ANCHORING PHENOMENON AND 5Es IN HIGH SCHOOL PHYSICS

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Background

Scientific inquiry provides an excellent means to help foster the development of students' habits of mind. Teachers who embrace inquiry-based classrooms promote critical-thinking skills, and empower students to become independent, lifelong learners. The 5E Learning Cycle model is a constructivist teaching strategy that includes five stages consistent with cognitive theories of how learning occurs (Llewellyn, 2013). Using an anchoring event to drive a unit means that students no longer view content as something that is learned on a lesson to lesson basis, but rather activities that have a long-range view which tie in together to help solve a complex and multifaceted phenomenon.

Focus Question

Will student engagement and understanding increase by creating a more interconnected unit with the incorporation of an anchoring phenomenon to drive instruction via the NGSS 5E Learning Cycle model?

Table 1. Data Triangulation Matrix.

Research Focus	Data Source #1	Data Source #2	Data Source #3
Student Growth (Focus Question)	Pre- and Post-Tests	Student Interviews	Formative Assessments via CATs
Student Engagement (Focus Question)	Engagement Tally Sheet	Student Interviews	
Students' Attitudes Toward Science (Secondary Question)	TOSRA Survey	Student Interviews	

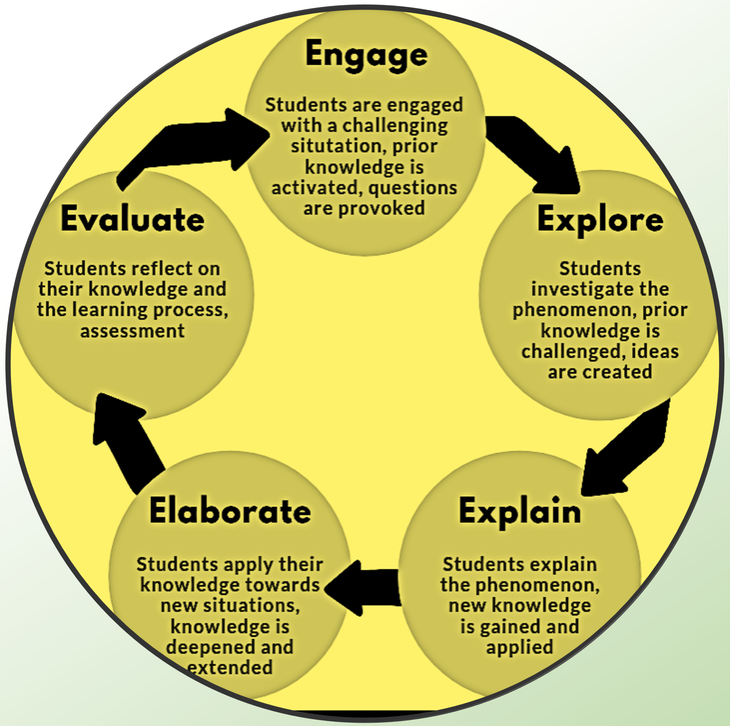

Figure 1. Overview of the 5E Learning Cycle model (Northern, 2019).

Methodology

Treatment

- Four sections of regular level physics students experienced a unit designed around the 5E Learning Cycle (Figure 1), where an anchoring phenomenon helped drive instruction (*N*=112).
- Data collection centered around student engagement and content understanding

Non-treatment

- Students were taught content via direct instruction, and then had to apply it during individual or group practice.
- Data collection centered around student engagement and content understanding

Results

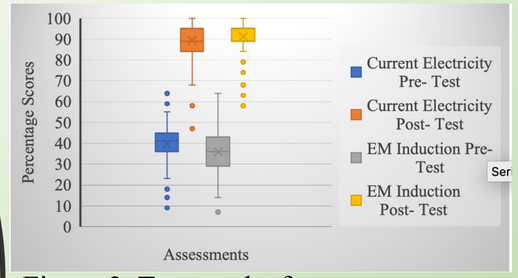

Figure 2. Test results for treatment units, (*N*=111).

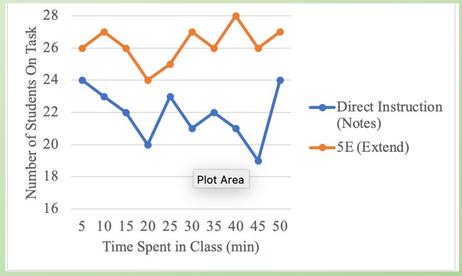

Figure 3. Student engagement tally throughout lesson, (*n*=28).

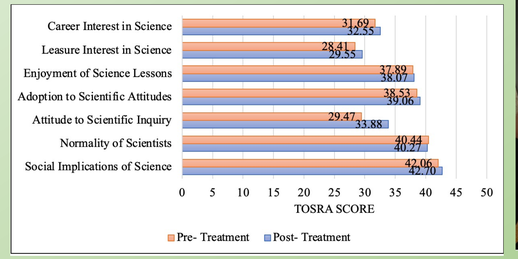

Figure 4. Calculated means for each section in the TOSRA survey, (*n*=88).

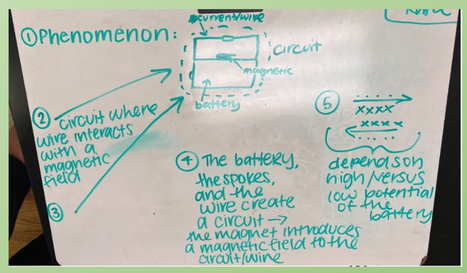

Figure 5. Example of student work during 5E lab activity.

Table 2. Pre- and post- unit normalized gain values.

Teaching Method	Unit	N	Normalized Gain
Direct Instruction	Electrostatics	101	0.74
Direct Instruction	Magnetism	102	0.75
5E Learning Cycle	Current Electricity	105	0.82
5E Learning Cycle	Electromagnetic Induction	107	0.86

Conclusion

Pre- and post- test results were analyzed to determine student growth by comparing the mean and normalized gain values. Observations, a behavior tally sheet, and pre and post Linkert style surveys helped to gather data on student engagement. The analyzed data indicates more student growth and engagement took place during the treatment units.

References

Llewellyn, D. (2013). *Teaching high school science through inquiry and argumentation*. Thousand Oaks: Corwin.

Northern, S. E. (2019, August 27). *The 5 E's of Inquiry-Based Learning*. Knowledge Quest. https://knowledgequest.aasl.org/the-5-es-of-inquiry-based-learning/