
FACTORS AFFECTING STUDENTS'
PROGRESS IN READING:
KEY FINDINGS FROM A
LONGITUDINAL STUDY

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Abstract

As a basis for policy development, the study reported here was a research initiative of the State Board of Education and School Programs Division of the Ministry of Education, Victoria, Australia. Conducted among a sample of 5,000 students and their teachers, drawn from 70 government and 30 non-government elementary schools and secondary colleges, the study was designed to provide information over a four-year period (1988-1991) about factors affecting students' literacy development (with a particular focus on reading achievement), and to identify key factors affecting that development.

The study had two primary foci, substantive and methodological. The substantive focus entailed an empirical delineation of student level, teacher level, and school level factors that were hypothesised to influence students' achievements and progress in reading, with particular emphasis on the implications of findings for both policy and practice. The methodological focus involved a comparative examination of the adequacy of explanatory modeling techniques to account for the magnitude and stability of these influences over the first three years of the study, and to use the quantitative findings as a basis for intensive qualitative investigations of class/teacher and school level characteristics among a sub-sample of participating schools during the fourth year. Thus, both quantitative and qualitative methods were used.

Following an outline of the policy context for the study, the related research and description of the methodologies employed, the paper presents a nontechnical summary of key findings with particular emphasis on their related policy implications. Specific technical details of findings from various aspects of the study have been reported elsewhere (Rowe, 1990a, 1990b, 1991b; Rowe & Rowe, 1992a, 1992b, 1992c; Rowe & Sykes, 1989).

Policy Context of the Study

CONSISTENT WITH THE ADOPTION OF CORPORATE MANAGEMENT MODELS in educational governance and the prevailing climate of *economic rationalism* in which such models operate, policy activity since the mid 1980s related to issues of *accountability, assessment, standards monitoring, performance indicators, quality assurance, and school effectiveness* have been widespread throughout Australia, Britain, Europe, and North America (e.g., Austin & Reynolds, 1990; Bosker, Creemers, & Scheerens, 1994; Bottani & Delfau, 1990; Broadfoot, Murphy, & Torrance, 1990; Chapman, Angus, Burke, & Wilkinson, 1991; Cuttance, 1992; Floden, 1994; Hewton, 1990; Jesson, Mayston, & Smith, 1987; OECD, 1989, 1993; Reynolds & Cuttance, 1992; Shavelson, 1994; Wyatt & Ruby, 1989). Much of this activity continues to be directed away from concerns about *inputs* of education systems (i.e., curriculum and teacher professional development), towards *outputs* (i.e., student performance, teacher, and school effectiveness).

From the mid-1980s in Australia, focus on standards monitoring, performance indicators, accountability, and teacher and school effectiveness issues were ultimately given impetus by the federal government's financial support for the *Good Schools Strategy* and its related projects, namely, the *National Schools Project* (NSP) and the *National Project on the Quality of Teaching and Learning* (NPQTL) (Schools Council, 1991). "The NSP is a major action research activity of the NPQTL to investigate how changes to work organization can lead to improved student learning outcomes" (Hill, 1992, p. 403). This activity confirmed an increasing national approach to educational governance and accountability by the government, first signaled in the paper entitled, *Strengthening Australia's Schools* (Dawkins, 1988). Above all, the major effect of

these initiatives was to signal major shifts in government policy intention “. . . to bring the delivery of professional educational services into public sector accounting, underscored by a concern to ensure that such services represent value for money” (Rowe & Sykes, 1989, p. 129). Reviews of these developments have since been provided by Chapman, Angus, Burke, and Wilkinson (1991) and McGaw, Piper, Banks, and Evans (1992).

