How Did a Grade 5 Community Co-Structure Driving Questions for Knowledge Building about Ecosystems?

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The Issue/Problem

In knowledge building community, members need to take on collective responsibility for charting the directions and courses of inquiry (Scardamalia & Bereiter, 2006). Guiding students to form driving questions based on core concepts and big ideas of a particular knowledge domain plays an important role in starting and sustaining students' knowledge building inquiry progress. The process of forming driving questions transforms students from having all kinds of questions about a particular knowledge domain to being able to notice the meaningful patterns of all their questions so that they can "think effectively about problems" (Bransford et al, 2000). How such process can effectively take place and how Knowledge Forum could be used to support the process need further investigation.

Major Goal

This poster will show how a 5th grade knowledge building community formed "juicy" driving questions to sustain their inquiry about ecosystems. The research goal of this study is to understand how students' initial individual questions were guided to evolve into collective questions through a bottom-up approach.

How the Research Addresses the Issue/Problem

Students from a Grade 5 classroom studied ecosystems supported by Knowledge Forum (Scardamalia & Bereiter, 2006) over a four-month period. Students began their inquiry with watching videos and reading books about ecosystems while taking notes about what they learned and what they wondered about. On the basis of students' individual questions, the whole class had a reflective meeting to review the questions, identify connections, and formulate collective areas of wondering as the focus of their subsequent knowledge building work. Rich data were collected including student entries in science notebooks, classroom videos, and online discourse records. The data were analyzed qualitatively to trace the development of questions and ideas.

Findings and Advances

Students generated a rich set of individual questions (see Table 1) based on their initial research using videos and books. In a whole class discussion, students shared their questions and clustered these questions based on ecological topics (see Figure 1). Based on the sharing and review of questions, in the next class session, students wrote down what they thought as overreaching "juicy questions" for deeper research. They wrote the questions on post-it notes and organized the questions on the chart paper. The teacher guided students to notice meaningful patterns among their questions. Five collective areas of inquiry were generated through this process and named in connection with the core concepts and "big ideas" about ecosystems (NGSS Lead States, 2013). Students indicated the connections between their individual questions and these core areas, and they wrote down their names under the wondering areas (Figure 2). In the following whole class meeting, students developed driving questions for the five areas of inquiry. The class formed a "driving question tree" that had the driving questions as five big branches and students' interest in particular ecosystems as small branches (Figure 3).

"An important aspect of learning is to become fluent at recognizing problem types in particular domains" (Bransford, 2000, p. 44) and "the ability to recognize problem types has been characterized as involving the development of organized conceptual structures, or schemas, that guide how problems are represented and understood" (p. 33). In this study students' ways of perceiving and connecting their ecology questions evolved. The teacher guided students to develop a sensitivity to patterns of their questions. Students do not have all the answers to all their ecology questions, but they noticed meaningful patterns and organized problems around big ideas through a reflective discursive process. The "driving question tree" became a shared structure that guided student participation and collaboration.

Next steps

We are conducting more systematic data analysis to elaborate the development of driving questions and the related progress of inquiry. Improved classroom technology support and pedagogical strategies are needed to make the process more efficient to help students generate “juicy question tree” to guide their reflection and participation.

References

Bransford, J., Brown, A. L., Cocking, R. R., & National Research Council (U.S.). (2000). *How people learn: Brain, mind, experience, and school*. Washington, D.C: National Academy Press.

NGSS Lead States. 2013. *Next Generation Science Standards: For States, By States.* Washington, DC: The National Academies Press.

Scardamalia, M., & Bereiter, C. (2006). Knowledge building: Theory, pedagogy, and technology. In R. K. Sawyer (Ed.), Cambridge handbook of the learning sciences (pp. 97-115). New York: Cambridge University Press.

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Table:

1. [Ecosystems]: How long does it take to form a good ecosystem?
2. Are there abiotic or biotic factors in an ecosystem?
3. [Aquatic]: How long would it take for freshwater fish to die in salt water, and vice versa?
4. Plankton are like plants on land?
5. [Food web]: Is a food web never-ending?
6. If the food web is never-ending, then are we all, I mean every living organism on earth, connected?
7. [Biomes]: I still don't exactly get what a biome actually is.
8. Are some biomes easier to survive in than others?
9. [Food chain]:Doesn't the whole food chain start with the sun?
10. Are there more 2nd level or 3rd level consumers?
11. Does succession happen every day?
12. If we stop polluting, would be that be an example of secondary succession?
13. [Brain pop ecosystems]: How long does it take a species to adapt?
14. [Land biomes]: How come there are different biomes?
15. How did they each evolve?
16. Since the temperate forest has fertile soil, could all plants survive there?
17. What biome has the most life?
18. [Deserts]: What biome is the largest? Desert?
19. Do more animals live more in cold deserts or hot deserts?
20. [Tropical rain forests]: Since the Canopy has the most animals, what has the least?
21. How can I help stop destroying the rainforest?
22. [Tundra]: Do plants grow in the alpine tundra?
23. [Extinction]: How many extinct species are there?
24. What species is least likely to go extinct?
25. If such problems are caused by human activity, how come we keep on doing what we are doing?
26. [Taiga]: Do animals in the taiga adapt from season to season?

Table 1: One student’s individual questions generated in two class sessions

Figures:

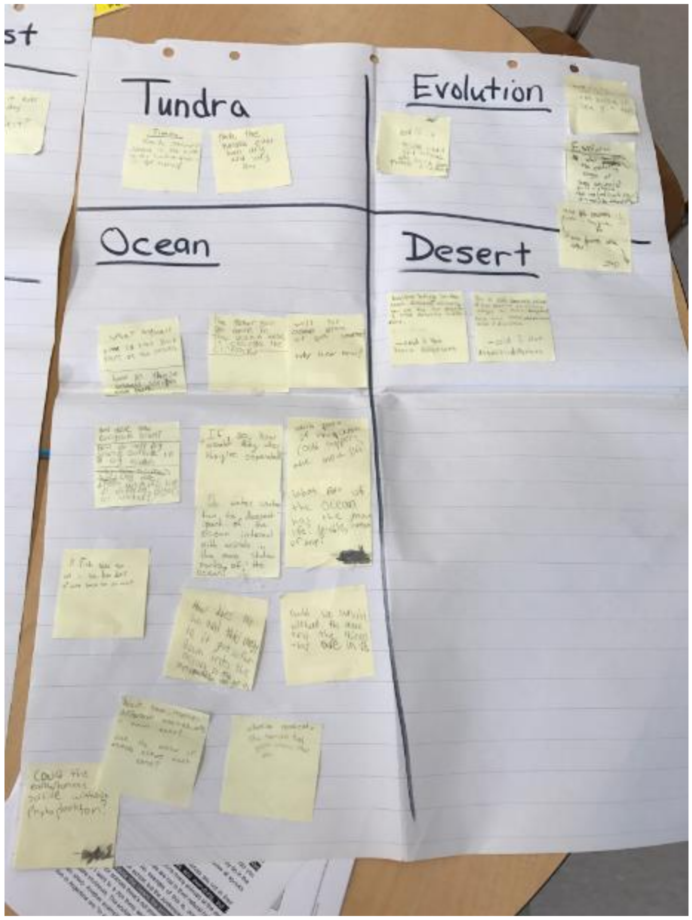

Figure 1: Individual questions categorized based on topics

Figure 2: Initial questions re-categorized based on core concepts and "big ideas" of ecology

Figure 3: Driving question tree