APPLYING 3D WEB-BASED AND AUGMENTED REALITY ENVIRONMENTS IN PUBLIC AVALANCHE EDUCATION

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Increased use of and accessibility to computers has created a surge in web-based science learning exercises. But systematic implementation of interaction design principles and formal evaluation of conceptual learning in web-based hazard education applications has been limited. This pilot project attempts to evaluate and improve upon existing web-based avalanche education tools using, as a case study, a route-finding exercise from the Canadian Avalanche Association’s (CAA) new online safety course. This project specifically explores the potential for using highly interactive geovisualization technologies such as 3D web-based and augmented reality environments to increase comprehension of avalanche science concepts and risk perception. Avalanche education materials have traditionally relied on 2D diagrams, text, and images. New web-based tools continue to use 2D representations, even though such representations may be limited in their ability to convey abstract and complex, spatially dynamic phenomena and processes. The CAA’s current interactive route-finding exercise permits users to attempt to plot a route on a 2D photograph while they receive visual feedback regarding terrain hazards. The exercise represents a step forward in using new technologies, but the extent to which this tool affects learning and risk perception has not been formally evaluated. It is possible that traditional use of 2D representations in avalanche education materials may impede understanding of avalanche science concepts. Further, those recreationalists’ misperceptions of avalanche risk may partially stem from the limitations of current education methods and tools. We are currently developing alternative 2D and 3D versions of the current CAA exercise, which implement constructivist learning principles, systematically incorporate interaction design principles, and integrate the new Avaluator decision-making card. The Avaluator card helps recreationalists identify and avoid obvious hazards in avalanche terrain. These new exercises permit users to review an avalanche bulletin, explore a basin-scale terrain using 2D photographs or a 3D terrain model, and plot a route as they receive feedback about the presence of avalanche hazards. We are also developing an augmented reality prototype to explore whether this new technology has potential for avalanche education. Differences in conceptual understanding and risk perception among users will be evaluated online using repeated-measure testing and surveys. The overall goal of this research is to provide a roadmap for future interactive avalanche education. This work attempts to determine what combination of geovisualization technologies, education design principles, and interface and interaction design is most effective in increasing user comprehension and risk perception.

Key words: Avalanche education, Augmented reality, Geovisualization, 3D terrain visualizations