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Volcanic Eruption: Students Develop a Contingency Plan

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Dangerous, loud, sensational, exciting – natural hazards have what it takes to get students attention around the globe. Arising interest is the first step to develop an intrinsic motivation to learn about the matter and endure the hardships that students might discover along the way of the unit. Natural hazards thereby establish a close-knit connection between physical and anthropological geography through analyzing the hazardous event and its consequences for the people living in the affected area. Following a general principle of didactics we start searching right on our doorsteps to offer students the possibility to gain knowledge on the familiar and later transfer it to the unknown example. Even in Southwest Germany – a region that is rather known for its wine than its volcanic activity – we can find a potentially hazardous region.

The “Laacher See” volcano (a caldera lake) in northern Rhineland-Palatinate is according to Prof. H.U. Schminke a “potentially active volcano” . Its activity can be proven by seismic activities, or experienced when visiting the lake’s southeastern shore, where carbondioxid and sulphur gases from the underlying magma chamber still bubble up. The Laacher See is part of a range of volcanoes (classified from ‘potentially active’ to ‘no longer active’) of the East Eifel Volcanic Field. Precariously the Laacher See is located closely to the densely populated agglomerations of Cologne (NE, distance: 45 km) and the former capital Bonn (NE: 35km), as well as Koblenz (E: 24km) and the Rhine river. Apart from that, the towns of Andernach (E: 8km $\pm$ 30 000 inhabitants) and Mayen (SW: 11km $\pm$20 000 inhabitants) and many smaller towns and villages are nearby due to economic reasons. The number of people affected by a possible eruption easily exceeds two million people considering the range as prime measurement. The underlying danger, as projected in a simulation presented by Prof. Schminke, is a lava stream running down the Brohltal valley, causing a blockage and afflux of the Rhine, which, due to the given conditions of a very narrow valley, would lead to excessive flooding affecting even the greater Rhine-Main-region. Not to mention the consequences of a pyroclastic flow, dropping volcanic bombs and further hazardous/disastrous consequences.
In comparison to other “potentially active” or “active volcanoes”, e.g. the Vesuvius, the Laacher See is scarcely monitored and according to recent publications poorly analyzed in terms of contingency and evacuation plans. This offers space for critical analysis and creative solutions to an existing problem. Short: We need geographers and their knowledge to provide help.

Given these facts, the Laacher See could be the layout for a very interesting geography project bringing together previously gained knowledge and understanding of volcanic activities, their destructive powers, consequences and risks in case of an eruption in combination with their topographical characteristics. Your students thereby act the role of a geoscientist developing contingency plans and evacuation zones for the greater Laacher See area. This involves a detailed analysis of the topographical characteristics based on (classic) topographic maps or online via the use of a GIS (e.g. Google maps). In a second step students enlist the possible consequences they already know according to their range and copy them onto a transparency layer on the topographic map. Using such a layer technique students add population density, important topographic features and maybe even anticipated wind directions to their map. The information density and the specific layout of this map are thereby only determined by the student’s previous knowledge, their personal abilities and skills and the amount of time provided. This offers the opportunities to even differentiate the task within your group and provide support adjusted to the individual students level.
On the basis of their own thematic map your students should be able to develop a (basic) plan to evacuate people from the affected regions. Based on the abilities of your group you can vary the task in many different ways, such as adding information on traffic and public or private transportation to the scenario.

Didactic Aspects:

Nevertheless it cannot be aim of such a project to develop of a real-life evacuation plan, as this would exceed your student's abilities by far. The focus should rather be on the process of dealing with the problem and developing solutions to it, than on the mere product e.g. a complete plan. This approach corresponds with recent tendencies in German didactics of teaching geography at school favoring the so-called "prozessorientiertes Experimentieren"(see: Lethmate, Otto and Wilhelmi for further reference) as part of training your students (geographic) skills. Applied to the presented task of developing an evacuation plan, you should encourage your students to give argumentative proof for the decisions they make in order to compare their results from a problem solving perspective.

Overview:
[U+27A2] What: process- driven role-play "planning evacuation in case of an eruption of a potentially active volcano (Laacher See)"
[U+27A2] For whom: adjustable from German form 8-11 (age: 14- 17 years)
[U+27A2] Time: depending on the prior knowledge of volcanoes a min. of 45-90 minutes.

Sources:
Lethmate, J.: Sind geographische Experimente Experimente? Praxis Geographie 33, Heft 3, S. 42-43

Otto, K.-W. u.a.: Das geographische Experiment im Kontext empirischer Lehr-Lernforschung, Geographie und ihre Didaktik 38 (2010) H.3, S. 133-145

Wilhelmi, V.: Die experimentelle Lernform. Herausforderung des kompetenzorientierten Geographieunterrichts, Praxis Geographie 42, Heft 7-8, 2012, S. 4-8