Effects of technology and male teachers on boys' reading

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In response to concerns about boys' academic underachievement as well as the international gender imbalance in our teaching force composition, a call has been made to hire more male teachers and practice 'boy-friendly' pedagogy. Our investigation of effects of male reading teachers and use of computer-based books demonstrated their ability to de-feminise boys' views of reading but no differential effects were evident on boys' reading achievement or reader self-perceptions between boys taught by males or by females, whether or not they use technology in their reading practices.

With the understanding that competent reading is the strongest predictor of school success (Adams, 1990; Hoffert & Sandberg, 2001) comes the responsibility to ensure that all young children receive effective reading instruction to become proficient readers and successful students. In light of this relationship between literacy and success, attention should be paid to the convergence of evidence from recent national and international test results showing girls outperform boys in reading and writing (Council of Ministers of Education, Canada, 2001, 2006; Gambell & Hunter, 2000; Mullis et al., 2003). A significant gender gap favouring females in reading and writing is currently demonstrated in all countries participating in international testing (Council of Ministers of Education, Canada, 2001; Organization for Economic Cooperation and Development, 2004). Furthermore, the gap is consistently demonstrated at every age that is measured and reported. For example, the Progress in International Reading Literacy Study (PIRLS) (Mullis et al., 2003), measured nine- and ten-year-old children's achievement in two areas of reading—literary and informational—in children from 35 countries. In many countries, girls were over-represented in the distribution of students attaining the upper quartiles (Mullis et al., 2003). In response to these findings, educators must form appropriate pedagogical responses to help boys become better and more committed readers while also maximising girls' achievement.

Educational responses to boys' underachievement have varied and have caused controversy within academic circles. While some interventions have suggested 'boy-friendly' learning environments as a means to attract and retain male students' interest, others suggest that these types of programs reinforce stereotypes and result

in harm to both boys and girls (Alloway et al., 2003; Carrington & Skelton, 2003; Mills et al., 2004; Skelton, 2003). Clearly, what is called for are research-based interventions that are sensitive to and reflective of the heterogeneity within the category of boys. The current study sought to investigate the effects of two classroom variables on boys' reading attitudes and achievement: male reading teachers and computer-based books.

Male models in the classroom

In Canada, the percentage of male teachers declined during the 1990s from 41 per cent in 1989 to 35 per cent in 1999 (Statistics Canada, 2003). In Australia, the number of male teachers dropped between 1987 and 1997 (Lewis et al., 1999). In the USA, the percentage of males teaching in elementary schools dropped between 1981 and 2005 from 18 per cent to 14 per cent (A. Martin, 2005). These statistics have generated public concern that boys are not being exposed to representative numbers of male models in the classroom (BBC News, 2005; Carrington & Skelton, 2003; Eng, 2004; Hetzner, 2003; Mills et al., 2004; Ontario Public School Boards' Association, 2000; Sax, 2005; Tinklin et al., 2001).

According to theories of gender development, children's observations of same-sex role models are important to gender identity development (Golombok & Fivush, 1994; C. L. Martin & Halverson, 1981) and, as a result of their interactions with same-sex models, by age six children can reliably make predictions about same-sexed children's behaviour. While children learn the cultural stereotypes associated with both sexes, they learn about their own sex more quickly and elaborately yet, by age eight, they can also make predictions about the behaviour of children of the other sex (C. L. Martin, 1993).

Research suggests that a reason for some boys' lack of engagement with reading is their perception that it is a feminine activity (Baron, 1996; Brophy, 1985; Cummings, 1994; Government of the UK, 2000; Hermine, 1998; Katz & Sokal, 2003; McKenna, 1997; Pottorff et al., 1996) and that an over-abundance of female reading models in the homes and schools of young children leads to these perceptions (Adams, 1990; Basow, 1992; Delamont, 1990; Pottorff et al., 1996). Research has demonstrated that American boys' perceptions of their competence in language arts drops steeply over the course of elementary (primary) school (Jacobs et al., 2002) during the time boys are developing their awareness of gender roles. This finding is especially troubling in that Jacobs et al. also showed children are more likely to demonstrate increased value for an activity in which they perceive themselves as competent. Jacobs and colleagues suspect that the relationship between competence and task value may be two-way, in that children also spend more time on tasks they value, resulting in 'greater long-term engagement over time' (2002, p. 511). Similarly, Watt (2004) studied the developmental path of older Australian children. Although Watt found that boys' value of English language arts decreased over the course of Years 7 to 11, she did not find evidence to support gender intensification or gender convergence and concluded that gendered perceptions of specific academic domains appear at earlier ages, perhaps even before children begin school. Watt suspects that early socialisation experiences promote gendered

perceptions within children. Proponents of initiatives to augment the representation of male teachers believe that male teachers will serve as male models for young boys (Bradley, 1999; Carrington & Skelton, 2003; Coulter & McNay, 1993; Gamble & Wilkins, 1997; Mancus, 1992; A. Martin, 2005; Mulholland & Hansen, 2003) and may alter their views of reading as feminine.

