Impact of Curriculum Design for Disaster Risk Reduction Education Using Web GIS Technology on Student Learning Effects in Secondary Schools

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As the United Nations Development Programme (UNDP) pointed out in 2015, the first priority to implement disaster risk reduction (DRR) is to understanding disaster risk. The concept of disaster safety must be included in education from the childhood stage to reach the goal of sustainable disaster reduction. Geospatial thinking is essential to the Earth sciences where there is a heavy reliance on cognitive thinking skills that include understanding spatial relationships, the ability to use tools of representation properly, and reasoning skills. Some researchers have already constructed online systems based on the geospatial technologies for DRR education using hazard maps. The US National Research Council pointed out that the research base still lacks specific knowledge of what kinds of geospatial learning experiences lead to student improvement, of how to infuse geospatial thinking in the Earth science curriculum, and of how to use geospatially enabled learning technologies with classroom learners. The Web-based GIS (Web GIS) enables online geographic visualization and analysis using a web browser. This study utilizes Web GIS as a visual instructional technology to support geospatial thinking, and analyzes factors affecting the learning effect of students based on the developed systematic DRR education material and a curriculum design approach. They were implemented multiple times in the classrooms of Japan and China, to explore what kind of technological, pedagogical, and content knowledge is required for teachers to effectively use Web GIS. This approach may provide a coherent chain of reasoning to link evidence to theory so that the structured education systems can be generalized and replicated in a variety of schools. Questionnaire surveys were also conducted to collect information about the understanding of teachers and students along with their feedback on the system and the curriculum design. The results may allow us to construct an optimal guideline for DRR education combined with science and technology.

Keywords: Web GIS, Geospatial Thinking, Disaster risk reduction, Curriculum approach