Consistent with these shifts in focus, the rhetoric of Australian government reports specifically related to teacher education and professional development during this time (e.g., Joint Review of Teacher Education, 1986; Report of the Inservice Teacher Education Project, 1988; Report of the Quality of Education Review Committee, 1985) emphasised the importance of functional links between teacher professional development and the quality of student educational outcomes. This emphasis was curious given that there was, and continues to be, a serious shortage of empirical evidence to support such links. While there was an expanding local and international literature attesting to the efficacy of inservice professional development for teachers (Eraut, 1985; Guskey, 1986; Harris & Fasano, 1988; Ingvarson, 1987; Ingvarson & Mackenzie, 1988; Joyce & Showers, 1988; Sutton, 1987; Walberg, 1986), evidence for its impact on student outcomes was scarce (for exceptions, see Brophy, 1986; Brophy & Good, 1986). In fact, Ingvarson and Mackenzie (1988) noted with alarm: “A considerable investment is made in further training and development for teachers, but little is known about the impact or benefits of most of what takes place” (p. 139). This comment continues to apply to a dearth of knowledge about *benefits* for students.

However, teacher professional development in Australia during the mid 1980s, particularly in the teaching of literacy, was characterised by intense activity. Major impetus for this came from the 1984 Commonwealth Schools Commission-funded program, *Basic Learning in Primary Schools* (BLIPS), which was to operate between 1985 and 1987. Focused on the early years of elementary education (kindergarten [K] to Grade 3), the central aim of this program was (Commonwealth Schools Commission, 1984):

. . . to raise the achievement levels of primary school children in basic subjects. Particular emphasis is to be placed upon improving students’ performance in reading, writing, speaking, and listening. (p. 1)

Three priority areas were identified for program support: (a) inservice teacher professional development programs, (b) home-school relations and parental participation, and (c) curriculum change. However, the major priority area was teacher professional development, “. . . providing intensive programs to improve elementary teachers’ understanding of language . . . learning, and developing their skills in teaching and observing children” (Commonwealth Schools Commission, 1984, p. 1).

By the end of 1987 in the state of Victoria, there were at least nine literacy programs operating in both elementary and secondary schools (Rowe, 1987) including the Early Literacy Inservice Course (ELIC), the Later Reading Inservice Course (LaRIC), the Continuing Literacy Inservice Course (CLIC) and Reading Recovery (Clay, 1985). Some of these programs had statewide exposure, involving the training of large numbers of teachers. For example, it was estimated that approximately 4000 Victorian teachers had been trained in the ELIC program by the end of 1987 (Rowe, 1987; Rowe & Griffin, 1988). Other programs were localised (e.g., Reading Recovery) or were specific to Catholic schools (i.e., CLIC). Others were undergoing trial or were in their first stages of operation (e.g., LaRIC and Key Group Literacy).

Although there was a body of qualitative, formative evaluation literature for these programs separately, indicating positive changes in teacher confidence and associated teaching practices (e.g., Charlton & Holmes-Smith, 1987; Felton, 1986; Geekie, 1988; Glen, 1986; Rowe, 1987; Wheeler, 1986), quantitative attempts to examine the impact of professional development (PD)

programs on changes to teachers' professional self-perceptions and then to student achievement outcomes were conspicuous by their absence. A notable exception was the study by Smylie (1988) whose findings indicated that changes in teachers' classroom practices due to professional development (PD) were a direct function of teachers' professional self-perceptions (i.e., "personal teaching efficacy," p. 25). However, a longitudinal study of teacher PD effects on student outcomes had yet to be conducted. In spite of the conceptual and methodological difficulties entailed by this kind of research (namely, a multilevel data structure of students nested within teachers and schools over time), it was argued that "... the estimation of changes to teachers' professional self-perceptions and practices is crucial to the provision of evaluative criteria for determining the effects of inservice teacher training on student achievement outcomes" (Rowe & Sykes, 1989, p. 130).