Despite theoretical support for providing boys with male reading models, numerous large-scale and international studies have demonstrated that male students do not perform significantly better for male teachers than they do for female teachers (see Allan, 1993; Butler & Christianson, 2003; Carrington & Skelton 2003; Carrington et al, 2005; Coulter & McNay, 1993; Ehrenberg et al., 1995; Froude, 2002; A. Martin, 2003; Sokal et al., 2005).

In contrast, Dee (2006) recently found that 13-year-old boys (and girls) performed better for same-sex teachers. Based on the results of a large retrospective study of over 24 000 eighth-grade students, the author predicted that one year with a male teacher of language arts would eliminate one-third of the 1.5-year reading gap between female and male students. It should be noted, however, that Dee's findings were generated through after-the-event analysis of large databases rather than by experimental design. Furthermore, his findings are not based on random assignment: in fact, his data suggest that students are strategically assigned to specific teachers by sex. For example, male students with low achievement orientation may be strategically assigned to male teachers as a means of improving student performance.

In addition to research demonstrating performance differences, a dated yet carefully constructed experimental design examining effects of a teacher's sex on reading attitudes was conducted by Canadian researcher Dan Shapiro. In this study of second-grade boys and girls assigned to same-sex and other-sex teachers, a six-month intervention yielded more negative attitudes toward reading in all groups except girls taught by male teachers (Shapiro, 1980) but attitudes toward reading in boys taught by male teachers became less negative than those taught by female teachers. This supports Jacobs et al.'s (2002) and Watt's (2004) stances that boys' experiences with literacy should be examined with consideration to affective factors in addition to performance factors.

These studies by Dee and Shapiro suggest that the effects of male teachers on boys' reading achievement and attitudes would benefit from further exploration.

Male students and computers

Another proposal for engaging boys in reading is to incorporate technology into the pedagogy used by the classroom teacher. Use of computers has been shown to help increase boys' achievement in school, especially in boys with low achievement (Bangert-Drowns et al., 1985; Niemiec & Walberg, 1985). Comprehension, as measured by richness of story retelling, is superior when children read from computer-based books compared to traditional texts (Doty et al., 2001; Mathews, 1996; Pearman, 2003).

Aside from achievement effects, the use of computers is related to more positive attitudes in boys. Whitley (1997) conducted a meta-analysis of 82 studies and

found that boys have more positive attitudes toward computers than do girls. Furthermore, boys are three times more likely to attend a summer computer-camp (Hess & Miura, 1985), perhaps indicating greater interest in computers.

In a review of 12 studies, Sutton (1991) found that in all studies, except one with a small sample size, male students perceived computers to be within the male domain. This trend is even stronger in male students from an ethnic minority (Campbell & Perry, 1989). Millard (1997) suggests that boys are 'staking a claim to technology' and that this skill set makes them 'differently literate'. Seeing as most Canadian boys and girls also view computer use as masculine (Sokal, 2002), it is reasonable to hypothesise that presenting reading materials, viewed by some boys as feminine, through a masculine format may 'neutralise' perceptions of the reading task as feminine.

It is important to note that some researchers and educators hold reservations about using computers to support boys' reading. Research shows that the positive achievement effects of computer use decline over time, suggesting that the novelty effect of computer-based instruction may be at work (Clark, 1985). Lewin (1996) also cautions that, while the interactive nature of computerised books creates greater interest in boys (Booth, 2002), it may foster over-dependence on features that decode words rather than fostering independent meaning-making skills and strategies in readers. Furthermore, Lefever-Davis and Pearman (2005) show that 'hot links' and animation features in CD-ROM books tend to distract readers and increase reading time, leading to reader fatigue.

Thus, while positive achievement, attitudes and a view of computers as masculine seem to suggest computer-based books may be part of the solution to some boys' reading needs, computer use is not without its limitations as a means of tackling boys' reading needs.

