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<th>BACKGROUND</th>
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| Traditional Fracture Mechanics class is - heavy on mathematics. - focusing on mathematic and engineering mechanics students - having too many mathematical problems. | **Target population**  
- 1st year of PhD students of Engineering and Sciences (~20 students)  

**Course structure**  
• 5 mins reviews on previous materials  
• 30 mins lecture on new materials  
• 15 mins to work on problems  
• 15 mins to present a student’s research and Q&A | 1. Identify and apply principles of fracture mechanics, appropriately to interpret the behavior of brittle materials.  
2. Distinguish (a) how ductile materials and brittle materials may break, (b) how the fractures of each material initiate and propagate, and (c) how linear fracture mechanics for each material are different.  
3. Relate the concepts to well-known standards accepted in industry.  
4. When presenting historical failure case study, identify, describe, and analyze failure behaviors based on fracture mechanics.  
5. Analyze testing results of brittle geological materials to evaluate fundamental fracture mechanics properties.  
6. Present the research paper including clear problem statement(s), mathematical analysis, theoretical and experimental fracture mechanics, and supporting references.  
7. Explain, within the context of the fracture mechanics, the goals of the fracture mechanics and how realizing these goals may impact all engineering disciplines. |

Inductive Teaching such as “driving question” will help students connect class content to their metacognition. The assessments mentioned earlier will help me:  
1. Assess students’ learning at the end of class and help students practice chunk the lessons that they learn during the class.  
2. Assess how students solve assigned problems and how they describe their problem-solving methods in their homework.  
3. Encourage active and self-reflective, and self-directed learning skills after taking the class.  

Eunhye Kim, Ph.D., P.E., Assistant Professor of Mining Engineering, Research Interests: **Fracture Mechanics of Geomaterials, Rock Mechanics** (B.S. Civil Eng. & Computer Sci., M.S. Civil, Urban & Geosystem Eng., Ph.D. Energy & Mineral Eng.)