

Teacher Efficacy and the Effects of Coaching on Student Achievement¹

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This research considers relationships between student achievement (knowledge and cognitive skill), teacher efficacy (Gibson & Dembo, 1984), and interactions with assigned coaches (self-report measures) in a sample of 18 grade 7 and 8 history teachers in 36 classes implementing a specific innovation with the help of 6 coaches. Student achievement was higher in classrooms of teachers who had more contact with their coaches and in classrooms of teachers with greater confidence in the effectiveness of education. Teachers who relied on school administrators reported less involvement with their coaches and these teachers obtained lower student achievement. There was no interaction between efficacy and coaching, possibly because there was virtually no peer observation.

Cette recherche porte sur les relations entre le rendement scolaire (connaissance et aptitude cognitive), l'efficacité des enseignants (Gibson et Dembo, 1984) et les interactions avec des aidants (mesures d'auto-évaluation) dans un échantillon de 18 enseignants d'histoire dans 36 classes de 7^e et 8^e année où était implantée une innovation avec l'intervention de six aidants. Le rendement scolaire a été supérieur dans les classes des enseignants qui avaient plus de contacts avec leurs aidants et dans celles des enseignants ayant une plus grande confiance dans l'efficacité de l'éducation. Les enseignants qui comptaient sur les administrateurs scolaires ont fait état de contacts moins nombreux avec leurs aidants et ont obtenu un rendement scolaire inférieur. Il n'y avait aucune interaction entre l'efficacité et l'encadrement des aidants, peut-être parce qu'il n'y avait presque aucune observation mutuelle.

Previous research on coaching offers consistent evidence of positive outcomes. For example, Bennett's (1987) meta-analysis showed that coaching combined with other training techniques produced implementation effects surpassing those of other methods. But what of the conditions under which coaching is most effective? Is it possible to distinguish teachers likely to benefit from coaching from those better off with some other school improvement technique?

Teacher efficacy measures the extent to which teachers believe their efforts will have a positive effect on student achievement. Although most researchers have treated teacher efficacy as a unidimensional trait, others have distinguished two types, following Bandura's (1977) distinction be-

tween expectations about one's ability to implement particular strategies and expectations about the outcomes of these strategies. The most frequently used instrument (Gibson & Dembo, 1984) produces two scores: personal teaching efficacy (the expectation that the respondent will be able to bring about student learning), and general teaching efficacy (the belief that teachers' ability to bring about change is limited by factors beyond their control). In most studies there is a weak positive correlation between the two measures and some researchers (for example, Hoy & Woolfolk, 1990) have argued that it is misleading to combine the scores into a single measure. Even when two scales are used, teacher efficacy measures tend to be more global than those developed to assess efficacy in other domains.

Previous research has found that teacher efficacy predicts teachers' implementation of innovative programs and student achievement. McLaughlin and Marsh (1978) used a single questionnaire item for each of two dimensions of teacher efficacy, Rand 1 and 2. They found evidence for an extended causal chain—from teacher efficacy to teacher behaviour to student efficacy to student behaviour to student achievement. Ashton and Webb (1986) used the same measures, finding that Rand 1 (a measure of general teaching efficacy) was related to math scores and that Rand 2 (personal teaching efficacy) influenced language performance; both measures were linked to teachers' instructional practice (avoidance of seatwork and development of a positive emotional climate in the classroom). Smylie (1988) developed three items to measure personal teaching efficacy (for example, "if I really try hard I can get through to even the most difficult unmotivated students") that were positively related to implementation of an interactive teaching program. Stein and Wang (1988) measured teacher efficacy by having teachers rate how well they felt they could implement each of 22 elements of a mainstreaming program; scores were positively related to implementation. Anderson, Greene, and Loewen (1988) used the Gibson and Dembo instruments to find that personal teaching efficacy predicted student achievement in language, reading, and math in grade 3 but not in grade 6.

