

Down From the Ivory Tower: Bringing Research Into the Classroom — What [Values] The Mathematics Textbook Also Teaches

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The mathematics textbook is a basic teaching tool. In some cases, it is perceived as *the* mathematics curriculum. Considering different textbook series, we may select one for student adoption, or choose particular sections of other series for class investigation or extension work. We base our selection criteria on different factors, such as the extent to which the content covers institutional intended learning outcomes, the clarity of content exposition, the language demand, the amount of worked examples and/or exercise questions, etc.

While directly facilitating effective student mathematics cognitive learning of content and skills, these factors also influence student affective learning — attitudes, beliefs and values about school mathematics. For example, consider the way two textbooks, A and B, each begin their chapter on 'percentages'. (Note: These are hypothetical examples, devised to reflect real texts, but in a few words, and also to highlight different approaches to 'similar' contents).

Textbook A

You may want to ask yourself, "Based on my experiences, where have I come across the '%' symbol?" You may want to get together with some of your classmates and share with one another the places in which the '%' symbol has been used. Your group may also want to explore what the symbol means, as well as its usefulness in daily life.

Textbook B

- (a) Name some places in which the '%' symbol is used.*
- (b) Find out what is denoted by the '%' symbol.*
- (c) Discuss the usefulness of the concept conveyed by the '%' symbol.*

The intended cognitive learning outcomes may be similar in both blocks of text. However, what attitudes, beliefs and underlying values do these respective texts — or their textbooks — portray? How are the affective states of the student reader potentially affected by the two texts? The 'voice' of each mathematics textbook writer may be implicit, but nevertheless, "whenever an utterance is made, the speaker/writer makes value-laden choices (not necessarily consciously) between alternative structures and contents" (Shield, 1991, p. 3).

The discussion in textbook A begins by inviting reader question-posing. The reader is explicitly referred to by the pronoun 'you'. The textbook invites readers to discuss and share in a group, thus portraying the doing of mathematics as a collaborative human activity. Altogether, these features exemplify the mathematical value of **openness**. That is, mathematical ideas and knowledge can be individually accessed and collectively discussed, perhaps interpreted differently, and these differences can be challenged, defended, clarified and verified.

On the other hand, the text in textbook B is characterised by imperatives, with their impersonal tone, partly due to the absence of any pronoun, and displays an apparent

disregard for readers' prior knowledge (unlike in textbook A). As a whole, the text reflects the writer's valuing of the **mysterious nature** of the mathematics discipline.

Alan Bishop has discussed these two complementary mathematical values of openness and mystery (1988). More examples may be found in Bishop (2000). Importantly, one is not more or less right than the other. Both values reflect views of the nature of mathematics. It is perhaps desirable to achieve a balanced portrayal of complementary values to our students.

However, a preliminary analysis (Seah & Bishop, 2000) shows that, in most Victorian mathematics textbooks, some mathematics content and pedagogical values are given more emphasis than their complementary values. Conflicting affective messages between textbooks and teachers may also result in confusion in our adolescent students, at a time when their personal values framework is developing.

I have highlighted the writers' underlying values because any impact on young readers' developing value system will be so internalised as to affect their subsequent expressions of beliefs and attitudes. Although values may be learned within particular contexts, they are often applied to all subsequent relevant contexts, that is, they become 'context-free'. They exert an "influence on ... [one's] perception of the social and political world. In other words, values provide abstract frames of references for perceiving and organising experience and for choosing among alternative courses of action" (McConatha & Schnell, 1995, p. 80).

As teachers, our pedagogical actions and decisions also reflect our own values. When we mediate the text for our young charges, "authorised information becomes associated with ... [our] explanations. As students are not within the appropriate and sanctioned group to be entitled to criticise the school text, teachers' mediation becomes authoritative" (Pepin & Haggarty, 2000, p. 13).

An important hallmark of teacher professionalism has been our continual growing expertise in adapting (which includes heightening our professional awareness, and negotiating about details and interpretation, but which does not merely mean uncritically adopting) values messages portrayed by textbooks. Teachers sharing and discussing their own professional experience in this area will provide the necessary vocabulary and structure to understand better how values relate to affective factors, and how values complement cognitive learning in improving student mathematics learning as a whole.

Information about the Monash University - Australian Catholic University 'Values And Maths Project' and related publications can be assessed at: <http://www.education.monash.edu/projects/vamp>

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