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The practice of a developing teaching programme by JpGU for earthquakes to lower secondary school students

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The committee of school curriculum at Japan Geoscience Union (JpGU) has investigated into the school curriculum of RIKA, which is roughly a subject of natural science, from primary schools to universities without the earth and planetary course at universities. According to our former studies (NEMOTO et. al., 2009; NEMOTO et. al., 2010), technical terms which appear in the present 5 types of RIKA's textbooks for lower secondary schools are different.

On the one hand, for instance, the words P wave, S wave, trench, earthquake, seismometer, principal motion, epicentre, hypocentre, seismic intensity, tsunami, plate, magnitude, the 1995 Kobe earthquake, and the 1993 Hokkaido Nansei-oki earthquake appear in all 5 textbooks. On the other hand, ridge, duration of preliminary tremor, seismic intensity meter, and uplift appear in 4 textbooks, oceanic plate, continental plate, fault, and subsidence appear in 3 textbooks. In the same way, Primary wave and Secondary wave in English, landslide or landslip, ground fissure, hypocentral distance, Japan trench, active fault, former seismic intensity scale, seismic intensity scale, and distribution of seismic intensity appear in 2 textbooks, and GPS, instrumental seismic intensity, burned-out house, completely or partial destroyed house, rock fracture experiment, island arc, landslide, earthquake generating car, earthquake country, news flash of earthquake, seismic energy, ground, seismic hazard, epicentral distance, 'SHINGENCHI' which is roughly in and around epicentre, hypocentre distribution, 'CHOKKAGATAZISIN' which is roughly speaking an earthquake directly above its epicentre, debris avalanche, disastrous earthquake, and disaster prevention day appear in only 1 textbooks.

That is to say, only one textbook describes the relationship between magnitude and seismic energy. Moreover, ground motion does not appear in any textbooks. Therefore, students may be liable to confuse the meanings of seismic intensity with magnitude.

At first, we accordingly examined what ratio of students, who belong to universities, understand the meanings of seismic intensity and magnitude. Secondly, we made new teaching curriculum of earthquakes for lower secondary school students including with seismic intensity, magnitude, seismic energy, and strong motion. Thirdly, we practiced teaching the first grade students at RIKA classes in a lower secondary school using the proposed earthquake programme. The proposed key sentences are as below;

- (1) The scale of earthquake is magnitude. Magnitude is related to seismic energy.
- (2) The scale of ground motion is seismic intensity.

We used not only paper materials but also several simple experiments by a teacher and students at the practical classes. In one simple experiment, for instance, hard and soft jelly are used in order to understand the occurrence of different ground motion on hard and soft grounds into same input motion, respectively. For the purpose of measurement of the class effectiveness using the proposed programme, questionnaires were sent to the students.

As a result, using ground motion as part of an earthquake education for the first grade students in lower secondary schools is effective in order to understand the meanings of seismic intensity and magnitude. In this presentation, we will report the results in detail and clarify remaining problems in order to further developing the curriculum in future.

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