Methods and Results of a Three-Year Evaluation to Infuse Arts Strategies in Elementary Reading and Mathematics Instruction

Brian Lawton and Paul R. Brandon
Curriculum Research & Development Group
University of Hawai'i at Mānoa

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Project Description

- **The ARTS FIRST Windward Research Project (AFWRP)**
  - three-year U.S. Department of Education Model Development and Dissemination Grant project
  - awarded to the Hawai'i Arts Alliance

- **Goals**
  - develop elementary teachers' skills in using arts strategies (drama, dance, music, and visual arts)
  - provide students with a greater awareness the arts
  - to improve academic achievement (especially reading achievement).

Study Design

- A quasi-experimental non-equivalent control group study in the Windward School District on the island of O'ahu.
- Six selected schools were matched on
  - Grade 3 and 5 SAT reading achievement (% at or above average);
  - SES (% free/reduced-price lunch);
  - School size (N students/N teachers); and
  - Ethnicity
- Matched schools were randomly assigned within pairs to the project or control group

Schools

ARTS FIRST Windward Research Project Groupings of Title I Windward District Schools
(all statistics except test scores are from 2001–02 School Status and
Improvement Reports; test statistics are from 2002–03)

School	N students	N teachers	% Free/ reduced lunch	Ethnicity				Reading SAT (% average + % above average)	
				Haw'n/ part-Haw'n.	Japanese	Filipino	White	Gr.3	Gr.5
A*	600	40	64.0	28%	0.6%	1.4%	17.5%	91.0	85.5
D	554	33	61.4	42.6%	2.2%	12.5%	12.3%	91.3	79.3
B*	466	41	56.5	53%	9.1%	8.3%	8.1%	78.2	69.1
E	612	40	51.1	42.2%	15.9%	3.9%	13.1%	86.6	78.4
C*	237	15	44.4	44.6%	13.8%	7.5%	17.4%	78.8	86.1
F	145	11	53.1	55.7%	1.3%	3.2%	15.8%	83.4	62.5

* **Project schools**

Two control schools were "in good standing, unconditional"
Two schools, one project and one control, were in "school improvement Year 2"
One project school was in "corrective action"
One project school was in "planning for restructuring"

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Program Model Evolution

- Grade level implementation
  - Year 1 (Grade 3)
  - Year 2 (Grades 3 and 4)
  - Year 3 (Grades 4 and 5)
- Years 1-2
  - Specific arts strategies (ad hoc)
    - drama, dance, music
- Year 3
  - Three types of fundamental arts strategies had evolved
    - *Observing*
    - *Patterning*
    - *Representing*
  - 17 arts strategies (drama, dance, music, and visual arts) specifically matched to reading and mathematics standards

Strategy Overview

- Drama example

Final Professional Development Model

- Six full-day teacher professional development sessions throughout the year (two back-to-back)
- Follow-on in-class artist mentor sessions.
  - Modeling,
  - co-teaching,
  - solo-teaching (with mentor present)

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Mixed-Method Evaluation

- To address the three project objectives, quantitative and qualitative evaluation data were collected.
  - Quantitative data:
    - **student achievement**
    - **student attitudes toward school**
    - **student interest in the arts**
    - teacher's attitudes toward the arts
    - weekly teacher implementation logs
    - professional development quality (project group only)
    - Control teacher use of the arts
  - Qualitative data:
    - student focus groups (project group only)
    - teacher focus groups (project group only)
    - principal interviews (Year 1 and 2)
    - professional development quality (open-ended responses)
    - in-class teacher observation videos

Student Quantitative Data

- Student Interest in the Arts Questionnaire
  - 26-item, 4-point scale, collected students' interest in drama, dance, music, and visual arts.

- School Attitude Survey
  - 26-item, 4-point scale, collected students attitudes toward school.

- Student achievement
  - The Hawai'i State Assessment (HSA).
    - Reading and math scaled scores

Student Interest-in-the-Arts Questionnaire

- Administered at the beginning and end of Years 2 and 3 (developed in Year 1).

