An Integrated Instructional Model that Links Science and Literacy in Grades 1-2

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Overview

– Systemic Issues in K-5 Science

– K-5 Science IDEAS Model
  • Architecture
  • Research Findings

– Implications of Model for K-5 Science
Systemic Issues in K-5 Science
(Issues to Address to Improve K-5 Science)

Curricular Issues
- Curriculum Not Focused on Core Ideas
- Curricular Framework not Grade-Articulated

Instructional Issues
- Instructional Time Inadequate for K-5 Science
- Day-to-Day Classroom Instruction is Fragmented/Rote

Institutional Issues
- K-5 Science Support Inadequate (Resources, Teacher PD)
- No Institutional Commitment “Value” for Effective K-5 Science
- No Comprehensive Institutional Accountability for K-5 Science
K-5 Science IDEAS Model - Architecture

Curricular Framework
- Increased Instructional Time for Science
- Coherent Curricular Focus on Core Ideas
- Grade-Articulated Structure for Cumulative Learning

Integrated Instructional Model
- Six Interactive Elements Focusing on Core Ideas
  - Hands-On Activities
  - Reading Comprehension
  - Writing/Journaling
  - Propositional Concept Mapping
  - Prior Knowledge/Cumulative Review
  - Applications Projects/Activities
Integrated Instructional Model (Continued)

- Combination of Elements Results in Integration of Literacy within Science
- Instructional/Planning
  - Intra-/Inter-Grade Level Planning to Insure Curricular Articulation
  - Grade Level Allocation of Time to Science Instructional Units that Focus on Core Ideas
  - Identification of Available Resources (e.g., Reading Materials, Hands-Activities)
  - Identification and Sequencing of Elements within Units (Multi-Day Lessons)
K-5 Science IDEAS Model- Architecture

Articulated Curricular Sequence of Core Ideas Across Grades 1-2

allocate concept(s) to units

Concept(s) to be Taught in Unit

develop unit plan

specify concepts to be taught

Grade 1-2 Integrated Model Elements (Age-Appropriate)

identify concept-focused activities / materials for elements

Hands-On Activities / Teacher Demo.

Teacher Reading / Guided Reading

Concept-Mapping

Journal/Writing

Application Projects

Prior Knowledge / Cumulative Review

Multi-Day Unit Framework for Classroom Instruction

sequence of teaching activities

Unit Pre-Test

Prior-Knowledge Review

Activity 1

Activity 2

Activity 3

Activity 4

Activity 5

Activity 6

Activity 7

Activity 8

Activity 9

Activity 10

Activity 11

Activity 12

Activity 13

Activity 14

Activity 15

Activity 16

Cumulative Review

Unit Post-Test
K-5 Science IDEAS Model- Architecture (Interdisciplinary Foundation)

Knowledge-Based Teaching System

Teaching Pedagogy

Curriculum Knowledge / Core Concepts

Active Learner Involvement

Evaluate Student Performance

Assign Classroom Learning Activities

Select Teaching Strategies

Knowledge To Teach

Target Student Knowledge Deficiency

Student Mastery

Determine State of Learner Knowledge
K-5 Science IDEAS Model - Architecture

Institutional Implement Support

– Teacher Professional Development / Resources
– Teacher Leadership Cadre (for Sustainability/Expansion)
– Classroom Fidelity Monitoring (District/Principal)
– Establishing “Value” of K-5 Science Outcomes/ K-8 Accountability
K-5 Science IDEAS Model - Representative Findings
(Multi-Year Evidence in Grades 3-4-5 with Transfer to Grades 6-7-8)

Note 1 - N=12 Schools (Schoolwide Implementation).
Note 2 - Adj. ITBS Effects: Science (+.38 GE), Reading (+.32 GE)
Note 3 - Grades 3-4-5: Direct Effects, Grades 6-7-8: Transfer Effects
## K-5 Science IDEAS Model- Findings

(Research Evidence for Primary Science IDEAS- Grades 1-2)

### Prior Grade 1-2 Findings

<table>
<thead>
<tr>
<th>Years</th>
<th>Treat. Duration</th>
<th>N. Schools</th>
<th>ITBS Science</th>
<th>ITBS Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>8 Weeks</td>
<td>2</td>
<td>+.28 GE $^b$</td>
<td>+.42 GE</td>
</tr>
<tr>
<td>2012</td>
<td>1 Year</td>
<td>2</td>
<td>+.16 GE</td>
<td>+. 58 GE</td>
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</tbody>
</table>

### Preliminary Grade 1-2 Findings: Year 1 of 3

<table>
<thead>
<tr>
<th>Years</th>
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<th>N. Schools</th>
<th>ITBS Science</th>
<th>ITBS Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-14</td>
<td>6 Months</td>
<td>9</td>
<td>+.52 GE</td>
<td>+.26 GE</td>
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</tbody>
</table>

$^a$ All ITBS GE Scores Represent Adjusted (Mean) Effects

$^b$ Grade 1 Effect for ITBS Science in the 8-Week Study was Not Significant
Implications of Science IDEAS Model for Improving K-5 Science Instruction

1. Increase Instructional Time for K-5 Science
2. Integrate Literacy Instruction within Science
3. Focus Classroom Instruction on Cumulative Learning of Core Ideas
4. Provide Teacher PD in support of K-5 Science Instruction
5. Develop Teacher Leadership Cadre as Capacity Building Resource for Sustainability/Expansion
6. Adopt as a Major Priority In-Depth Science as a Basis for Reading Comprehension in Grades K-5
7. Explicate Institutional “Value” of K-5 Science through Strong Accountability
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