Enhancing School Safety Activities: The Contribution of Geological Engineers ~An Example from Tochigi Prefecture's Elementary Schools~

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Abstract: Japan is constantly exposed to the risk of diverse natural disasters such as earthquakes and torrential rains. This study examined the role geological engineers could play in enhancing the quality of disaster prevention education at elementary schools in Tochigi Prefecture, Japan. This was done through interviews with faculty and observations of evacuation drills, handover drills, and other activities. The target schools implement training and learning activities tailored to the region's topographical characteristics, cultivate students' ability to protect their own lives. These efforts have been confirmed to enhance students' disaster awareness and safety action capabilities. However, challenges exist in learning knowledge about disaster prevention and disasters, including teacher workload, difficulty accessing specialized information, and the complexity of the content, making sufficient implementation difficult in some aspects. Addressing these challenges, geological engineers providing specialized expertise to educational settings is considered highly likely to contribute significantly to improving the quality of disaster prevention education.

Keywords: ***School safety, DRR in Education, Community engagement, DRR thinking and action.***

Introduction

Japan continues to face risks from diverse natural disasters, including a major earthquake directly beneath the capital, a massive Nankai Trough earthquake, and increasingly severe and frequent torrential rains and typhoons. In Japan, a country prone to frequent natural disasters, disaster prevention education is essential for protecting lives. Disaster prevention education for students is promoted with the aim of enhancing their awareness of disaster risks and fostering the ability to make appropriate judgments and take appropriate actions during disasters (e.g. Ministry of Education, Culture, Sports, Sports, Science and Technology, 2013, 2019).

The School Health and Safety Act mandates that all schools develop a School Safety Plan and a Crisis Management Manual.

The natural disasters specified in these guidelines are meteorological disasters, lightning, tornadoes, earthquakes and tsunamis. Each school prioritizes disaster prevention education and evacuation drills for disasters with high occurrence frequency and risk of damage, based on regional characteristics.

Numerous disaster prevention education programs such as explanations of disaster mechanisms (e.g. Sato and Fujioka, 2020) have been implemented to date. Furthermore, while research exists in higher education institutions and many private companies conduct disaster prevention classes and create/distribute awareness materials, such initiatives remain limited. Given that geological engineers can contribute significantly to school education, this study examined how geological engineers can contribute to school education and what outcomes can be expected.

Methodology

This study was conducted through semi-structured interviews with faculty responsible for the target elementary schools. The interview items are as follows. Interview content was recorded and transcribed verbatim, then analyzed as qualitative data.

- Basic Policy for Disaster Prevention Education
- Specific Implementation Content
- Collaboration with faculty, Parents, and the Community
- Students' Responses and Outcomes
- Challenges and Future Directions

Results

(1) Fundamental Approach to Disaster Prevention Education

The goal is for students to acquire the ability to protect their own lives, emphasizing the development of judgment, action, and a cooperative attitude during disasters.

(2) Annual Initiatives and Practical Activities

Evacuation drills are conducted four times annually, primarily targeting earthquakes and tornadoes. The inclusion of tornadoes reflects the regional characteristics of Tochigi Prefecture, where they frequently occur and cause significant damage. Parent handover drills are also conducted every other year, with the school's responsibility extending from

evacuation within the school grounds to the handover to parents at home.

(3) Collaboration with faculty, Parents, and the Community

The disaster prevention manual is updated annually. faculty training is conducted once a year to confirm roles during emergencies and ensure shared understanding, including for new faculty. Information is provided to parents via the school website and newsletters. Fifth graders participate in lessons creating personal timelines for flood preparedness, conducted in cooperation with the town's disaster prevention specialists. These timelines are taken home to help spark discussions about family preparedness and evacuation methods. Collaboration with the community occurs through lectures and drills with the fire department and police.

(4) Students' Responses and Outcomes

Students demonstrate improved seriousness in evacuation drills and learning activities, showing heightened disaster awareness through repeated training. Sustained repetition and reinforcement remain essential to link knowledge with action.

(5) Challenges and Outlook

Differences in individual students' understanding are observed, and staffing levels and time constraints for faculty also pose challenges. Future efforts will aim to develop students' ability to think and act independently, fostering collaboration with families and the community. While emphasis is placed on evacuation, there is room for education to cultivate judgment skills during disasters.

Discussion

Providing Expert Knowledge and Its Effects

Geological engineers involved in disaster prevention education can provide specialized insights into disaster mechanisms. Students' understanding of how disasters occur can enhance their predictive and decision-making abilities. For example, specific knowledge—such as the difference between P-waves and S-waves in earthquakes or the causes of landslides and slope failures—can aid in making informed decisions during disasters.

Promoting Understanding of Regional Geological Characteristics and Its Effects

Understanding the geological characteristics specific to each region—such as mountainous areas and steep slopes, lowlands and plains along rivers, coastal areas, and regions near volcanoes—enables students to visualize disaster risks more concretely. This deepens their understanding of hazard maps and facilitates consideration of safer evacuation sites and routes. Enhanced disaster prevention awareness also leads to providing advice to others and improving the disaster resilience of the local community.

Conclusion

This study explored how geological engineers can contribute to school safety activities, focusing on elementary schools in Tochigi Prefecture. Through the study, it was found that schools are making significant efforts to enhance students' disaster awareness and safety actions by tailoring education and training to local topographical characteristics. Faculty proactively update safety plans and manuals and collaborates with parents and the community to foster a culture of preparedness.

However, challenges remain, such as the limited time and resources available to faculty and the difficulty of accessing specialized knowledge. In this context, the involvement of geological engineers—providing expert knowledge about disaster mechanisms and regional geological characteristics—can play a vital role in improving the quality of disaster prevention education. Their participation not only deepens students' understanding of disaster risks but also empowers them to make informed decisions and take effective action during emergencies.

The findings of this study highlight the significant potential for geological engineers to contribute to both the cognitive and practical aspects of disaster risk reduction in school settings.

Acknowledgement

I would like to express my sincere gratitude to the Takanezawa Town Office in Shioya District, Tochigi Prefecture, and to Kamitakanezawa Elementary School in Takanezawa Town for their invaluable cooperation in conducting this survey.

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