The Great Debate: A Vehicle for Inquiry and Critical Assessment of Knowledge

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Abstract
Senior students in Geological Engineering at Queen’s University take part in “The Great Debate” as part of GEOL 445 Site Investigation and Case Histories in the fall of their fourth year, a timed formal debate on a topic of societal importance such as storage of spent nuclear fuel or sequestration of CO2 in deep geological repositories. Students work in instructor-assigned teams and are guided in their work by 5 interim deliverables that are undertaken during class time. The Great Debate work is supported by lectures by the instructor and guests from a wide variety of sub-disciplines in Geological Engineering. Students report a high degree of satisfaction and high level of learning after the debate. In addition, they are often surprised at how engaged they become. Some students change their point of view concerning these topics and some become very passionately pro or con. Acquiring technical knowledge, including proficiency with government regulations, while developing engineering judgment and an appreciation of the wider implications of geological engineering practice are achieved by almost all participants. The format of the debate, and roles played by members of the team can be modified easily to accommodate students with disabilities or for whom English is not the first language.

1 Technical and Non-Technical Aspects
Site investigation is a staged, project-specific process. After a review of existing information, a field testing program is designed to test an earth model so that the third stage, a tunnel through rock of different types and strengths or a deep well in a new gas play, e.g. can be implemented safely. Large-scale projects (e.g. Niagara Tunnel Project, B.C.’s Sea to Sky Highway) are tax payer-funded, multi-stakeholder projects. Cost are not uncommon and are usually attributable to insufficient site investigation. Stakeholder issues are often the “deal breakers” in such projects. Canada’s first attempt at implementing a deep geological repository for spent nuclear fuel was halted because of public dread. Two decades later, the Nuclear Waste Management Organization has consulted widely with Canadians so that a management system for spent fuel can be achieved. Thus, the impact of public opinion may be as important as the engineering and it is important for graduates to understand public concern in an ethical and meaningful way.

2 What is Learned
On debate night the speaking roles are timed and speakers are cut off ruthlessly. Notes are allowed, and the coach may move freely among members. The con side usually questions the reliability of the technical information used by the pro side, and raises issues likely to be aired at a citizen’s town hall meeting where there is opposition to a major engineering undertaking. Students become entrenched in their positions; emotions run high. However technical issues are portrayed accurately and precisely. The judges pronounce winners on the basis of technical merit and quality of debate. Students report in post-Debate reflections that they had been sceptical but in the end found themselves engaged and excited. Many are astonished at their learning and the debate itself. A further deliverable, a portfolio containing interim deliverables, notes, and references is required. The final exam tests both knowledge and attitudes around the debate topic. Students often identify the Great Debate as the highlight of GEOL 445.

3 Summary
Academic debate can deeply engaging for engineering students especially if the topic is current and technically interesting. They conduct research as a team and as individuals, pool information, and carefully evaluate the reliability of information they obtain.