Against this background, a formal proposal for a longitudinal study of the impact of inservice teacher professional development programs on students' literacy achievements was formulated (Rowe & Griffin, 1988) and submitted for funding of its operational costs, to be met by a direct grant from the *Commonwealth Resource Agreement 1988: Literacy and Numeracy* allocation. A rationale for the study was expressed in the following terms (Rowe & Griffin, 1988):

Given the heterogeneity of existing literacy programs, a desirable outcome of the study would be the identification of program effects and their related mediating factors that yield sustained improvement in students' literacy achievements over time. (p. 1)

The original intention of the study was to focus on students' literacy development in *reading, writing, and spoken language*. This intention was subsequently modified to focus exclusively on reading. The reasons for this were twofold. First, psychometrically reliable instruments for the measurement and assessment of students' writing and speaking/listening skills spanning the full range of elementary and secondary schooling had yet to be devised. This was especially the case for students in the early years of elementary schooling (Griffin, 1990; Griffin & Nix, 1991). The second reason was that the major thrust common to the literacy PD programs in Victorian schools at the time (as cited) emphasised the development of students' competencies in reading.

Scope and Nature of the Investigation

In a comprehensive review of the reading research literature, Calfee and Drum (1986) noted: "Literacy is the foundation for lifelong learning; thus its importance in practice and in research" (p. 843). The *prima facie* simplicity of this assertion belies the fact that literacy-related research constitutes one of the most vital, vigorous, diverse, complex, and problematic domains of educational and psychosocial inquiry. From a preliminary search of the ERIC files when first beginning their review, Calfee and Drum reported having found more than 25,000 entries identified under the general heading of *reading*. Since that time, the volume of literature has not diminished. To synthesise and evaluate findings from the similarly expanding body of literature related to factors affecting students' reading achievement *per se* is difficult, not only because of the plethora of relationships that have been found, but also because of the range of methodologies that have been employed. Nonetheless, the major factors identified in the literature were classified in four domains: (a) students' cognitive, affective, and behavioral characteristics, (b) sociocultural and home background factors, (c) teacher and/or instructor characteristics, and (d) school organizational and climate characteristics (Rowe, 1991a, 1991b). Some of this literature is reviewed briefly.

From exploratory work in these domains separately and their interactions, many significant associations with students' reading and other academic achievements have long been identified.

Bearing testimony to this is the meta-analytic work of Fraser, Walberg, Welch, and Hattie (1987); Fraser (1989); Hattie (1992); and Walberg (1986); and the work of the International Association for the Evaluation of Educational Achievement (Elly, 1992; Lunberg & Linnakylä, 1993; Postlethwaite & Ross; 1992; Purves, 1973). While there was clearly no lack of empirical evidence, the problem remained one of explicating the observed relationships among factors in *explanatory* terms. Further, since little was known about the relative salience of student, home, and school factors affecting reading achievement, or the impact of teacher and school characteristics and the extent to which these factors are in turn modified and changed by achievement, it was not known which of these factors or combinations might best be enhanced to maximise achievement. Thus, the key task confronting the present study was the identification of *alterable variables* (Bloom, 1980) that may have important implications for both the formulation and implementation of policy and practice.

Given this substantial body of exploratory research related to student achievement, it was considered timely for an *explanatory* study to be undertaken to examine the operation of elements in what Keeves (1986a) refers to as the *cycle of performance*. Moreover, due in part to analytical problems in much of the existing research, the direction of effect relationships among the elements was not clear. A guiding proposition of the study was that it is no longer sufficient to merely report simple bivariate relationships (e.g., coefficients of correlation, regression, or effect size) between given factors and specified learning outcomes. Rather, even at the risk of oversimplification, it was considered necessary to develop *explanatory* models based on substantive theoretical grounds that specify the directions and provide estimates of the effects of critical variables in the *cycle* on student achievement (Rowe, 1989, 1991b). By estimating the extent to which a variable acts either directly or indirectly with other variables to influence achievement, it is possible to gain an understanding of how such variables affect learning and to identify practical intervention strategies.