Although no previous study has linked teacher efficacy to coaching, such a link is credible. Teachers who believe they will make a difference are more likely to see coaching as an opportunity to expand and consolidate their teaching techniques. In contrast, teachers who see student learning as swamped by uncontrollable forces might regard coaching as nothing but more work. Similarly, teachers with strong beliefs in their own effectiveness would be more willing to accept the risk of negative feedback from a coach. Coaches are more likely to be motivated by high-efficacy teachers who believe instructional improvement is worthwhile. The coaches, like the curriculum consultants studied by Alpert, Weiner, and Ludwig (1979), might be more responsive to the needs of "well patients"—teachers least needing help.

Two studies (Poole & Okeafor, 1989 and Poole, Okeafor, & Sloan, 1989) used Gibson and Dembo's instruments to explore relationships among

teacher practice, teacher efficacy, and teacher collaboration where there was “natural” coaching. Neither study established formal coaching networks, but in each there was substantial informal coaching. Teacher efficacy mediated the relationship between teacher collaboration and teacher practice (defined as the extent to which curriculum guides were implemented), although the effect of efficacy varied. Poole and Okeafor (1989) found that teachers with high *general* teaching efficacy had higher implementation if they collaborated *more* with other teachers. Yet Poole, Okeafor, and Sloan (1989) found that teachers with high *personal* teaching efficacy were more likely to implement district curriculum guides if they collaborated *less* with other teachers. Although the counter-intuitive findings in the Poole et al. research may have been an artifact of subscale construction,² it is more likely that teacher efficacy interacts with coaching in some other way. This study examines the mediating effects of teacher efficacy on the relationship between coaching and student outcomes in a small sample of grade 7 and 8 history teachers, hypothesizing that:

1. student achievement would be higher in the classrooms of teachers who interacted more extensively with their coaches;
2. student achievement would be higher in the classrooms of teachers with higher teacher efficacy beliefs;
3. coaching and teacher efficacy would interact such that high-efficacy teachers would benefit more from coaching than low-efficacy teachers.

SAMPLE

The sample consisted of 18 teachers from a small rural Ontario district who varied on a range of demographic factors—age, sex, amount of teaching experience (in the profession and in history), and formal qualifications (degrees)—and in teaching assignments (number of history classes time-tabled). The 18 teachers were responsible for 36 history classes.

They were assisted by six coaches whom the district selected for the project because of their competence and interest in teaching history. The coaches differed on demographic and organizational variables (for example, whether the coach was in the same school as the coachee). Coaches were matched with teachers on the basis of geography.

TREATMENT

The task of teachers was to implement a new history curriculum guideline (Ontario Ministry of Education, 1986). Teachers were given three kinds of resources to meet Guideline expectations.

First were curriculum materials: the Guideline itself, detailed instructional materials produced by a consortium of boards (Interboard History Project, 1987a, 1987b), texts produced by commercial publishers, and a variety of other print and nonprint materials.

The second resource was three half-day workshops distributed over the school year. Each workshop emphasized specific strategies for meeting the cognitive skill expectations of the history program. The instructional procedures recommended to teachers in these workshops, elaborated in Robinson, Ross, and White (1985), had positive effects on problem-solving achievement in previous studies (see, for example, the meta-analyses in Ross, 1988b; Ross & Maynes, 1983) and there is evidence these effects endure over time (Ross & Maynes, 1985). The workshops followed a demonstration, practice, feedback format in which specific teaching strategies were demonstrated in a large group setting; practice activities were completed in small groups led by coaches; and, after feedback, in-class implementation schedules were developed.