- Compared Year 3, Grade 5 students between groups to determine differences in interest in drama, dance, music, and visual arts after complete program implementation.

Student Interest-in-the-Arts Questionnaire: Validity

- Content-related
  - Item selection
    - 6 items for each of the four art forms were developed
  - Pilot tested in Year 1 for item understanding
- Construct-related
  - Exploratory Factor Analysis
    - Reflected division of four constructs (four art forms)
  - Item response theory (IRT) calibration
    - IRT analyses identified three items for each art form (were also the highest loading factors in factor analysis) that discriminated most among respondents.
    1. I like to learn about…,
    2. I like to do…,
    3. …makes me happy

Student Interest-in-the-Arts Questionnaire: Reliability

- Test reliability was determined using the three factors identified in the IRT model.

- Internal consistency
  - Cronbach's alpha
    - Drama items, .90
    - Dance items, .91
    - Music items, .79
    - Visual arts items, .84

- Test-retest
  - 37 Grade 2-5 students
    - Range .62-.86

- Generalizability theory analysis
  - Item by occasion
    - Zero variance due to occasion, reflects high test-retest correlation

School Attitude Survey

- The School Attitude Assessment Survey–Revised (SAAS-R) was selected for constructs of interest (McCoach and Siegel, 2003)[b]

  – academic self-perceptions and attitudes toward school. Administered at end of Years 1, 2, and 3.

- Compared Year 3, Grade 5 students between groups to examine changes in attitudes toward school after complete program implementation.

[b] McCoach, D. B., & Siegle, D. (2003). The school attitude assessment survey–revised: A new instrument to identify academically able students who underachieve. Educational and Psychological Measurement, 63, 414–429.

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School Attitude Survey: Validity

- Content-related
  - Item selection
    - Based on a content-validated instrument
    - Selected specific items addressing two constructs of interest: school attitudes and academic self-concept.
    - Modified language to be clearly understood by the average 3rd grader.
  - Pilot tested to elementary-age students (Grades 2-5) at the University of Hawai'i Laboratory school
- Construct-related
  - Factor Analysis
    - Reflected division of two constructs
  - Item response theory (IRT) calibration
    - IRT analyses identified five items (highest loading factors in factor analysis) that discriminated most among respondents

School Attitude Survey: Reliability

- Test reliability was determined using the five factors identified in the IRT model.

- Internal consistency
  - Cronbach's alpha, .74

- Test-retest
  - 37 Grade 2-5 students
    - .58

- Generalizability theory analysis
  - Results indicated zero variance due to item by occasion.

Hawaii State Assessment (HSA)

- *Subject areas tested*
  - Language arts (reading and writing)
  - Mathematics
- HSA is state-developed criterion-referenced test incorporating selected items from the SAT9 and custom developed items matching state content and performance standards.
- Compared Grade 5 scores controlling for Grade 3 scores.

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Propensity Score Matching

- Propensity score analyses were conducted to adjust the scores for preexisting differences among groups
- Predictor variables
  – SES (free/reduced lunch status)
  – Gender
  – Ethnicity
  – Grade 3 HSA and SAT Reading Scores
  – Grade 3 HSA and SAT Mathematics Scores
- Estimated propensity scores
  – Matched students between two groups within five strata.
- Ensured that we were comparing individuals with similar characteristics (gender, ethnicity, SES, HSA) across groups.

Fixed Effects Model

- ## Interest in the Arts
  - ANCOVA, covaried out the effects of
    - pretest
    - strata

- ## Our nested structure examined the effects between schools nested within groups

Results: Interest-in-the-Arts Questionnaire, Drama

Student Interest-in-the-Arts Questionnaire, Drama: ANCOVA results, with Year 1, Grade 4 Pretest and Strata as Covariates

Source	df	Type III SS	F Value	Pr > F
Grade 4 Pretest	1	.16	.26	.608
Strata	4	1.68	.68	.605
School(group)	5	2.99	.98	.435