Major Research Question

It was in this context and in the light of this rationale that the present study addressed the following research question:

To what extent are students' reading achievements over time influenced by factors at the student level (including home background effects, attitudes towards reading, and attentiveness in the classroom), **at the teacher level** (professional development and teacher affect), **and at the school level** (including school organization, climate, or school ethos factors)?

Four major features of this question should be noted. First, central to the thesis of the present study was the assertion that each of the factors mentioned, and their interrelations, do in fact influence students' reading achievement. The supporting literature for this assertion is considerable; a brief review of which is presented here. Second, given the importance of these factors, explanatory models were proposed and tested for fit to the relevant student and teacher data by applying three statistical modeling techniques: (a) multiple regression models using ordinary least squares estimation (OLS), (b) structural equation models using weighted least squares (WLS) estimation (Jöreskog & Sörbom, 1989), and (c) multilevel models using iterative generalized least squares (IGLS) estimation (Prosser, Rasbash, & Goldstein, 1991). In the attempt to answer the research question, the investigation focused on a comparison of the parameter estimates obtained from fitting these statistical models to the data in terms of their explanatory utility, as well as the substantive implications for interpretation of the findings.

Third, the research question implies that the related data have a hierarchical or multilevel structure, namely, students within classes/teachers within schools. Under such circumstances it is important to account for variability at the student, the class/teacher, and school levels simultaneously, both in terms of explanatory variables at these levels and the extent to which between-class/teacher/school differences may explain variation at the student level. While learning essentially takes place at the student level, the fact that students are grouped into classrooms and schools demands careful estimation of the variation in student achievement that may be due to group membership influences. To ignore the essential hierarchical nature of the sampling structure, typical of much educational and psychosocial research and to assume that the student, teacher, or school alone is the unit of analysis, leads to gross aggregation bias, heterogeneity of regression, and related problems of model mis-specification due to lack of independence between measurements at different levels (Aitkin & Longford, 1986; Bryk & Raudenbush, 1989, 1992; Burstein, 1988; Cheung, Keeves, Sellin, & Tsoi, 1990; Goldstein, 1986, 1987, 1995; Raudenbush & Willms, 1991; Robinson, 1950; Rowe, 1989; Rowe & Hill, 1995).

In particular, failure to account for the essential hierarchical nature of the data is that traditional single-level analyses invariably lead to an increased probability of committing Type I errors (Aitkin & Zuzovsky, 1991; Rowe, 1992a), with important ramifications for the substantive interpretation of findings. Unfortunately, such errors occur all too frequently in educational and psychosocial research. Recent developments in multilevel analysis provide strategies that make allowance for estimating the effects of variables at different levels of analysis simultaneously, thus providing evidence for teacher/program/school effectiveness (Bryk, Raudenbush, & Congdon, 1992; Longford, 1986, 1987; Prosser, Rasbash, & Goldstein, 1991; Rasbash, Goldstein, & Woodhouse, 1995). Moreover, such evidence is likely to have useful implications for educational policy determination and implementation.

Fourth, the longitudinal nature of the project was a crucial design feature of the study. Fundamental questions in education centre upon issues of growth in individual and group learning. Since it is axiomatic that students enter classrooms in schools to learn, grow, develop, and change, the study of growth in student knowledge and skills in schools is of central interest in a considerable body of educational research. However, in spite of the fact that the very notion of *school learning* implies *growth* and *change* in specific organizational settings and such issues fall quite naturally into a contextual and longitudinal framework, the vast majority of research attempts to determine the salience of factors affecting student learning outcomes have ignored the inherent hierarchical structure of the derived data and have been addressed with cross-sectional designs (Burstein, 1980; Goldstein, 1979, 1987; Raudenbush & Bryk, 1988; Raudenbush, 1989; Willett, 1988).

