The Impact of the 5E Learning Cycle on 7th Grade Students' Learning and Retention of Science Concepts

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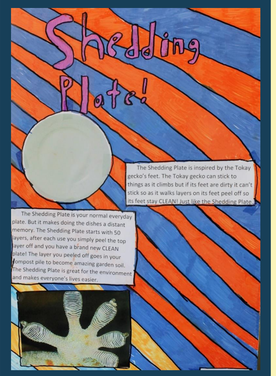

Project Background:

In the fall of 2016, Montana adopted new science content standards modeled after the Next Generation Science Standards (NGSS). This generated a need to improve my inquiry-based teaching skills. I set out to do so by implementing the 5E Learning Cycle, an inquiry-based instructional strategy that includes five phases: engage, explore, explain, elaborate, and evaluate. During the study period, I implemented two 5E Learning Cycle units and two non-5E Learning Cycle units for comparison. The project allowed me to monitor my transition to more inquiry-based teaching practices while comparing my 125 seventh-grade life science students' learning and retention of science content in traditional versus 5E Learning Cycle units.

Research Question:

What impact does the use of the 5E Learning Cycle, an inquiry-based format, have on seventh-grade life science students' learning and retention of science concepts?

Sub Questions:

- How does the 5E Learning Cycle impact students' learning of science concepts?
- How does the 5E Learning Cycle impact students' retention of science concepts?
- How does implementing the 5E Learning Cycle impact me as a teacher?

Table 1

Quantitative and Qualitative Data Collection Tools

	Data Source 1	Data Source 2	Data Source 3
Sub Question 1	Pre- and post-unit test results	Performance assessment results	Pre- and post-unit concept maps
Sub Question 2	Post- and delayed post-unit test results	Essential Vocabulary Progress Checks	Student interviews
Sub Question 3	Lesson plan template, Science learning cycle lesson plan rubric	Self-reflection form	Student survey

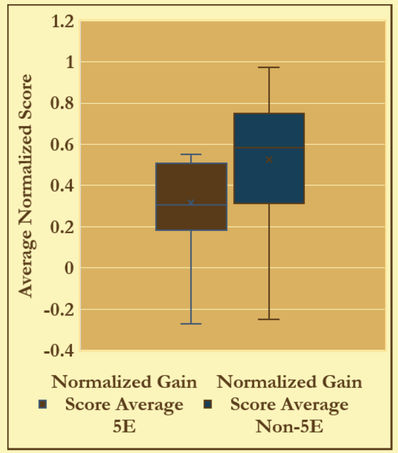

Figure 1. Average normalized gain scores for 5E versus non-5E units, ($N = 71$).

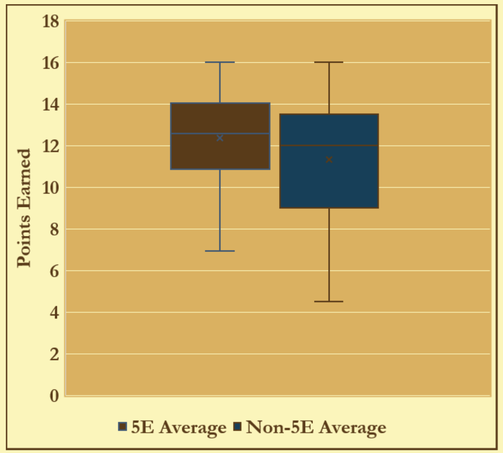

Figure 2. Average performance assessment scores on 5E versus non-5E units, (N = 111).

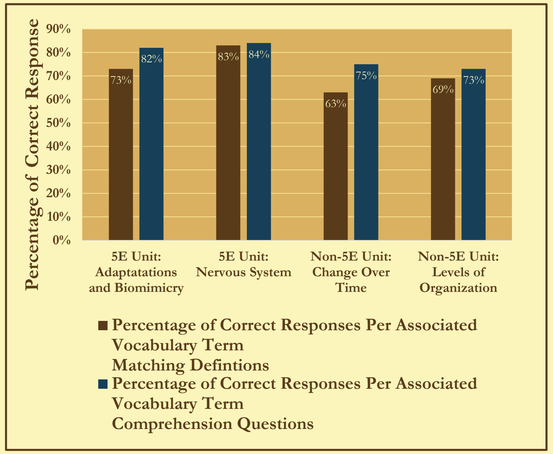

Figure 3. Correct response percentages for 5E and non-5E vocabulary terms, (N = 123 for matching definitions, N = 121 for comprehension questions).

Results:

- In reviewing the data collection tools used to assess how the 5E Learning Cycle impacted student learning, a definitive statement for or against the 5E Learning Cycle cannot be made. Normalized gain scores for pre- and post-unit tests suggest that non-5E instruction may be best whereas student scores were higher on performance assessments embedded within 5E units. There was no statistical difference between concept map scores on 5E versus non-5E units.
- An evaluation of content retention for the two methods was also inconclusive. There was no statistical difference between 5E and non-5E units' post- and delayed-post unit test scores though Essential Vocabulary Progress Checks revealed that students may better retain content vocabulary knowledge associated with 5E units. Student interviews did not show a significant difference in content retention between the two unit types.
- Teacher self-reflection forms and student surveys did not reveal substantial differences between the impact on the teacher between the two unit styles with one notable exception: I often was more curious during 5E units than non-5E units because of the divergent ideas, projects, and conclusions students generated.

References:

Bybee, R. (2015). *The BSCS 5E instructional model* (p. 29). Arlington, Virginia: NSTApress.