The third resource was contact with coaches. The number of contacts varied, ranging from a minimum of one face-to-face and one telephone contact during the year to dozens of each type. The contacts could be initiated by either party. The approach was an adaptation of the In-School Resource Coaching Model (Seller, 1987; Seller & Hannay, 1987) in which teachers (alternating roles) move through a process of analyzing program expectations, observing classroom practice, planning changes, and giving feedback on implementation. Project coaching deviated from the model in two significant ways: the relationship was less reciprocal in that the coaches were relative "experts" in the history program, and there was virtually no classroom observation component. No teachers invited coaches to observe and none of the coaches pushed for an invitation. Only two coaches invited teachers into their classrooms, and in each case it was for the coach to provide a demonstration lesson for the coachee. In the absence of classroom visits, coach and teacher judgments about existing practice and feedback on implementation consisted entirely of teacher reports and, where available, lesson plans, student workbooks, and assignments. At the outset of the project, coaches met as a small group for two in-service days. They worked through activities about the theory behind the In-School Resource Coaching Model, demonstrating specific coaching techniques and giving practice with feedback. The six coaches maintained a coaching network which met for a half-day on six occasions over the year to plan coaching activities and reflect on their experiences.

Teachers also had an opportunity, neither encouraged nor discouraged in the project, to seek help from in-school colleagues (other teachers in the school and school administrators).

INSTRUMENTS³

Student outcome measures were administered in September and May. The knowledge instruments consisted of multiple-choice items selected from the Ontario Assessment Instrument Pool, a public pool maintained by the provincial Ministry of Education. Items were randomly assigned to two

forms which were rotated through the sample so that half the students in each class had form A as pretest followed by form B as posttest; the remaining students received the test forms in the reverse order. There were 15 items in each of the grade 7 forms, 20 items in the grade 8 forms.

Cognitive skills were assessed with open-ended instruments developed in previous investigations (Ross, 1988a, 1990). The items were near-transfer tests involving content not used in the instruction. The comparative thinking items were in this form: "Compare two famous people." The decision-making items were in this form: "There has been a lot of concern with the way students and teachers dress in the school. Should there be a dress code for students and teachers? How should the school decide?" A 50% random sample of student responses ($n=429$) was marked by two trained testers; the proportion of exact agreement between the two raters on a random sample of 92 items was .97. Student scores on each instrument were aggregated to the class and then to the teacher.

Teacher efficacy was measured in May with a 16-item self-report instrument (Gibson & Dembo, 1984). Subjects used a six-point agree/disagree scale to respond to statements such as: "When a student does better than usual, many times it is because I exerted a little extra effort." A total score and two subscale scores (personal teaching efficacy and general teaching efficacy) were produced. The coding was inverted on six of the items to ensure that high scores meant high efficacy on the total test and on both subscales. The internal consistency of the total instrument (Cronbach's Alpha) was .78; for the two subscales it was .69 and .73.

Coaching was measured in two ways. In May teachers completed a self-administered questionnaire concerning how often they used various personnel resources in implementing the Guideline, with respect to three student outcomes (knowledge, comparative thinking, and decision making). Scores ranging from 3 to 12 were created for four items: use of own coach, use of other teachers in the school, use of the coaching network, and use of school administrators. Teachers and coaches were interviewed individually in June. The interview probed coach participation in teacher decision making; descriptions of curriculum deliberation were used to place teacher-coach pairs on an interaction profile. For each teacher task (setting student objectives, developing lesson plans, delivering lessons, appraising the effects of instruction) there were five levels of collaboration between coach and teacher. The lowest level described a teacher functioning without specific input from the coach; the highest described an equal partnership. The placements on each dimension were summed to give a score ranging from 5 to 25.

ANALYSIS

I have produced descriptive statistics for each variable, calculating internal consistency reliabilities for teacher efficacy and student achievement vari-

ables. Since scores on the three outcome measures were highly correlated, I created a single composite achievement score by summing the measures. Pretest scores correlated with post performance. I used residualized achievement scores instead of analysis of covariance to conserve degrees of freedom.

