Literacy Through Science: Re-engineering the Educational Environment for Optimal Performance in More than one Domain

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Beginning Questions

Why do we do this research?
How did we choose this topic?

Problems of Practice
- 1997 –

15% OF KINDERGARTENERS READING

(Curwood, 2007)
2001 Problem:
STUDENT PERFORMANCE IN READING AND MATH
K-3 PROBLEM: READING PERFORMANCE

Report of the National Reading Panel: teaching children to read
An evidence-based assessment of the scientific research literature on reading and its implications for teaching instruction.
National Reading Panel (U.S.)
PROFICIENCY BY END OF 3\textsuperscript{RD} GRADE
PUT READING FIRST

5 essential components

• Phonemic awareness
• Phonics
• Fluency
• Vocabulary
• Comprehension
Surveyed 349 school districts in 2007

8/10 increased instructional time in literacy by as much as 150 minutes a week

+50% cut Social studies by 75 minutes a week
+50% cut science by 75 minutes a week.
INSTRUCTIONAL TIME IN K-2

2000

- Literacy: 57%
- Mathematics: 24%
- Science: 10%
- Social Studies: 9%

2007

- Literacy: 57%
- Mathematics: 24%
- Social Studies: 5%
- Science: 5%
Iowa reform pushes students to read earlier - or else

Kindergartners at Hubbell Elementary School in Des Moines no longer have time set aside to play — or to take a nap. Recess, too, has been shortened to 30 minutes a day.

Like many schools across Iowa, the state's push for education reform has set higher expectations that are placing more pressure on teachers and students.

Now, 5- and 6-year-olds are expected to know their letters and numbers before they start kindergarten. And by the spring, they are supposed to be able to add and subtract numbers up to 10 and read words such as "school" and "food."
-2015-
ALL KINDERGARTENERS READING
ARE CHILDREN SMARTER?

2010 study revealed remarkable stability around ages at which most children reach cognitive milestones such as being able to count four pennies or draw a circle.

“People think children are smarter and they are able to do these things earlier than they used to be able to—and they can’t.”

- Marcy Guddemi, PhD
  Executive Director
  Gesell Institute
GOOD FOR SHORT TERM GOALS
-2007-

Scores on K-3 tests go up
-phonics skills
-word recognition
-word reading speed and accuracy


William Teale PhD
University of Illinois
BAD FOR LONG TERM GOALS

4th grade reading on up demands
- Vocabulary knowledge
- Domain knowledge
- Ability to comprehend a variety of genres

Initial bump fades by 5th grade
Translate into larger achievement gap
Positive and statistic significant impact on:

- **Instructional time** on 5 essential components
  - Phonemic awareness
  - Phonics
  - Fluency
  - Vocabulary
  - Comprehension
- **Professional development for teachers**
- **Decoding skills**

No significant impact on reading comprehension
Problem of Practice

M.D. or Doctorate in Medicine is to Ph.D. in Biomedicine as Ed.D. or Doctorate in Education is to Ph.D. in Education
Research Questions

- What opportunities for scientific argumentation arise in science nature investigations?
- What opportunities for writing arise in science nature investigations?
- What opportunities for reading arise in science nature investigations?
- What is the comparison of literacy assessment scores in classrooms that engage in nature investigations through a project approach versus classrooms that do not engage in investigations through a project approach?
Data Needed to Answer Those Questions

- Children’s Literacy Data
- Children’s Science Performance Data
- Classroom Observation Data
- Teachers’ Perception
Mixed Methods

- Quasi-experimental: Three experimental classrooms (PK-1) and three control classrooms (PK-1)
  - Qualitative data analysis using CLASS (concept development; language development)
  - Qualitative data analysis for the development of coding system of reading/writing opportunities in science
  - Linguistic data analysis/content analysis
  - Quantitative data analysis (Repeated Measures ANOVA; Latent Growth Curve Analysis) using scores from assessments and linguistic data
- Teachers’ perceptions on literacy through science (Qualitative study)
Data Collection

Fidelity Data: 5 Fidelity classroom observations per classroom (one-hour-long visit with 20-min-long videotaping and other observations in October, November, January, February, March) using CLASS Concept Development and ECLS-K 6 Science-related observations; This will be total 600-minute-long videos which should be transcribed and analyzed. When it takes 2 hours to transcribe a 20-minute-long video, total 60 hours will be needed only for transcribing.

Children’s Science Data (Pre-Post): The ECLS-K 2011 Science Domain (1st grade) and Lens on Science (PreK-K) will be administered in September and April; Approximately 85 children will be individually assessed. As it will take 20 minutes for each child to be assessed, total 3400 minutes (57 hours) will be required for administering pre and post tests. The data entry and the statistical analyses should be conducted.

Children’s Literacy Data (Pre-Post): The Individual Growth and Development Indicators (IGDI; for PreK) and the Observation Survey (for K and 1st Grade) will be administered in September and April; Approximately 85 children will be individually assessed. As it will take 20 minutes for each child to be assessed, total 3400 minutes (57 hours) will be required for administering pre and post tests. The data entry and the statistical analyses should be conducted.

Teachers’ perceptions of science integration in literacy: 3 teachers in the experimental classrooms will be interviewed twice. Each interview will take approximately 1 hour. Total 6 hours will be required for interview. The interview data should be transcribed and analyzed. When it takes 4 hours to transcribe a 1-hour-long video, total 24 hours will be needed only for transcribing.
Budget TALK!!

Researchers’ time, Dissemination
Teachers’ professional development
Transportation, lodging
Paper, envelopes, Assessment materials
(even color printing, laptops)
Research assistants
Future

Discovery Research PreK-12 (DRK-12)

PROGRAM SOLICITATION

NSF 15-592

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):
  December 07, 2015
  December 05, 2016
  First Monday in December, Annually Thereafter