Preparing College/Career Readiness through Integrating Science Learning with Literacy in Secondary Education

Presenters

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Preparing College/Career Readiness through Integrating Science Learning with Literacy in Secondary Education

A LEA-IHE-Business Partnership Initiative Supported by TN DOE MSP and THEC ITQ Grants (2015-18)
Picture of College Readiness

Percent of 2016 ACT-Tested High School Graduates Meeting ACT College Readiness Benchmarks by Subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Tennessee</th>
<th>Nation</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>58</td>
<td>61</td>
</tr>
<tr>
<td>Reading</td>
<td>38</td>
<td>44</td>
</tr>
<tr>
<td>Mathematics</td>
<td>30</td>
<td>41</td>
</tr>
<tr>
<td>Science</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>All Four Subjects</td>
<td>20</td>
<td>26</td>
</tr>
</tbody>
</table>

Legend: Tennessee, Nation
Percent of 2012–2016 ACT-Tested High School Graduates Meeting ACT College Readiness Benchmarks*

- English
- Reading
- Mathematics
- Science
- All Four Subjects

* Data points for each year:
  - 2012: English (59), Reading (43), Mathematics (29), Science (21), All Four Subjects (16)
  - 2013: English (58), Reading (36), Mathematics (29), Science (27), All Four Subjects (18)
  - 2014: English (59), Reading (37), Mathematics (30), Science (28), All Four Subjects (19)
  - 2015: English (58), Reading (38), Mathematics (30), Science (29), All Four Subjects (20)
  - 2016: English (58), Reading (38), Mathematics (30), Science (30), All Four Subjects (20)
ETSU Service Areas

<table>
<thead>
<tr>
<th>Populations</th>
<th>K-12 students</th>
</tr>
</thead>
<tbody>
<tr>
<td>TN</td>
<td>6.55 M</td>
</tr>
<tr>
<td></td>
<td>995K</td>
</tr>
<tr>
<td>1st TN</td>
<td>792K (12%)</td>
</tr>
<tr>
<td></td>
<td>86K (8.6%)</td>
</tr>
</tbody>
</table>

& 17 Local Edu Agents:

Bristol, Carter, Cocke, **Elizabethton**, Greene, Greeneville, Hamblen, Hancock, **Hawkins**, Johnson City (pending), Johnson County, **Kingsport**, Newport, Rogersville, Sullivan, Unicoi, and Washington. (68-78% population in the region)
## Picture of Educational Attainment

<table>
<thead>
<tr>
<th>LEA</th>
<th>High school diploma and above</th>
<th>Associate's degree and above</th>
<th>Bachelor's degrees and above</th>
<th>College Going Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>88.7%</td>
<td>27.4%</td>
<td>20.5%</td>
<td>64.6%</td>
</tr>
<tr>
<td>2</td>
<td>88.6%</td>
<td>21.6%</td>
<td>15.8%</td>
<td>61.2%</td>
</tr>
<tr>
<td>3</td>
<td>96.6%</td>
<td>21.6%</td>
<td>15.8%</td>
<td>61.2%</td>
</tr>
<tr>
<td>4</td>
<td>93.7%</td>
<td>21.0%</td>
<td>15.5%</td>
<td>45.7%</td>
</tr>
<tr>
<td>5</td>
<td>98.6%</td>
<td>21.0%</td>
<td>15.5%</td>
<td>45.7%</td>
</tr>
<tr>
<td>6</td>
<td>91.5%</td>
<td>18.9%</td>
<td>12.7%</td>
<td>48.5%</td>
</tr>
<tr>
<td>7</td>
<td>90.3%</td>
<td>27.4%</td>
<td>20.5%</td>
<td>64.6%</td>
</tr>
<tr>
<td>8</td>
<td>92.6%</td>
<td>27.4%</td>
<td>20.5%</td>
<td>64.6%</td>
</tr>
<tr>
<td>9</td>
<td>93.6%</td>
<td>19.5%</td>
<td>12.9%</td>
<td>51.2%</td>
</tr>
<tr>
<td>10</td>
<td>91.0%</td>
<td>35.0%</td>
<td>29.4%</td>
<td>61.5%</td>
</tr>
<tr>
<td>Partner Av.</td>
<td><strong>24.1%</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TN Av.</td>
<td></td>
<td></td>
<td></td>
<td>33.4%</td>
</tr>
</tbody>
</table>
Research Questions