TABLE 1
Summary of Key Variables

	<i>Mean</i>	<i>Standard Deviation</i>	<i>t-Values</i>
<i>Achievement</i> (<i>n</i> =397–429 students)			
total: pre	7.84	3.11	
total: post	16.01	5.55	-29.09, <i>df</i> =396, <i>p</i> <.001
knowledge: pre	5.94	2.67	
knowledge: post	9.54	3.81	-25.58, <i>df</i> =428, <i>p</i> <.001
comparative: pre	1.45	1.07	
comparative: post	3.76	1.71	-24.85, <i>df</i> =428, <i>p</i> <.001
decision making: pre	.46	.60	
decision making: post	2.99	2.71	-19.09, <i>df</i> =428, <i>p</i> <.001
<i>Teaching efficacy</i> (<i>n</i> =16–18 teachers)			
personal teaching efficacy	39.20	4.96	
general teaching efficacy	26.20	5.61	
<i>Uses of personnel resources</i> (<i>n</i> =16–18 teachers)			
use of coach	6.88	2.50	
use of other teachers	.63	2.50	
use of coaching network	5.94	3.47	
use of administrators	2.87	1.26	
teacher-coach interaction profile	9.81	5.08	

A matrix of Pearson product-moment correlations accounted for all variables in the study. Measures of achievement, teacher efficacy, and coaching were entered into a step-wise multiple regression, the order of entry determined by the size of correlation with achievement residuals. An analysis of variance helped to elaborate findings from the regression.

FINDINGS

Table 1 summarizes the results from the main measures used in the study. The table shows that student achievement significantly increased from pre to post. The sum of achievement scores for comparison, decision making, and knowledge produced a composite score; correlations of the subscores with the total were .74, .76, and .77, respectively. Since pretest scores significantly predicted post performance [$F(1,470)=43.64, p<.0001$], residuals from the regression of post on pre were used in subsequent analysis. Student achievement results were then averaged for each class and for each teacher. The teacher was used as the unit of analysis in subsequent procedures.

None of the variables concerned with teacher and coach demographics was significantly correlated with achievement, even when the alpha level was lowered from $p<.05$ to $p<.10$ in response to the small number of cases. The same absence of relationship was observed for organizational variables.

There were correlations, displayed in Table 2, among achievement, teacher efficacy, and coaching measures. The set of cells in the upper left of the matrix indicates that achievement correlated positively with all measures of teacher efficacy. The upper right set shows that the teacher efficacy subscales correlated positively with the total scale and nonsignificantly with each other.

The lower left set of cells indicates that achievement correlated positively with most of the use of the personnel resources measures, including self-reported use of coach, placement on the teacher-coach interaction profile, and self-reported use of the coaching network. In contrast, self-reported use of school administrators correlated negatively with achievement. The latter correlation was substantially affected by a few outliers. Two of the highest achievement scores in the study were reported by two teachers who did not involve the principal in any way in their curriculum deliberations; one of the lowest achievement scores was recorded in the classroom of the teacher who worked with the principal the most. The lower middle cells show there were few correlations between teacher efficacy and use of personnel resources. The total scale and one of the subscales correlated positively with use of the coaching network and placement on the teacher-coach interaction profile. The lower right set of cells shows that teachers who reported more use of their coach also reported more use of other teachers and the coaching network. They also placed higher on the teacher-coach interaction profile. In contrast, teachers reporting greater use of school administrators made less use of the coaching network and placed lower on the teacher-coach interaction profile.

TABLE 2

Correlations Between Achievement, Teacher Efficacy, and Coaching

	Mean student achievement	Teacher efficacy (total)	Personal teaching efficacy	General teaching efficacy	Coach	Other teachers	Coaching network	Admini- strators
Teacher efficacy (total)	.70**							
Personal teaching efficacy	.59**	.72**						
General teaching efficacy	.54**	.84**	.23					
Use of personnel resources								
coach	.67**	.39	.39	.25				
other teachers	.29	.00	-.15	.11	.44**			
coaching network	.48*	.54**	.28	.53**	.48*	.24		
administrators	-.55**	-.40	-.19	-.42	-.49	.02	-.46	
coaching profile	.52	.48**	.32	.43*	.43*	-.09	.17	-.55**

** $p < .05$

* $p < .10$

TABLE 3

Summary of Step-Wise Multiple Regression

<i>Step</i>	<i>Variable</i>	<i>Multiple R</i>	<i>R square</i>	<i>Adjusted R square</i>	<i>F</i>	<i>P</i>
1	Use of coach	.67	.46	.41	10.03	.008
2	Personal teaching efficacy	.80	.64	.57	9.63	.004

The variables in the matrix were entered into a step-wise multiple regression. Table 3 shows that the regression equation explained 57% of the variance. The only significant predictors of student achievement were self-reported use of coach and personal teaching efficacy. There was more student growth in the classes of teachers who reported greater use of their coach and in the classes of teachers who had stronger beliefs in their personal efficacy. The regression was repeated with the total teacher efficacy scale replacing the two subscales. The results (not shown) were virtually identical.

