How Chemistry Students Learn in an Inquiry-Based 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.

Inquiry-Based Lessons
<table>
<thead>
<tr>
<th>Lesson Plan</th>
<th>Framework Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP1: Name That Atom</td>
<td>E1, E3, E4, E6, E9</td>
</tr>
<tr>
<td>LP2: Isotopes Simulation</td>
<td>E1, E2, E4, E6</td>
</tr>
<tr>
<td>LP3: Tape Inquiry</td>
<td>E1, E2, E3, E4, E6, E7, E8, E9</td>
</tr>
<tr>
<td>LP4: Matter Inquiry</td>
<td>E1, E2, E3, E4, E5, E6, E7, E8, E9</td>
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<tr>
<td>LP5: Ions Simulation</td>
<td>E1, E2, E3, E4, E6, E7, E8, E9</td>
</tr>
<tr>
<td>LP6: Separating Mixture</td>
<td>E1, E2, E3, E4, E5, E6, E7, E8, E9</td>
</tr>
</tbody>
</table>

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.