DOCUMENT RESUME

ED 468 821 SE 066 818

AUTHOR	Cwikla, Julie
TITLE	Top TIMSS-R Mathematics Performers: What Are They Doing Differently? TIMSS-R Report, 2002.
PUB DATE	2002-04-00
NOTE	8p.; Funded by the Delaware Foundation for Science and Mathematics Education. Report 2 of 3. For other TIMSS-R Reports, see SE 066 817-820.
PUB TYPE	Numerical/Quantitative Data (110) -- Reports - Descriptive (141)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*Comparative Analysis; *Educational Environment; Faculty Development; Mathematics Education; Performance Tests; *School Culture; Secondary Education; *Standardized Tests; Teacher Background; *Teacher Student Relationship
IDENTIFIERS	*Delaware; Third International Mathematics and Science Study

ABSTRACT

This report examines the top Third International Mathematics and Science Study-Repeat (TIMSS-R) performers and compares Delaware classroom environments with those of the top performing students. Data analyses show that Delaware's average class size is larger than any of the top performers, and student attendance, skipping, and tardiness problems are more severe in Delaware than in any top performer. The majority of Delaware students are taught mathematics by teachers who did not major in mathematics or mathematics education, which is different from the top performers. It is shown that teachers' professional development opportunities are not as plentiful in Delaware as in the top performing schools, and teachers in the top performers participate in significantly more professional classroom observations than Delaware teachers. (KHR)

TOP TIMSS-R MATHEMATICS PERFORMERS: WHAT ARE THEY DOING DIFFERENTLY?

Julie Cwikla, Ph.D.
Mathematics Education
University of Southern Mississippi

April 2002

Funding Agency:
Delaware Foundation for Science & Math Education

INTRODUCTION

The Delaware Science Coalition performed at the National and International averages in both mathematics and science (See Figure 1) as reported in previous analyses of the Delaware TIMSS-R data (Cwikla, 2001).

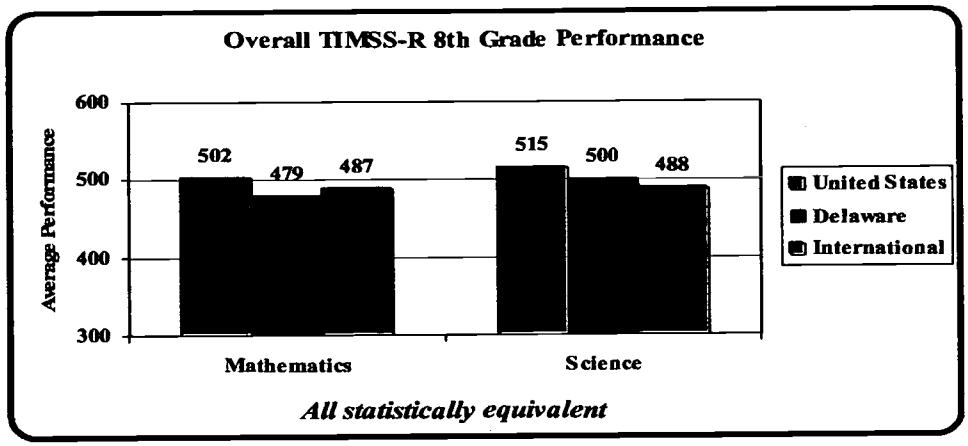

Figure 1: Comparison of Average Performances of U.S., DE, and International.

However, Delaware was significantly outperformed by regions and states with similar characteristics such as demographics and geographic proximity (See Table 1).

State/ Consortia	% Minority	# Tested	Math Avg
DE Science Coalition	37	1268	479
Illinois (IL)	35	4781	509
Maryland (MD)	45	3317	495
Michigan (MI)	18	2623	517
Oregon (OR)	20	1889	514
First in the World (1stWrld)	26	750	560
Montgomery County (Mont)	21	1096	521
Southwest PA Collaborative (SWPA)	13	1538	517

Table 1: Comparison of Similar states and Consortia

The performance difference suggests that Delaware educators could benefit from the examination of top performers' mathematics education systems. This technical report will highlight characteristics of states and entities that consistently outperformed Delaware. There is no one characteristic that is predictive of high mathematics performance. But the examination of various classroom features and teacher characteristics of higher performers, offer some direction for educational policy.

CLASSROOM ENVIRONMENT

Class Size

Optimal class size is debated in the literature. Although, the difference in class size is one student in some cases, Delaware has the largest average class size compared to the higher performers, averaging 29 students (See Figure 2). The majority of the top performers have an average mathematics class size of 24 students.