Methods

Participants

The participants (N = 119) were third-grade (n = 53) and fourth-grade (n = 66) boys who attended twelve schools in Winnipeg, Manitoba, Canada (see Table 1). Each school principal was approached by letter and asked to identify 10 third-grade and fourth-grade male students who would benefit from one-on-one reading assistance. All participants at each school were then identified as struggling readers by their classroom teachers. Pre-treatment reading levels as measured by the Alberta Diagnostic Reading Program confirmed the teachers' selections, demonstrating a mean reading level of grade 1.56 among the boys, indicating an average gap of 1.4 to 2.4 grades between reading performance and current grade placement. Furthermore, 13 per cent of the boys indicated that they viewed reading as feminine before the reading intervention.

Our sample was diverse: 76 per cent of the schools were located in the inner city, and 24 per cent were not. The majority of the children's parents (56 per cent) self-identified as belonging to non-Canadian ethnic groups exclusively or in combination with self-identifying as Canadian, although 92 per cent used English in

their homes. One-third of the families self-identified as having aboriginal ancestry. One-third of the children's mothers and one-fourth of the children's fathers had not completed high school. Approximately one-fifth of the mothers and one-sixth of the fathers held university degrees. Approximately 60 per cent of the families lived in poverty, earning less than $40 000 per year, although 57 per cent were employed either full-time (36 per cent) or part-time (21 per cent).

Instruments

Alberta Diagnostic Reading Program This informal reading inventory yields data about subjects' reading performance, including instructional reading level measured in terms of early-, middle-, and late-in-year grade. The Alberta Diagnostic Reading Program was chosen from among a variety of informal reading inventories to deal with possible inequities between participants' background knowledge. Reynolds et al. (1982) showed that cultural background can affect the ways children interpret text. Many of the passages in this program are based on Western Canadian experiences such as ice skating and some were particular to aboriginal experience.

Subjects were asked to read graded narrative and expository passages. Given that reading is widely understood by reading professionals as a meaning-making activity, and to ensure reliability in the administration of a complex test by research assistants, instructional reading level was measured by responses to comprehension questions only. The questions required several cognitive processes: predicting/inferring; attending/analysing/associating; synthesising; and monitoring. Instructional Reading Level was determined by a minimum of seven and a maximum of eight correct responses to ten comprehension questions. This test was administered before and at the end of the 22-week intervention. The final application of this measure began at the last-tested instructional reading level. Comparisons between the before and after tests suggest changes in reading performance.

Gendered activities Q-sort (Sokal, Monette, McBey & Wocjik, 2006) This measure provided children with pictures depicting nine activities such as playing football, watching television and reading. Children were asked to physically place the pictures into categories of activities usually done by girls, activities usually done by boys or activities usually done by boys and girls. The children's classification of the picture depicting reading was used to infer their views of reading as masculine, feminine or gender neutral.

Readers' self-perception scale (Henck & Melnick, 1995) Coming to view oneself as a reader is a critical passage in a child's successfully becoming a proficient reader (Stanovich, 1986). This scale includes 33 statements on a Likert scale, representing five aspects of reader self-efficacy (general perception, progress, observational comparison, social feedback and physiological state). Repeated administration yields evidence of possible changes in a boy's view of himself as a reader. This self-perception scale was used before and at the conclusion of the 22-week intervention and took 15 minutes to administer. Piloting of the instrument

indicated that children became bored with this instrument when it was administered in full. Therefore, it was administered in portions between the other instruments.

Procedures

Once ethics approval had been granted and consent from the parents, teachers, and administrators was given, the 119 children were then randomly assigned to work with either a male or a female research assistant for the duration of the intervention. Half of the children were randomly assigned to the *technology group* and half were assigned to the *no technology* group, therefore creating a 2 (male research assistant/female research assistant) by 2 (technology/no technology) design. Initial visits by the 12 research assistants involved developing rapport with the children and administering the reader self-perception scale, Alberta diagnostic reading program and the gendered activities Q-sort. These same instruments were again administered at the end of the study.

Each week for 22 weeks, the research assistants visited the individual children at school to conduct 30 minutes of reading. Assent was secured from the boys before each session began. In all cases, the texts used for the reading were selected from a common book supply, based on research about books that hold high interest for boys (Worthy et al., 1999). Some books were read from printed texts while others were read in .pdf format from a computer screen. It is important to note that the computer-based books were simple .pdf files and did not include 'hotlinks' or animated objects that have been shown to increase boys' interest in the task. In this way, we sought to isolate the perceptions of computer use versus book use for reading rather than confounding the comparison with extraneous differences. In each case, the research assistants selected the books before their individual reading sessions with each boy. Research assistants were instructed to choose texts based on their understanding of each boy's interests as well as to choose books that represented an attainable challenge in reading level for the individual boy.