The teacher sample was bifurcated on each of the two independent variables (coaching and teacher efficacy) and the values were entered into an analysis of variance of student achievement. In the first iteration, personal teaching efficacy represented the efficacy variable. In subsequent iterations, it was replaced by general teaching efficacy and then by the total teaching efficacy score. No interactions between efficacy and coaching appeared in any of these analyses. The results for the total efficacy scale are displayed in Table 4 and Figure 1.

TABLE 4

Summary of Step-Wise Multiple Regression

	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P</i>
Within cells	70.64	10	7.06		
Constant	16.52	1	16.52	2.34	.157
Teacher efficacy [TE]	96.67	1	96.67	13.69	.004
Use of coach	41.23	1	41.23	5.84	.036
TE x Coach	2.03	1	2.03	.29	.604

FIGURE 1

Effects of Use of Coach and Teacher Efficacy on Student Achievement

DISCUSSION

The first hypothesis of the study, that student achievement would be higher in the classrooms of teachers who interacted more extensively with their coaches, was confirmed. Although it is reasonable to infer that coaching practices contributed to higher achievement, it is possible that teachers who were enjoying greater success in the classroom might have sought out their coaches and/or coaches might have responded more enthusiastically to success stories. Although the direction of causality in a correlational study cannot be determined with absolute confidence, the study adds to the growing evidence that coaching may positively affect student achievement.

The second hypothesis of the study, that student achievement would be higher in the classrooms of teachers with high teacher efficacy beliefs, was also confirmed. Personal teaching efficacy, rather than general teaching efficacy, was salient. This study is one of few attempting to examine the effect of teacher efficacy on student achievement and is the only one to do so in social studies. It should be noted that efficacy was measured on a single occasion, a practice followed by virtually all previous investigators. Recently, a few researchers have proposed that teaching efficacy should be viewed as a variable state rather than as a trait. This approach is more congruent with Bandura's theory and with the way in which self-efficacy is

measured in other domains. Those who have measured teacher efficacy over time periods similar to the duration of this investigation have found some changes, particularly when preservice teachers were involved. Stein and Wang (1988) reported that teachers became more confident about their ability to implement a particular innovation in a study in which teacher efficacy was measured with a unique instrument specific to the innovation being implemented. Hoy and Woolfolk (1990) used global measures based in part on the Gibson and Dembo (1984) instruments that we used. They found that personal teaching efficacy increased and general teaching efficacy decreased after preservice teachers had experienced the initial shock of practice teaching; in contrast, no changes were observed among preservice teachers who had not practice taught. Housego (1990) also found that practice teaching had an effect on preservice teacher confidence: scores on an instrument measuring feelings of preparedness to teach increased. The only study to report changes in teacher efficacy scores using the same instrument as we used, Anderson, Greene, and Loewen (1988), found that teacher efficacy measured at the beginning and end of the year correlated strongly; $r=.73$ and $r=.86$ for the two subscales. It is possible, although unlikely given the general nature of the items in the instrument and the relative maturity of the teacher sample, that teachers' feelings about their effectiveness were coloured by their perceptions of students' history performance.

Subsequent teacher efficacy research might be informed by studies of efficacy in other domains. First, the stability of teacher efficacy scores should be measured in experienced teacher populations, particularly when teachers are attempting curricular change. Feelings of competence might change as a new program is implemented. A curvilinear relationship might be predicted: high scores during the first rush of enthusiasm, declining as teachers try to incorporate new practices into their routines, followed by a return to higher scores as the change is institutionalized.