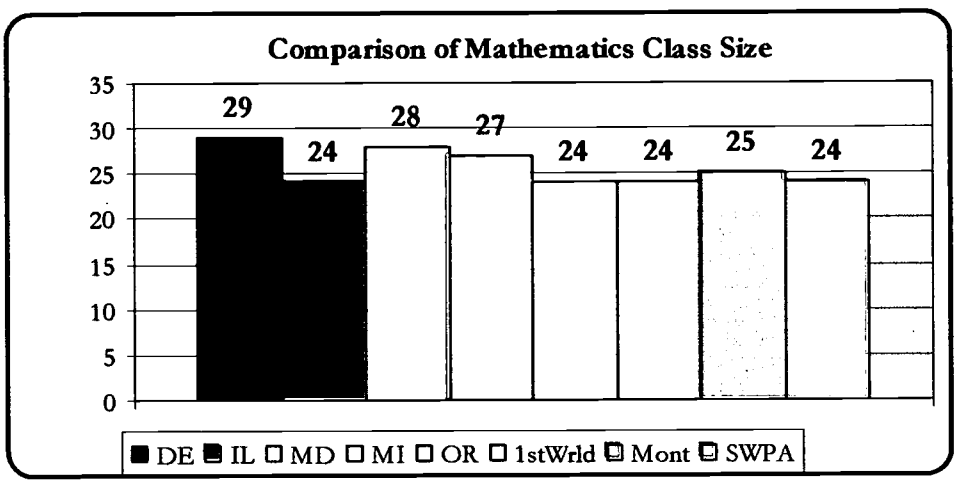

Figure 2: Comparison of mathematics class size.

Student Attendance

Delaware schools report class attendance problems significantly more than any other state or entity described here, all of which are higher mathematics performers (See Figure 3). Montgomery County has not been included in this figure because data were only available for 50% of the students assessed in the TIMSS-R.

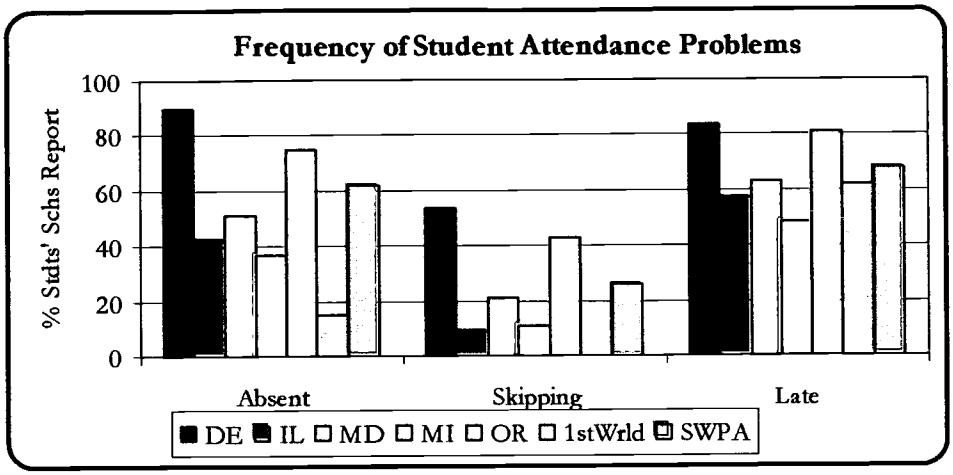

Figure 3: Schools report of student attendance problems.

TEACHING & TEACHERS

The mathematics strands emphasized by the top performers were different from the Delaware classrooms. Delaware emphasized a combination of Algebra, Geometry, and Number more than any other group (See Figure 4). The majority of the higher performers seem to emphasize two areas of mathematics, whereas Delaware's reported mathematics curricula in 1999, is distributed across all Algebra, Number, Other, and a combination of all three.

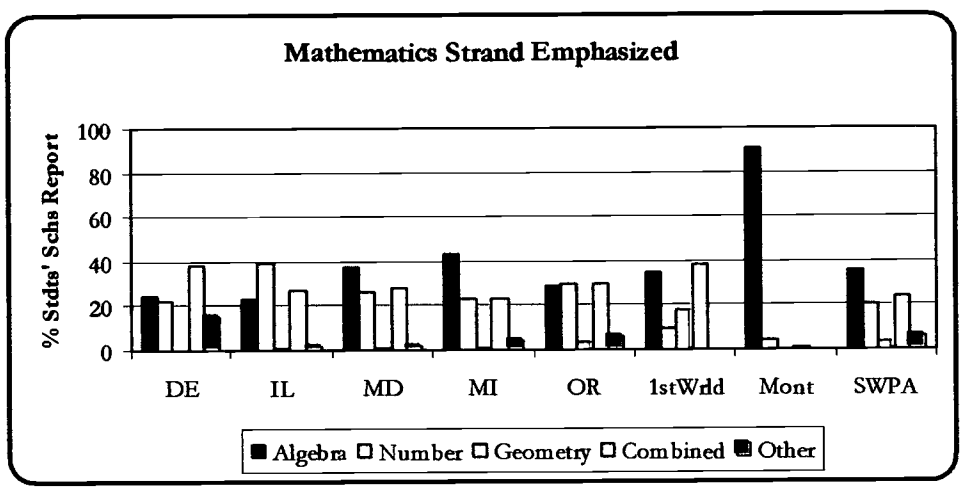

Figure 4: Mathematics strand emphasis across states and entities.

