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Inquiry-based Content Immersion: Increasing Science Content Knowledge and Appreciation in Pre-service Elementary Teachers

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Inquiry-based content immersion: Increasing paraeducator’s science content knowledge and self-efficacy as science teachers and learners

Dowdy, S., Burgess, D., and Feiro, C.S.

RESEARCH QUESTION

During summer 2014, as part of an alternate route teacher certification program, a cohort of 15 paraeducators enrolled in a hybrid science education methods/content immersion. The aim of the hybrid course was to help these paraeducators feel more comfortable engaging in scientific inquiry. Additionally, nearly all of the paraeducators were first generation college students so they had to navigate institutional, cultural, linguistic and relational borders to become certified elementary teachers.

Can a short intensive content immersion in science, followed by instruction in and practice teaching inquiry science, have a positive impact on the paraeducators feelings of self-efficacy as science learners and teachers?

RESULTS AND OBSERVATIONS

Student improvement on the content post-test exceeded expectations:

- Average pre-test scores: 46.8% correct; high score of 78.9% and low score of 26.2%.
- Average post-test score: 79.9% correct; high score of 94.7% and low score of 57.9%.
- Average improvement: 32.2 percentage points.

Table 1: Factors, loadings, and reliability coefficients for the 21 Likert items used in the survey.

<table>
<thead>
<tr>
<th>Beliefs about effective science instruction</th>
<th>Instrument</th>
<th>Factors (# of items)</th>
<th>Items (total #, type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beliefs about effective science instruction</td>
<td>HRI Teacher Views about Science Instruction</td>
<td>Learning theory-aligned instruction (11)</td>
<td>21 Likert items (SA to SD)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Confirmatory science instruction (7)</td>
<td></td>
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<td></td>
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<td>Hands-on over all else (3)</td>
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<tr>
<td>Self-efficacy as a learner of science</td>
<td>Colorado Learning Attitudes about Science Survey (CLASS)</td>
<td>Personal interest (6)</td>
<td>12 Likert items (SA to SD)</td>
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<tr>
<td></td>
<td></td>
<td>Real world connection (4)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Problem solving confidence (4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The three factors where SCED 201 students have the greatest gains</td>
<td></td>
</tr>
<tr>
<td>Self-efficacy as a teacher of science</td>
<td>Science Teaching Efficacy Belief Instrument - Preservice (STEPI-B)</td>
<td>Personal science teaching efficacy belief (13)</td>
<td>9 Likert items with factor loadings and reliability coefficients above .50 (Q23 excluded due to vague/obscured language) (SA to SD)</td>
</tr>
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<td></td>
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<tr>
<td>Beliefs about peer collaboration in learning science concepts</td>
<td>MORE</td>
<td>Beliefs about peer collaboration in learning science concepts (1)</td>
<td>1 open-ended item</td>
</tr>
</tbody>
</table>

Table 2: HRI Pre- and post-survey data for all factors. Average calculated using responses of 14 out of 15 students enrolled in the course. Values shown are overall means ± standard deviation. Level of significance (p-value) was calculated using a two-tailed Student’s t-Test. Grey boxes indicate items included in the CLASS self-efficacy as a science learner aggregate score. Scores were inverted as necessary so that higher scores always reflect the more “sophisticated” condition.

CONCLUSIONS AND TAKEAWAYS

- The paraeducator’s appreciation for inquiry-based pedagogy was enhanced through the content immersion.
- The content immersion was an effective way to improve the paraeducator’s content knowledge in a short time frame.
- Paraeducator’s feelings of self-efficacy as science teachers and learners increased.
- Rich inquiry-based instruction, while initially challenging, can be an effective method of instruction for all including ELL and bilingual students.

WHAT THE PAREUDEAUTORS SAID ABOUT INQUIRY-BASED PEDAGOGY

- “The coolest thing I learned was that there are several ways to teach science (NOT just a textbook) through scaffolding.”
- “This kind of science is very colorful and has lots of dimensions. Science is just life, we’re just going deeper.”
- “Thank you…for reminding me that this world is beautiful and there is sooooo much we can learn from it every single day.”