Paired Reading, the program used in all the reading sessions, is a reading practice based on Topping's research (1987). The process includes duet reading during which student and tutor read simultaneously, and solo reading when the student chooses to read independently. Evaluation of the use of the Paired Reading approach in several countries suggests strong gains in word identification and text comprehension result from use of this approach (Miller & Kratochwill, 1996; Northern Alberta Reading Specialists' Council, 1991; Pumfrey, 1986).

At the end of the project, all the books used in the research, approximately $7000 of high-interest books, were donated to the participating schools. The children who participated in the project made the presentation to the schools and the books are now housed in the children's classrooms for use by all the class members.

Findings

Over the course of the treatment, five boys (3 per cent) moved away from the participating schools and therefore discontinued participation in the study. For the remaining 114 boys as a group, paired *t*-tests indicated that there were significant

Table 1 Demographic information

Descriptor	*Frequency*	*Percentage*
Grade		
Grade 3	53	44.5
Grade 4	66	55.5
School Location		
Inner city	91	76.5
Not inner city	28	23.5
Language in the home		
English	110	92.4
Other	4	3.4
Missing	5	4.2
Ethnicity		
Canadian	52	43.7
Aboriginal	17	14.3
Aboriginal and Canadian	23	19.3
Other	9	7.6
Other and Canadian	12	10.1
Missing	6	5.0
Mother's education		
Less than high school	36	30.2
High school	29	24.4
Trade school	18	15.1
University	24	20.2
Missing	12	10.1
Father's education		
Less than high school	33	27.7
High school	36	30.3
Trade school	10	8.4
University	20	16.8
Not applicable	8	6.7
Missing	12	10.1
Family income		
Less than $20 000	42	35.3
$20 000–$40 000	30	25.2
$40 001–$60 000	16	13.4
Over $60 000	15	12.7
Missing	16	13.4
Employment status		
Full time	43	361
Part time	25	21.0
Unemployed	46	38.7
Missing	5	4.2
Number of books in the home		
None	2	1.7
A few	51	42.8
Many	61	51.3
Missing	5	4.2

gains in reading performance over the course of the 22-week intervention, t (113) = 7.34, p =.00, $M_{\text{grade equivalent gain}}$ = 0.67, as well as significant gains in their general self- perceptions as readers, t (113) = 3.38, p = 0.001, self-perceived progress, t (113) = 2.64, p = 0.01, and self-perceived observational comparison, t (113) = 3.19, p = 0.002.

A multivariate analysis of variance was then conducted with reading teacher's sex and the use or non-use of computers as the fixed factors. The dependant variables were the changes in boys' scores over the 22 weeks in reading performance, gendered view of reading (masculine, gender neutral or feminine), and the five subscales of reading self-perceptions.

The multivariate analysis of variance indicated no significant main effects of teacher's sex on any of the dependent variables (F_{range} = 0.03 to 53.47, p_{range} = 0.15 to 0.81) but significant differences in changes in feminine views of reading were demonstrated between the group that used technology (n = 58) and those who did not (n = 56), F(1) = 5.24, p = 0.02. Analysis of the means demonstrated that the scores of boys who read from computers changed by 0.12 points on a three-point scale toward viewing reading as less of a feminine activity, while the scores of boys who read from books showed a change in their views of reading in the direction of seeing reading as a more feminine activity by 0.09 points on the same scale.

Two separate analyses of variance were then conducted to analyse the effects of computer use on boys taught by male research assistants and boys taught by female research assistants. The boys taught by female research assistants (n = 57) demonstrated no significant differences in any of the dependent variables between boys who used computers and those who did not (F_{range} = 0.02 to 1.51, p_{range} = 0.23 to 0.88). The boys taught by male research assistants (n = 57) demonstrated significant difference in the magnitude of changes in feminine views of reading between the group of boys using computers (n = 29) and those who did not (n = 28), F = 4.74, p = 0.03. An examination of the means indicated that the boys who used computers with male research assistants showed a less feminine view by 0.17 on a three-point scale, while the boys who worked with males and did not use computers showed an increase in their feminine views of reading by 0.11 on the same scale.

It is important to note that the effects of male teachers (research assistants) using computers in the reading treatment were restricted to boys' feminised views of reading. There were no significant differences between those boys working with male or female research assistants or with or without computers in any of the performance measures or reader self-perception measures in the total sample of boys.

Discussion

Despite the call for more male teachers in the classroom and the proposed move to more 'boy-friendly' pedagogy as a means of tackling boys' reading underachievement, the current study revealed that neither male reading teachers nor computer-based reading had a significant effect on boys' reading performance when compared with the alternative. Indeed, the placement of males into the classroom as role

models appears naive (Skelton, 2003) in light of these findings. In order to understand the complex interactions involved in boys, schooling, literacies and achievement, a much more nuanced understanding of the processes in required (Connell, 1996). Evidence of this claim is found in those effects found to be statistically significant as well as those found to be statistically insignificant in the current study.