The mathematics classroom activities and modes of instruction were not significantly different across states and entities when student and teacher data were linked. For example teachers and their students have somewhat differing reports about classroom activities. This combined with

the only minor differences between Delaware teachers' report about classroom practice and teachers' report from the high performers, made the inquiry fruitless. However teacher preparation across Delaware and the high performers were significantly different.

Teachers' Degrees

The majority of Delaware students are not being taught by a mathematics teacher with either a mathematics or mathematics education major. The majority of students in the higher performing states and entities are taught by teachers with degrees in mathematics or mathematics education (See Figure 5). All the states and entities except Montgomery County have nearly double the percent of students taught by teachers with mathematics majors teaching eighth grade than Delaware. A separate study (Cwikla, 2002) indicated that the top performers in Delaware were taught by teachers who held degrees in mathematics or mathematics education. **Over 50% of the students in Illinois, Michigan, First in the World, and the Southwest Pennsylvania Consortium are taught by teachers with mathematics majors.** These comparative data support the importance of middle school teacher preparation and likely the accompanying content knowledge of those majoring in the content area they teach on students' TIMSS-R performance.

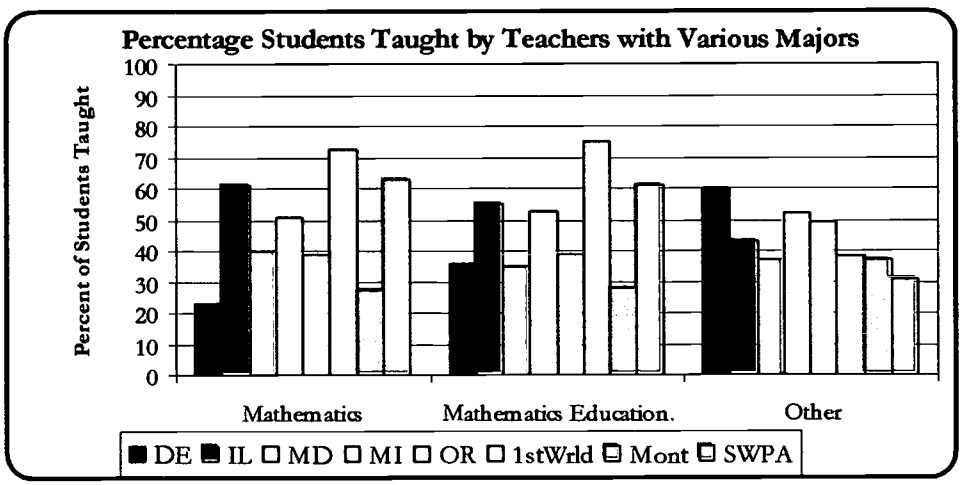

Figure 5: Comparison of mathematics teachers' degree majors.

Teacher Professional Development

One final significant difference between Delaware and the high performers is teachers' professional development (See Figure 6). The high performers in general, organize more out-of-district professional development opportunities and encourage more conference participation than

Delaware developers. First in the World is also a clear outlier in the teacher network group with most teachers participating in networks as well as the other three formats.

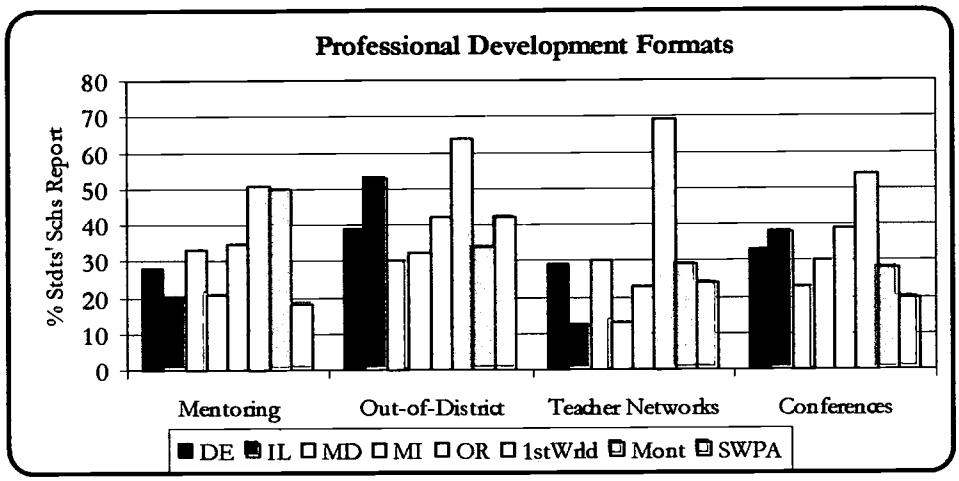

Figure 6: Forms of professional development across states and entities.

