Measuring Student Success in the Science Classroom through Inquiry-Based Discussion Formats and Student Discourse

**Project Focus Question**
How do student-led, inquiry-based discussion formats affect student success in the science classroom?

**Sub-Questions**
1. What type of relationship exists between inquiry-based discussion formats and content comprehension?
2. In what ways do inquiry-based discussion formats affect student participation?
3. How do inquiry-based discussion formats affect students’ scientific communication skills?

**Data Collection and Analysis Methods**

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**Student Quotes**

“I feel engaged in group discussions because people listen to my ideas and take into consideration my thinking.”

“It [scientific discourse] is fun.”

“I think you learn more because you have to defend your ideas, and everyone else shares their ideas.”

**Background**

Florence-Carlton High School is one of the smaller high schools located in western Montana. It averages about 270 high school students per year, and offers a variety of science elective courses. I teach earth science to all incoming freshmen. Many of these students begin the school year with little experience in scientific reasoning and communication. Often, my students appear unengaged in classroom discussion settings, and unconfident in communicating their own ideas, observations, and questions. Without these discussion skills, my students struggle to engage in higher level thinking processes. The primary focus of this study was to evaluate the effectiveness of inquiry-based discussion formats on student success in the science classroom.

**Treatment**

I implemented this intervention with one section of my four earth science classes during an eight week period beginning in late January, 2017. During the intervention, each class period began with a brainstorming discussion, transitioned into a lesson usually involving a lab investigation, and closed with a sense making discussion. During the sense making discussions, students were challenged to discuss a complex topic relating to the day’s lesson, formulate a response, and defend their response with evidence. Lastly, students conducted two large student-led investigations following a scientific argumentation framework. This framework required students to formulate a question, research that question and make a claim, defend that claim with evidence, and present that claim to their peers.

**Results**

Student performance in science content comprehension, participation, and scientific communication skills were compared between the treatment group and the control group to determine the impact of inquiry-based discussion formats on student success. Success between the two groups was measured through student journaling, Likert surveys, student interviews, field notes, and assessments. Improvements to content comprehension and student participation existed, but statistically, were not significant. However, there was a notable improvement to scientific communication skills among the treatment group.

**Results**

(Prompt: Sense Making Discussion)

**Prompt:** The destructiveness of an earthquake is dependent on _______. This is evidenced by _______.

**Student response:** “The destructiveness of an earthquake is dependent on the location in which it occurs. If a massive earthquake hits an area that is unpopulated, it won’t matter as much as a smaller earthquake that hits a heavily populated area. This is evidenced by Quake Lake and the 1906 San Francisco earthquake. Quake Lake was caused by a massive earthquake, but it was nowhere near as devastating as the 1906 San Francisco quake because Montana has a lot less people and fewer buildings to destroy.”

**Discussion**

As an educator, I have experienced the importance and value of implementing student discourse in the science classroom. While more time consuming than traditional discussion formats, inquiry-based formats can potentially build a stronger science program by teaching students how to communicate as scientists. I experienced students questioning one another’s claims, defending their own claims using evidence, and verbally discussing the findings of scientific investigations. Rather than myself, as the educator, providing reasoning for scientific claims, students developed their own. Because of this, students moved away from basic memory-recall learning, and began learning science as scientists do.