1 WEB 2.0 Technology in learning and teaching

Web 2.0 technology is described by Dawson, (2009) as a social integrative interface, which may be freely distributed and built to integrate and collectively transform mass participation into valuable emergent outcomes. This emerging technology by its nature encourages group participation, interactivity and most importantly are familiar tools (e.g. Facebook and Hi5) used by students regularly. It is therefore easy to see the attraction and benefits of utilizing these tools in HE (HEFCE, 2009).

Yammer (2012) is an example of a private social network, which like many Web 2.0 technologies is freely available on the web and which was used by the authors for a simulation exercise. One benefit of this tool is the interface which is similar to most social networking sites (e.g. Facebook) used by students. This familiarity ensure that students do not spend too much time having to learn the operations of a new software and can concentrate on the simulation exercise itself and being effective risk communicators. Yammer was developed for corporate communication and as such it operates as closed system, limiting communications within specified groups, it is real-time and incorporates graphics, sound and text elements. These are the key requirements of an effective communication tool for a simulation exercise as indicated by practitioners and the literature, and Yammer was therefore the preferred tool for the simulation exercise.

2.2 Real-time hazard simulation using Yammer

Practitioners strongly emphasized that the hazard simulation exercise should try to replicate the reality as far as possible (Kos, 2009). They emphasized that the simulation exercise should not merely strive to reproduce the sequence of events but also try to make participants feel immersed within the situation. This aspect of the simulation exercise benefited tremendously from external partners, practitioner's input and the author's participation in an actual emergency response simulated event in the workplace environment. The simulation exercise which was developed by the authors sets the scene of the Bay of Naples prior to a volcanic eruption by using video and sound clips of local speakers, street scenes, helicopter fly overs and news reports, as well providing participants the opportunity to converse with 'locals' who are talking about their day to day activity throughout the exercise. Setting the scene prior to the event is crucial as in reality the simulation exercise only lasts for 1 hour which represents several simulated months. Regular time and location updates (e.g. Video broadcast of news report with dates and location) are therefore vital throughout the exercise.

Understanding of communication protocols and reporting structure are essential in emergency situations (Kos, 2009). Failure to do so could escalate an existing disaster, making it even more difficult to manage (Kasperson, et al., 2000). Practitioners were keen to emphasize that participants are required to understand the importance of this and adhere to established communication structure. For the simulation exercise a communication pathway and reporting structure was developed (see Figure 1). Students undertook a number of mock exercises in using the communication pathway in order to become familiar with it before the assessed simulation exercise. Adhering to the communication pathway formed one of the key areas which they were asked to reflect upon at the end of the simulation exercise.

The simulation exercise was designed for small groups who are assigned to a particular sector (i.e. a geographical area of responsibility). Participants were trained (through class and mock exercises) to use a variety of resources for example, digital geo-spatial data, models, Geographical Information System (GIS) and maps to support their decision making during the simulation exercise. The simulation exercise, which lasts for an hour, starts out at very slow pace and ended at a frantic pace in the last 15 minutes - as would be the case during a rapidly changing crisis situation like a volcanic eruption. These were three phases: Phase A- Pre-eruption, 6 months before the eruption; Phase B- Pre-eruption, 2 weeks before eruption and Phase C- volcanic eruption in progress. Each group assumes the roles of Hazard analysis officer, with various members of staffs playing key roles (e.g. scientist, local resident, field officer. Each member of staff is provided with a set of questions to ask at pre-arranged times throughout the simulation. The multiple 'scientist' roles (e.g. seismologist, meteorologist, volcanologist and geologist) are critical in the simulation exercise as they are the people who have the greatest leeway in changing the direction of the simulation exercise (within reason). It is important that the individuals in these positions have a good grasp of the objectives of the simulation exercise and are able to ensure that these are achieved at the end of the exercise and within the set time.

