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How Chemistry Students Learn in an Inquiry-Based Classroom

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Inquiry-Based Learning in the Chemistry Classroom

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Research Question

How do chemistry students learn in an inquiry-based classroom?

Literature Review

- Research studies and literature reviews focused on the definition of inquiry-based learning, inquiry-based learning in action, and how to implement an inquiry-based classroom.
- Inquiry-based classrooms featured in the studies allowed students to confront problems , generate and test ideas for themselves, and apply them to new problem situations.
- Students make better connections and become more engaged in the material in that it becomes more meaningful when they are able to pose the questions. More time can be spent in the classroom exploring concepts and developing skills.

Methodology

- The study took place at an urban high school in Central Illinois. Participants were sophomores and juniors in three general-level chemistry classes.
- Six inquiry-based lessons were implemented over the course of 4 weeks
- Teacher reflection journals, lesson plans, and student work were collected.
- Data was analyzed using Marchewicz and Wink's (2011) Active Model of Inquiry Framework.

Elements of the Active Model of Inquiry

Framework Elements	Code
Observing	E1: Make observations when designing investigations
Defining the problem	E2: Define the context of what you will be investigating
Forming the question	E3: What specifically are you investigating?
Investigating the known	E4: What prior knowledge can be used?
Articulating Expectation	E5: What do you expect to happen?
Carrying out the study	E6: Follow your procedure that you came up with
Examining the results	E7: What did you find?
Reflecting on the findings	E8: What is significant in your findings?
Communicating with others	E9: Collaborate with the class on your findings

Table 1. The elements of the active model of inquiry were used to analyze data

Inquiry-Based Lessons

Lesson Plan	Framework Elements
LP1: Name That Atom	E1, E3, E4, E6, E9
LP2: Isotopes Simulation	E1, E2, E4, E6
LP3: Tape Inquiry	E1, E2, E3, E4, E6, E7, E8, E9
LP4: Matter Inquiry	E1, E2, E3, E4, E5, E6, E7, E8, E9
LP5: Ions Simulation	E1, E2, E3, E4, E6, E7, E8, E9
LP6: Separating Mixture	E1, E2, E3, E4, E5, E6, E7, E8, E9

Table 2. The elements of the active model of inquiry were incorporated into all six inquiry-based lessons

Results and Data Analysis

- Inquiry-based learning renders students thinking towards higher-order and critical thinking skills.
- Questions asked by students were directed towards higher-order thinking skills.
- Students were more engaged in inquiry-based activities and remained on task.
- Inquiry-based activities involved students to verbally communicate their findings and investigations as part of the learning process.
- Students designed and implemented inquiry-based investigations to arrive to their own conclusions.

Conclusion

- Chemistry students learn in an inquiry-based classroom by formulating questions, developing investigations, and analyzing results.
- Findings supported Marshall and Horton's (2011) research outcomes which stated that students were more frequently involved in a higher cognitive thinking level when participating in inquiry-based activities.
- For future research, it is important to implement more inquiry-based lessons over a longer period of time.