Least Square Mean Values for Project and Control Groups Grade 5 Drama

School	Group	LS means
A	project	.120
B	project	.196
C	project	-.262
D	control	-.121
E	control	-.094
F	control	-.247

Change F value to F only in italics
And Pr<F to p italics

Results: Interest-in-the-Arts Questionnaire, Dance

Student Interest-in-the-Arts Questionnaire, Dance:
ANCOVA results, with Year 1, Grade 4
Pretest and Strata as Covariates

Source	df	Type III SS	F Value	Pr > F
Grade 4 Pretest	1	.08	.13	.715
Strata	4	3.55	1.92	.130
School(group)	5	9.40	3.04	.012

Least Square Mean Values
for Project and Control
Groups Grade 5 Dance

School	Group	LS means
A	project	.923
B	project	.516
C	project	.194
D	control	.643
E	control	.383
F	control	-.056

Results: Interest-in-the-Arts Questionnaire, Music

Student Interest-in-the-Arts Questionnaire, Music:
ANCOVA results, with Year 1, Grade 4
Pretest and Strata as Covariates

Source	df	Type III SS	F Value	Pr > F
Grade 4 Pretest	1	.06	.15	.703
Strata	4	1.33	1.03	.381
School(group)	5	6.49	3.03	.013

Least Square Mean Values
for Project and Control
Groups Grade 5 Music

School	Group	LS means
A	project	.952
B	project	.583
C	project	.392
D	control	.957
E	control	.745
F	control	.240

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Results: Interest-in-the-Arts Questionnaire, Visual Arts

Student Interest-in-the-Arts Questionnaire, Visual Arts:
ANCOVA results, with Year 1, Grade 4
Pretest and Strata as Covariates

Source	df	Type III SS	F Value	Pr > F
Grade 4 Pretest	1	.731	1.21	.274
Strata	4	1.754	.96	.412
School(group)	5	2.218	.73	.601

Least Square Mean Values
for Project and Control
Groups Grade 5 Visual Arts

School	Group	LS means
A	project	.585
B	project	.197
C	project	.434
D	control	.490
E	control	.324
F	control	.518

Results: School Attitude Survey

School Attitudes Toward School Survey:
ANCOVA results, with Year 1, Grade 3
Pretest and Strata as Covariates

Source	df	Type III SS	F Value	Pr > F
Grade 3 Pretest	1	12.38	29.74	<.001
Strata	4	3.23	2.59	0.055
School(group)	5	6.61	3.18	0.009

Least Square Mean Values for
Project and Control Groups
Grade 5 School Attitude

School	Group	LS means
A	project	1.411
B	project	1.264
C	project	1.259
D	control	1.403
E	control	.979
F	control	.921

Results: Reading Achievement

Grade 5 Student Reading Achievement: ANCOVA results, with Year 1, Grade 3 Reading HSA and Strata as Covariates

Source	df	Type III SS	F Value	Pr > F
Grade 3 Reading	1	838382.34	544.28	<.001
Strata	4	8858.54	4.68	.001
School(group)	5	2156.34	2.80	.018

Least Square Mean Values for Project and Control Groups Grade 5 HSA Reading

School	Group	LS means
A	project	291.82
B	project	274.97
C	project	269.41
D	control	283.30
E	control	268.22
F	control	272.32

Results: Math Achievement

Grade 5 Student Mathematics Achievement:
ANCOVA results, with Year 1, Grade 3
Reading HSA and Strata as Covariates

Source	df	Type III SS	F Value	Pr > F
Grade 3 Math	1	653728.58	589.49	<.001
Strata	4	11658.62	2.63	.035
School(group)	5	18396.85	3.32	.006

Least Square Mean Values
for Project and Control
Groups Grade 5 HSA Math

School	Group	LS means
A	project	240.28
B	project	234.82
C	project	262.82
D	control	229.50
E	control	234.51
F	control	232.45

Conclusions

- Difficult to measure implementation on weekly basis
- Teacher buy-in
- "Research-based" reading programs
- Still showed differences between groups

Future steps

- Separating effects due to AFWRP program from effects due to other programs

- Assessing program-specific reading achievement