At the end of the simulation exercise, transcripts were produced which students could access (online or hard copy) (see Figure 1), which they may draw upon when reflecting on their performance. For the assessment students were asked to produce a reflective report, which was based on their reflections of their performance in relation to: -

1. Their ability to critically evaluate volcanic hazard, vulnerability and risk in the Bay of Naples based on the changing scenarios,

2. Their understanding of volcanic processes and impacts, vulnerability, risk and their risk communication skills during the simulation exercise.

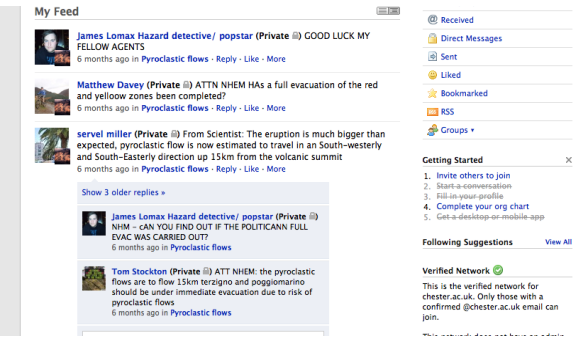

Figure 1: Typical communication log which students may use in their reflection and which was used as part of the assessment

3. Evaluation of the students learning experience

This purported benefit of using technology within education in the UK has been highlighted (Becta, 2009; Conole et al., 2006; Owen et al., 2006). However, the use of such innovative and new technology needs to be carefully monitored and evaluated to access its impact and usefulness (HEFCE, 2009). To date there has been limited assessment of the pedagogic benefits of this emerging technology, including Web 2.0. Whilst over the last three years there has been some development in this area (Kos, 2009; Plenderleith, et al. 2009; and Becta, 2009) there is still a significant void in research on the pedagogic benefits of WEB. 2.0 technologies.

As part of this research, students' experience has been evaluated using pre- and post-simulation questionnaires and focus group discussion. The evaluation process is ongoing and as such these findings are still in their preliminary phase. In total there were 42 respondents to the questionnaires. Three key themes evaluated part of this preliminary analysis. These were: students' motivational level linked to the simulation exercise, the effectiveness of the communication tool and finally, students' overall learning experience. These three themes are discussed in more detail below.

Students were asked to respond to the statement, 'Using Yammer made me more motivated and interested to learn', (on a scale of 1 to 5, where 1 = totally disagree, 5 = totally agree). As highlighted by Table 1, there were more students who agree with this statement (58.5%) (Levels 4 and 5) compared to those that disagree (27% levels 1 and 2). Most importantly, less than 10% of students totally disagree with this statement. Students highlighted their feeling of being in a 'real' emergency situation as one factor that motivated them to learn and engage with the activity. This was demonstrated by a male student who said '*Very helpful and gives an insight into what would happen in a real situation'*. Two female students indicated ' *I liked it. Definitely different, but a small taste of what it would be like in a real situation'* and *'More fast paced, greater pressure and more akin to a real life situation'*. The novelty of the tool, the easy-to-use interface and generally the use of the technology were common themes identified from students' responses as contributing to their motivational levels.

Motivational level*	Percentage
1	9.8%
2	17.1%
3	14.6%
4	39.0%
5	19.5%

Table 1: Indicates how motivated students are to learn when using Yammer for simulation exercises