• **RQ1**: How does cross-discipline instruction benefit and enrich each subject discipline?
• **RQ2**: How does integration of science learning with literacy in G6-12 impact college/career readiness?
Implementations in Y1 (Y15-16)

Y1 (Y15-16): 2 week PD, 72 teachers

PD Components:

• **Science**: standard-based sci., fun ELA activities
• **ELA**: close reading, accountable talk, writing, fun sci.
• **Integration**: demo (faculty-lead), research/field trip, curriculum planning and presentation,
• **Collaboration**: standards-activities in subject domain

Special session: college freshmen biology/chemistry courses
Findings in Y1 (Y15-16)

Quantitative Results:

• **TOSES**: Test of Scientific Literacy Skills
  
n=64, \( p<0.05 \)
  
  Science teachers had a more significant gain

Qualitative Results:
**Implementations in Y2 (Y16-17)**

**Y16-17**: 2 week PD, 87 teachers (including 7 math Ts)

**PD Components**:

- **Science**: sci content, ELA strategies, sci-math intg.
- **ELA**: reading, writing, sci activities.
- **Technology**: instructional tech.,
- **Integration**: demo (teacher-faculty), *Flatland*, curriculum planning and presentation
- **Collaboration**: science/ELA best practices, innovation in classroom, resources sharing, STEM professional panel
Change from Y15-16 to Y16-17

**Staff**: faculty team + lead teacher team

Y1 (Y15-16)  

Y2 (Y16-17)
Change from Y15-16 to Y16-17

Library Resources:

Credits
Rachel
Katie
Elizabeth
Connection with STEM Industry:

Change from Y15-16 to Y16-17
Example: Flatland
• We would like to have a partner group including one ELA-Biology Team + one ELA-Chemistry Team
Interactive Notebook

• Unit Cover Page

Setting the context

• Edwin A. Abbott
• What is a Romance?
• Early Sci-Fi/Speculative Fiction

Interactive Notebook

• Aha Connections Page
  – Big Question – How does Flatland help you think about your teaching and learning?
  – Line of Evidence
Strategy I: Contrast and Contradictions
Strategy II: Again and Again

Reading Flatland

• Discuss Contrasts and Contradictions & Again and Again with Partners
Humans’ best friend
Humans’ best friend
Observe this piece of art and link it to a keyword: Humans’ best friend

1. **What** do you think it is?
2. **Why** the object that you interpret is humans’ best friend?
3. **Draw a picture of it.** So other people may have an idea of what it looks like even without seeing it.
4. **Describe the shape of it** (in a few sentences) so others may have an idea of what it looks like even without seeing it.
5. **Create an original name or vocabulary** to represent this unique piece of art.
Using ACT Science and Reading Sample Questions:

1. Answer the questions

2. Please use the space below to provide an in-depth explanation of teaching practices you would engage in to help your students be successful on this specific examination.
ACT Reading strategies provided by a teacher participant

Without a doubt, this text will call for notice and note. Annotating the text prior to answering the questions would help the student to not only pull the proper conclusions, but also to note the direct comparisons, the use of statics (there were none in this passage,) as well as the important analogies such as being able to observe not only the color on the surface but the "fish and plants underneath." Through out the reading, I was reminded of our work with "Flatland" and how identifying and pulling out the "sign posts" made understanding the meaning of the author more clear. There were many word gaps in the article that students were quizzed on as to their meaning, so preparing students to use context clues to determine the proper meaning of the word would also be essential. Repetition was also used with words like iridescence and florescence as they were linked to the terms color and light. Since this is a new strategy to me, I would probably work up to all the sign posts by teaching students to look for two or three at a time, and then adding in more of the sign posts with increasing complicated non-fiction texts.
**Visions in Y3 (Y17-18) and Beyond**

**Y3 (Y17-18):** 2 week PD, 100-120 teachers

**PD Components:**
- **Project-Based Learning:** grade-wide, school-wide, partnered with STEM industry
- **Instructional/Curr. Tech:** online & onsite learning
- **Math integrated w/ Science and Literacy:**
- **Grade expansions:** from G6-12 to G4-12
- **Resources:** school-, district-, regional level
- **Connections:** LEA-IHE-Business

**Other ideas:** STEM Conference/workshop in Y18
Questions and Comments

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