Future research might also focus more precisely on the tasks of teaching in measuring teacher efficacy. In general, efficacy is assessed by asking subjects to report their confidence in executing a specific behaviour—for example, children might be presented with a series of arithmetic tasks (Schunk, 1981). A similar approach in teacher efficacy research might elicit teachers' feelings of effectiveness in solving various curricular problems (selecting objectives, conceptualizing student growth, developing teaching strategies, assessing performance). Other teacher tasks such as managing student behaviour and reporting to parents could be addressed in similar ways. Doyle (1986) provides a framework for classroom organization and management that could be used to sample tasks to produce a multidimensional conception of teacher efficacy.

The third hypothesis of the study was not confirmed: there was no interaction between coaching, teacher efficacy, and achievement. Although Figure 1 suggests there might be an ordinal interaction, one could not be

detected due to the sample size. Poole and Okeafor (1989) found that high-efficacy teachers benefited from collaboration with other teachers, while low-efficacy teachers did not. Poole, Okeafor, and Sloan (1989) found the opposite: there were benefits for low-efficacy teachers and negative effects for others. The research reported here found that both groups of teachers were better off if they collaborated with another teacher, in this case a designated coach.

The study began with the question: who benefits from coaching? The investigation found that all teachers, regardless of their level of efficacy, were more effective with increased contact with their coaches. But in this study there was no reciprocal classroom observation, a key element of most coaching models. Sparks (1986), in a controlled experiment, found that coaching without peer observation was much less effective than the full model; similar findings were reported in the meta-analyses of Wade (1984) and Yeaney and Padilla (1986). The range of coaching behaviours included in this study was substantially below the level recommended by coaching advocates, but the ideal levels are infrequently reached (Grimmett, 1987; Zahorik, 1987) and rarely endure (Galbo, 1989). In considering further research about interactions between teacher characteristics and coaching, it would make sense to specify, and systematically vary, the range of coaching behaviours: (a) low levels obtained in settings in which coaching receives no district level stimulus (as in the Poole & Okeafor studies), (b) medium levels obtained in settings in which a coaching program is partially implemented (as in the research reported here), and (c) high levels in which full implementation is achieved over an extended period of time (the ideal case).

The most interesting unforeseen finding of the study was the negative correlations between reliance on school administrators and other measures. Teachers who reported making greater use of school administrators reported less involvement with their coaches, and these teachers obtained lower achievement in their classes. There were also nonsignificant negative correlations with teacher efficacy. These findings lend themselves to a number of interpretations. Some principals may be curriculum meddlers rather than curriculum leaders; for a summary of evidence about the ineffectiveness of the principal in leading curriculum improvement, see Zirkel and Greenwood (1987). It could also be that teachers who made greater use of a supervisor rather than a subject expert in implementing the program may have had greater need of reassurance from an authority figure and/or were unwilling to risk avoidable feedback from a colleague. It is also possible that principals sought out underperforming teachers and focused their resources on helping them, although if this were true one wonders why such principals would not enlist the aid of the coach and other teachers in the school to provide additional support. A fruitful focus for subsequent inquiry might be the effect of tight versus loose coupling of coaches with principals.

This study was exploratory and limited in several ways, among them the small sample, the use of a correlational design, and the departure from ideal

coaching methods. Equally noteworthy was the decision to emphasize student outcomes as the dependent variable. Despite the importance of student achievement as the ultimate criterion of school success (provided the full range of school objectives are tested), a case could be made that teacher practice is a more immediate measure of coaching effects and that classroom observation is the best evaluation tool. There is clearly need for further research in this domain. Coaching is a powerful strategy for school improvement, regardless of whether the improvement efforts are focused within or between schools. Before reformers can make best use of coaching, much more must be learned about how its effects are mediated by individual and organizational variables.

NOTES

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- ² Poole et al. do not report recoding any of the items, a requirement if the two subscales are to be interpreted in the same way.
- ³ The instruments used in the study are available from the author.

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