First in the World also supports professional teacher observations. Figure 7 displays the significant difference between Delaware and most of the high performers in both observation of other mathematics teachers and being observed themselves.

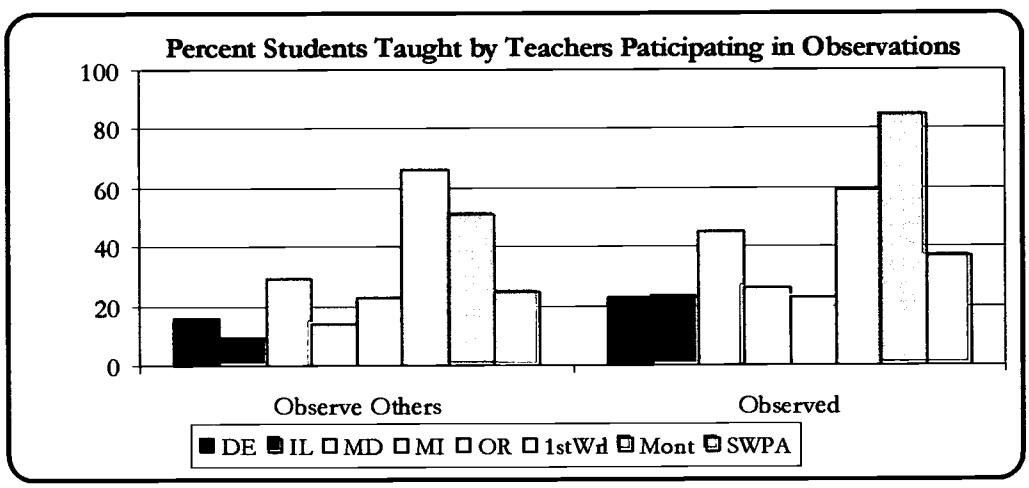

Figure 7: Teacher professional classroom observations

CONCLUSIONS

This study of the top TIMSS-R performers made explicit some of the differences between Delaware classroom environments and those of the top performing students.

- Delaware's average class size is larger than any of the top performers.
- Student attendance problems, skipping, and tardiness problems are more severe in Delaware than in any top performer.
- The mathematics strands emphasized are different in Delaware than in the top performers.
- The majority of Delaware students are taught mathematics by teachers who did not major in mathematics or mathematics education. This is considerably different from the top performers.
- Teachers' professional development opportunities are not as plentiful in Delaware as in the top performers.
- Teachers of the top performers participate in significantly more professional classroom observations than Delaware teachers.

Cwikla, J. (2002). *Differential mathematics performance on the TIMSS-R across Delaware student of color.* Technical Report: University of Southern Mississippi.

Contact the author with comments/questions: Julie_Cwikla@yahoo.com

Sedole8181

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

ERIC

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: TOP TIMSS-R MATHEMATICS PERFORMERS: WHAT ARE THEY DOING DIFFERENTLY?	
Author(s): JULIE CWIKLA	
Corporate Source: DELAWARE FOUNDATION FOR SCIENCE AND MATHEMATICS EDUCATION	Publication Date: APRIL 2002

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker shown below will be affixed to all Level 2B documents
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 1	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2A	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2B
Level 1 ↑ ☒	Level 2A ↑ ☐	Level 2B ↑ ☐
Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) and paper copy.	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Sign here, please

Signature:	Printed Name/Position/Title: JULIE CWIKLA, ASST. PROF
Organization/Address: UNIV. SOUTHERN MISSISSIPPI 244 LOVERS LN OCEAN SPRINGS, MS 39564	Telephone: 228-547-6547 FAX: E-Mail Address: julie.cwikla@usm.edu Date: 8/25/02

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, *or*, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:
Address:
Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant this reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:
Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:

ERIC CLEARINGHOUSE ON ASSESSMENT AND EVALUATION
UNIVERSITY OF MARYLAND
1129 SHRIVER LAB
COLLEGE PARK, MD 20742-5701
ATTN: ACQUISITIONS

However, if solicited by the ERIC Facility, or if making an unsolicited contribution to ERIC, return this form (and the document being contributed) to:

ERIC Processing and Reference Facility
4483-A Forbes Boulevard
Lanham, Maryland 20706

Telephone: 301-552-4200
Toll Free: 800-799-3742
FAX: 301-552-4700
e-mail: ericfac@inet.ed.gov
WWW: http://ericfac.piccard.csc.com

EFF-088 (Rev. 2/2000)