N= 42, larger motivational numbers = higher motivational level

As this was a communication-based task it was importance to determine the effectiveness of the communication tool and the ease of communication. Students were asked to respond to the statement, 'I found it difficult to communicate whilst using Yammer (1 totally disagree, 5 totally agree). By large, most students (70%) disagree with this statement (see Figure 2). The general tenure of student's response could be summarised by the comment of two students who stated '*Great communication tool, easy to interact and ask for help with work if needed*' and '*Experience was good, used more modern technology* [and*] was very useful* and '*User friendly, more exciting and unique'* However, it is of concern that 20% of students did demonstrate some agreement with the statement that they found it difficult to communicate with the tool. Analysis of students comments indicate the speed of the 'feed' on the site as one problem as reflected in the statements '*Very good, though can be slow to load at times. Conversations also get mixed up'* and *'Information could easily be lost if too many posts are added'*. The issue of 'conversation mix-up' (not displayed in the correct order in terms of response time) as highlighted in previous statement is as of great concern, as it essential that students respond to the all postings relevant to them. Missing important posts could mean making wrong decision, which could affect their performance in the simulation exercise. The chaotic nature of the feed on some students interface may be down to unfamiliarity of some aspects of using the tool, which can be addressed through more pre-simulation training. Some of this unfortunately is inherent in the Yammer programme itself, when responding to multiple threads. Yammer operates by placing the last thread you responded to the top of the screen. If there is an update from a separate thread, it is likely you may miss a recent update which may not be related to the last thread responded to. The solution is to keep all discussion to a single thread but this could prove problematic in a complex simulation as the one we did used multiple roles. For future simulation exercises it therefore important to provide more training on the use interface. The issue of being very slow, we have concluded may be down to our own internal University network (one student did the exercise overseas, in Spain and did not experience the same problem). For simulations with large groups this may become an issue which we need to address for future events.

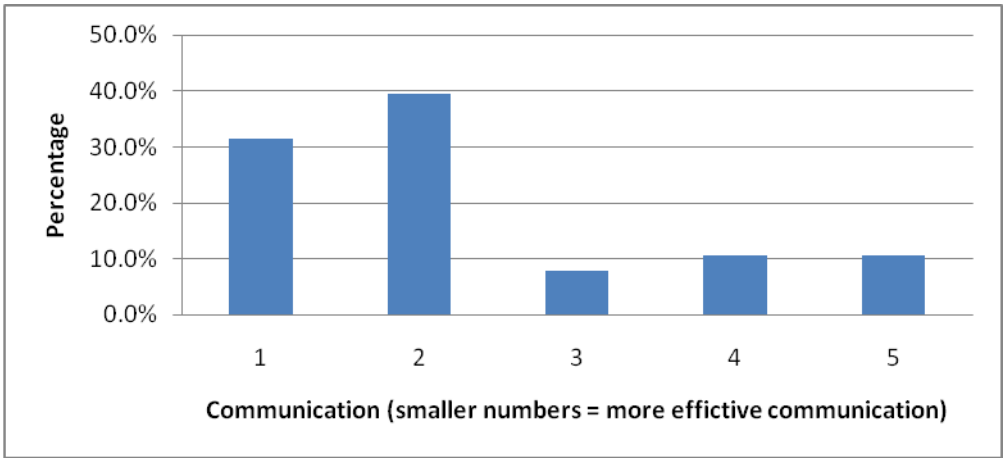

Figure 2. Students' response to the statement on the questionnaire 'I found it difficult to communicate whilst using Yammer (1 totally disagree, 5 totally agree)'

The evaluation gathered students' views on their overall learning experience as part of the simulation exercise. Each student was asked to provide three words that best summaries their learning experience. The most common words were interesting, exciting and interactive (see Figure 3). The innovative nature of the exercise was also highlights (see Figure 3) and is evident in the statement '*More fun, With interaction, Good way to learn*'. The pace of the simulation and the ability to recreate a feel of a real life situation were also identified as key factors contributing to a positive learning experience. As one student indicated 'It [The simulation exercise] *demonstrated real-life hectic scenario*'. The reaction of a 'real-life feel' is very important as this was one aspect we were keen to develop upon by consulting with practitioners, which appears to have paid dividends.

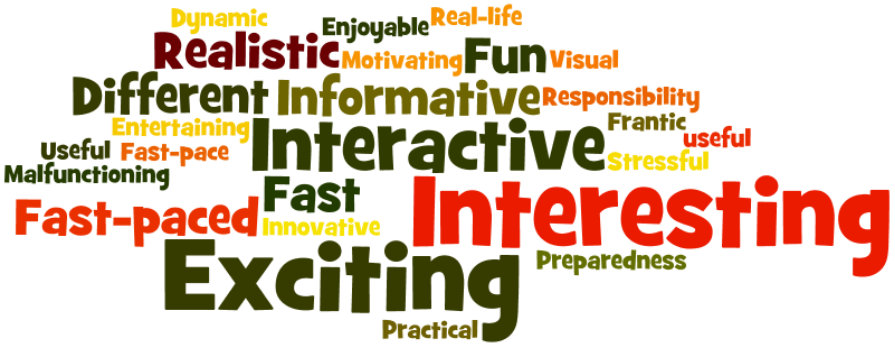

Figure 3. A 'wordle' representing the students overall response to their learning experience. N=42

