

## A Series of Brief Reports

# RESEARCH IN ONTARIO SECONDARY SCHOOLS

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## *Teaching and Textbooks: The Case of Grade 9 Mathematics*

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By [Gino Sturino](#)

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### Introduction

Reforms in secondary school mathematics education proposed by NCTM (National Council of Teachers of Mathematics) in 1989 and currently advocated by Ontario's Ministry of Education and Training propose teaching strategies be modified so that greater use be made of, for instance, graphing calculators and computers. In similar fashion, reformers suggest de-emphasizing practices where teachers and textbooks act as exclusive sources of knowledge. Nonetheless, since reformers have little to say regarding textbooks, widespread textbook use may represent a major stumbling block when implementing reforms.

My study explored, from teachers' perspectives, how they used Addison-Wesley's 1999 textbook, *Mathematics 9 (Ontario Edition) (AW-9)*, for classroom and planning purposes during the initial stages of reform implementation. Several questions regarding how textbooks were used were considered. How do teachers use (1) textbooks in classrooms, (2a) textbooks relative to other materials, (2b) textbooks at different stages of curriculum implementation, and (3) textbook-embedded features? While the first question focused on classroom practices, the others focused on textbook use from various planning perspectives.

### Methodology

An instrumental (focus on issues), multiple case (two teachers) and multiple site (two schools) case study approach was employed. "Gregory" and "Julia" were selected because they used AW-9 and taught the Principles of Mathematics, Grade 9, Academic Course (MPMID) in 1999/2000 (the initial year of its mandated implementation) and were in the process of doing so again in 2000/2001 (the second year of implementation). Data collection

began in November 2000 and completed in February 2001. Collected were teacher selection, questionnaire, observational, document and interview data. Each teacher was observed 14 hours and interviewed seven. Analyses included triangulating (1) observation, document and textbook data, and (2) textbook, interview and teacher questionnaire data.

## Results

### 1. How do teachers use textbooks in classrooms?

Classroom observations revealed a complex relationship existing between teaching strategies employed and the ways AW-9 was used. The two teachers adopted *three teaching approaches*: (1) teacher-centred strategies (lessons divided into units where teachers discussed previously assigned exercises, presented new materials in teacher-centred ways, and allotted time for students to complete newly assigned problems); (2) computer/textbook-centred strategies (teachers assigned AW-9 computer-based “investigations” to be completed prescriptively as stated in AW-9); and (3) calculator/activity strategies (variety of teaching strategies were employed). *Teacher textbook uses were related differently according to the teaching approaches employed.* (1) When teacher-led approaches were used, the textbook was limited to providing problem sets for classroom, homework and whole class discussion purposes; (2) when computer/textbook-led approaches were used, AW-9 and computers acted as the primary means for providing instruction; and (3) when calculator/activity approaches were incorporated, AW-9 was used in a variety of ways.

### 2. How do teachers use textbooks relative to other materials, and how do they use textbooks at different stages of curriculum implementation?

First, Gregory and Julia used AW-9 in different ways as implementation progressed. From a daily planning perspective, AW-9 *was always used but less so during the second year* where teachers indicated they relied more on *experience* gained during the initial year of implementation. Second, their *department heads* greatly influenced teacher planning, especially during the first year of implementation. The influence of these department heads was exerted through departmental meetings, the selection of AW-9 and their development of outlines based on the textbook. Finally, *The Ontario Curriculum, Grades 9 and 10: Mathematics, 1999* (TOC) and the *Course Profile: Principles of Mathematics (Grade 9 Academic)* (Profile) had less direct influence on teacher planning than did AW-9 or department heads. While both teachers acknowledged the importance of TOC, neither made great use of it for planning purposes. The Profile had even less influence on teacher planning than did TOC.

### 3. How do teachers use specific textbook-embedded features?

Planning in both schools occurred at two levels, the departmental and the teacher. At the departmental level, department heads incorporated personally modified versions of AW-9's chapter and section structure into their school course outlines. Teacher lesson planning, in turn, was guided by these outlines. Although planning was partially controlled this way,

Gregory and Julia had greater freedom when preparing individual lessons. Interestingly, the teachers made considerable use of AW-9 when planning lessons, albeit in different ways and for different reasons depending on the type of lesson. (In both cases, three lesson types were observed: (1) “typical” lessons were divided into intervals dedicated to teacher-directed new topic presentations, teacher-directed whole class discussions and textbook-based student work periods; (2) “geometry”, “computer-based” or “Geometer’s Sketchpad (GSP)-based” lessons included having students refer to materials in AW-9’s Chapter 11; and (3) “calculator-based” lessons included having students use TEXAS Instruments’ graphing calculators (TI-83).) The teachers somewhat relied on AW-9 when planning typical lessons, most of all when planning computer-based lessons and least of all when planning calculator-based lessons. During the first year of implementation, the teachers made extensive use of AW-9 when planning typical lessons; they used it to identify content to teach and problems to assign, but made little use of its “teaching sections”. They made greater use of AW-9 when planning computer-based lessons. Their apparent dependence on AW-9’s Chapter 11 GSP-based investigations was in turn based on other factors (TOC, departmental mandates and teacher experience with GSP) and not merely on AW-9’s many references to GSP. The teachers also referred to the textbook but to a lesser extent when planning calculator lessons; they used only half of AW-9’s references to TI-83s and only on occasion created calculator-based lessons without referring to AW-9.

## Conclusion

The extent AW-9 influenced early stage implementation of the MPMID curriculum outlined in TOC *cannot be overstated*. While classroom observations revealed the teachers using a variety of strategies, some more closely aligned with reform recommendations (e.g., graphing calculator and computer use) than others (e.g., teacher-centred strategies), AW-9 clearly played an important role (albeit in varying ways and to different degrees depending on the strategy employed). This is significant from a reform perspective in that AW-9 acted as *both* an obstacle *and* a means for reforming teaching strategies employed in classrooms. Furthermore, although AW-9 was an influential instrument used throughout the initial stages of implementation, it was not the only important one -- TOC and department heads clearly influenced teacher planning in important ways. Teachers nonetheless continued to make considerable use of AW-9 at the lesson planning level, a level where they clearly had more freedom to plan without recourse to the textbook. While the teachers relied less on AW-9 during the second year of implementation, its influence on practices could not be denied. If reforms in mathematics are not progressing as anticipated, it may be that reformers have not fully appreciated how important textbooks continue to be (albeit in combination with other important factors) in *both* facilitating and obstructing the implementation of reforms

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## Further Reading

Chandler, D. G., & Brosnan, P. A. (1994). Mathematics textbook changes from before to after

1989. *Focus on Learning Problems in Mathematics*, 16(4), 1-9.

Fan, L., & Kaeley, G. S. (1998). *Textbooks use and teaching strategies: An empirical study*. (ERIC Document Reproduction Service No. ED419790).

Lappan, G. (1999). Revitalizing and refocusing our efforts. *Mathematics Teacher*, 92(7), 648-53.

Sosniak, L. A., & Perlman, C. L. (1990). Secondary education by the book. *Journal of Curriculum Studies*, 22(5), 427-42.

Sturino, G. (2002). *Mathematics textbook use by secondary school teachers: A case study*. (Doctoral thesis, OISE/UT Library).

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[Gino Sturino](#), B.Tech., B.Ed., M.A., M.Ed., Ed.D. is a secondary school mathematics teacher in Toronto with 20 years' experience. He recently completed a Doctorate in the Department of Curriculum, Teaching and Learning (OISE/UT).

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OISE/UT Trent Valley Centre  
Box 719, 1994 Fisher Drive,  
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