Let us begin with an examination of the boys who began the study. Our study began with 119 boys who were identified as struggling readers. Interestingly, only 13 per cent of these boys viewed reading as a feminine activity. It could be argued that this percentage seems low, given that Katz and Sokal (2003) found that 24 per cent of *typical* second-grade readers viewed reading as feminine. One might expect an even higher percentage of *struggling* readers to hold this view—*if* a gendered view of reading is at the root of most boys' reading difficulties. Instead, we found a mere 13 per cent viewed reading as feminine, casting suspicion on the wisdom of interventions aimed at 'masculinising' reading practices as a way to deal with underachievement. A feminine view of reading, while evident in some boys, is not the basis of reading difficulties in all or even most boys in our study and generalised intervention based on this belief is misdirected.

Next, let us turn to the changes that were possible through male teachers, use of computers or a combination of both. The initial multivariate analysis of variance indicated that, while no benefits in achievement were evident when using computers as compared to not using them, attitudinal changes to boys' gendered views of reading were evident when computers were used. Initially, it looked as if computer use, in and of itself, could decrease a feminine view of reading in boys. The subsequent analyses of variance allowed us to tease out an interaction between computer use and the reading teacher's sex. The analyses of variance showed that only in the treatment group using computers and working with male research assistants were the decreases in feminine views of reading evident—not in the treatment group of boys using computers with female research assistants.

This finding is noteworthy in several ways. First, it suggests that the effects of male reading models and computer-based literacy may be cumulative. That is, while neither computers nor male teachers alone promote less feminised views of reading, together they do so. Second, this finding points to the limitations of studying male teachers only as the 'embodied male'. Clearly, attention to the presence of a male teacher is best understood in combination with the actions of that male, in this case a male using technologically based pedagogy.

Third, caution should be taken in generalising our findings to policy decisions regarding teacher hiring, computer purchasing and literacy curriculum and pedagogy. While it is clear that male teachers helping boys learn to read by using computers has definite effects on the boys' feminine views of reading, we are not sure if that is enough to make any long-term differences in their attitudes toward reading or their reading performance. The current study showed no immediate effects on either variable.

It is possible that a longer-term study may reveal that the boys who developed less feminine views of reading would eventually become better

readers simply by being more open to reading activities. Alternatively, less feminised views of reading may have no long-term effect on reading motivation or performance at all. While helping boys to develop more gender-neutral views of reading may be an important process that supports some boys to become better readers, it is not the panacea for boys' reading needs. This claim is supported by research (Katz & Sokal, 2003; Sokal & Katz, 2004), that showed that not all boys who view reading as feminine dislike it and that not all boys who dislike reading view it as feminine. Smith and Wilhelm (2002) suggest that there are other factors, such boys' sense of competence as readers and their understanding that reading has a purpose, that are also important when considering boys' reading experiences. Together, these research studies demonstrate the complex process by which masculinities, attitudes, behaviour and performance interact.

There are also three important limitations to our research that must be considered. First, the research assistants were not the boys' classroom teachers. While a program where adults—usually teaching assistants or parent volunteers—read with struggling reader for 30 minutes per week is certainly common in North American schools, the effects of these people cannot be extended to those of classroom teachers. Second, we did not investigate how the sex of the participants' teachers affected our findings. While our observations confirmed that all but one of the classroom teachers of the participants were female teachers, it would have been be interesting to investigate the interactions of our participants with their classroom teachers outside our study. Third, the International ICT Literacy Panel (2001) suggests that student computer use extends far beyond that of our design. While reading .pdf files from computers does not represent the most common uses of computers by students, restricting our students to this type of computer use was necessary to our design in order to isolate the effects of technology itself versus the many effects of computer literacies. Further research will be necessary to investigate the effects of other computer use such as wikis, blogs, search engines, instant messaging, emailing and online gaming.

Finally, let us be mindful that the percentage of boys who viewed reading as feminine at the beginning of our study—even in these groups of boys who were one to two years behind in reading—was very low. Clearly, while our findings are interesting in that they nuance the category called 'boys' and their differences in responses to male reading teachers and computer-based literacy practices, they are far from supporting either of these initiatives as a means to tackle the so-called 'boy problem'. Our study calls into question policies and initiatives that are based on gendered views of reading. Until we clearly understand how a feminine view of reading is related to reading performance, it seems premature to champion interventions based on this one small component of boys' experiences of reading.

Keywords

males teachers
gender stereotypes
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