4. Conclusion

Simulation exercises are useful educational tools, which can provide students with valuable and vital emergency management and risk communication skills that are difficult to develop whilst studying on an Undergraduate degree programme. However, by working with practitioners, this research has demonstrated it is possible to develop an exercise which can provide students with a 'feel of a real-life emergency situation.' The use of Web 2.0 technology demonstrates that a cost-effective tool, which is already familiar to students, may be effectively utilized for such exercise. The general tenure of student's feedback has been positive and that it enhances their learning experience. Students find the exercise to be interactive, innovative and interesting, which contributes to their motivation to learn about natural hazard processes and emergency management. There are some limitations of the exercise identified, for example the speed of the tool and the manner of in, which it displays, updated information. However, these are issues which may be overcome with careful planning and further investment in IT facilities.

5. References

Alexander, D. (2002), Principles of Emergency Planning and Management. Oxford: Publisher. Becta (2009) Software and Internet analysis: Micro-blogging in education. available from: http://emergingtechnologies.becta.org.uk/index.php?section=etr&rid=14363

Cohen, E., Hughes, P. and White, P.B (2007) Media and bushfires: A community perspective of the media during the Grampians Fires 2006. *Environmental Hazards.* Volume 7, Issue 2, *Pages 88-96*

Conole, G., de Laat, M., Dillon, T. and Darby, J. (2006) LXP: Student experience of technologies. Bristol, uK: JiSc. available from: www.jisc.ac.uk/media/documents/programmes/elearningpedagogy/lxpprojectfinalreportdec06.pdf [23 August 2009].

Dawson, R. (2009) *Implementing Enterprise 2.0: A practical guide to creating business value inside organizations with web technology*: Advanced Human Technology. (Publisher?)

Faulkner, H., and Ball, D. (2007) Environmental hazards and risk communication *Environmental Hazards.* Volume 7, Issue 2, (remove hyperlinks) Pages 71-78.

HEFCE (2009) Enhancing learning and teaching through the use of technology: a revised approach to HEFCE's strategy for e-learning. Higher Education Funding Council for England.

France,D. and Miller, S. (2011) *Simulating an Emergency Response Scenario using YAMMER a Web 2.0 technology. Association of American Geographers, Annual Meeting, Seattle, Washington, April 2011. Available from http://meridian.aag.org/callforpapers/program/AbstractDetail.cfm?AbstractID=38597*

Kasperson, R.E. Kasperson, J.X., Pidgeon, N.F., Slovic, P., (2000) The social amplification of risk framework: Assessing fifteen years of research and theory. In Pidgeon, N.F. Kasperson, R.K., Slovic, P. (eds), *The Social Amplification of risk*. Cambridge University Press (Place published).

Kos A (2009) Developing capacity for natural hazard management using an active learning approach and web-based geographical information .Natural Hazards Earth System Science., 9, 85–95, 2009

OWEN, M., GRANT, L., SAYERS, S., FACER, K. 2006. Social Software and Learning. FutureLab: Bristol, UK. Available online at: http://www.futurelab.org.uk/home15/01/11].

Plenderleith, J. and Adamson, V. (2009) The Policy landscape of Transformation; in: Terry Mayes, T., Morrison, D., Mellar, H Bullen, P. and Oliver, O. (ed) INCOMPLETE

Smith, K. and Petley, D. (2009), *Environmental Hazards: Assessing risk and reducing disaster (5th Ed)*, Routledge. (place published)

Yammer (2012) Yammer: The Enterprise Social Network. Available from https://www.yammer.com/