It should be noted that studies of school and classroom effects on student learning share two key features: (a) the fact that student growth is the object of inquiry and (b) the fact that such growth occurs in groups or natural organizational settings (i.e., classes and schools). These two features correspond, in turn, to two of the most troublesome and enduring methodological problems in educational research, namely, the problem of measuring *change* (Harris, 1963; Goldstein, 1979, Linn, 1981; Rogosa & Willett, 1985) and the problem of analysing *multilevel* data (Aitkin & Longford, 1986; Bryk & Raudenbush, 1989, 1992; Cronbach & Webb, 1975; Goldstein, 1987, 1995). Since students are not randomly assigned to either classrooms or schools, the task of measuring change in student growth is problematic if the effects of classrooms and schools are ignored.

A major criticism of research in schools is that most studies have used cross-sectional designs or have employed, at most, two time points. Since these studies are usually nonexperimental,

drawing *causal* inferences is particularly problematic in the absence of longitudinal data (Murnane, 1975), since measures of change based on only two time points are notoriously unreliable (Bryk & Raudenbush, 1987; Willett, 1988). The problem is that studies of student growth involve time-series, repeated measures data on students nested within groups, giving rise to difficulties associated with appropriate levels of analysis, aggregation bias, heterogeneity of regression, and problems of model mis-specification mentioned earlier. Further, Nuttall, Goldstein, Prosser, and Rasbash (1989) offer “. . . a note of caution about any study of school effectiveness that relies on measures of outcome in just a single year or of just a single cohort of students. Long time series are essential for a proper study of stability over time” (p. 775).

To avoid these problems, the present study employed a longitudinal, three-wave panel design involving: (a) repeated measures on four cohorts of students nested within classes/schools to estimate their growth trajectories and (b) repeated measures on schools—to evaluate the stability of school effects over time. The second design involved cross sections of student cohorts nested within schools that were changing over time.

At this point, the key terms of the research question are examined briefly within the context of the related research literature as bases for determining the elements of the proposed explanatory models for the student and teacher data to be tested and as pointers for the investigation of school level factors.

Student Home Background Factors

For the past 30 years, the major theories (or models) of learning processes (e.g., Bennett, 1978; Bloom, 1976; Carroll, 1963; Cooley & Leinhardt, 1975) and the *process-product* research generated by them (Brophy, 1986), have primarily focused on *school learning*, or “. . . holistic conceptions of student learning in classroom settings” (Boekaerts, 1986, p. 129). Such is also the case for reading achievement (Calfee & Drum, 1986) despite consistent findings indicating that school factors including financial and material resources, class size, teachers’ qualifications, classroom organization, and teaching methods account for less than ten percent of the variation in student achievement measures (Coleman, et al., 1966; Hanusheck, 1981; Glass, Cahen, Smith, & Filby, 1982; Larkin & Keeves, 1984; Thompson, 1985).

Rather, during these 30 years, highly respected researchers such as Coleman et al. (1966) and Jencks et al. (1972) in the U.S.A. and Bernstein (1971), Peaker (1967), and Plowden (1967) in Britain, “. . . provided evidence that schools and teachers are not effective in enhancing achievement” (Hattie, 1992, p. 9). They unanimously asserted that ethnic and family socioeconomic background factors constituted the dominant determinants of students’ educational achievement outcomes. In a comprehensive review of studies of educational production relationships covering many different schooling situations, grade levels, and outcome measures, Hanusheck (1985) concluded: “. . . differences in family backgrounds have dramatic effects on student achievement” (p. 4059). For example, Rutter, Tizard, and Whitmore (1970) and Thompson (1985) reported that the cumulative effects of home background factors consistently account for more than 50 percent of the variance in measures of student literacy performance.

Similarly, from several British studies during the mid 1980s, comparisons of the academic outcomes of local education authorities (LEAs) showed that social, ethnic, economic, and environmental factors accounted for up to 80 percent of the variation in student academic attainment (Department of Education and Science, 1983, 1984; Gray, Jesson, & Jones, 1984). In a review of factors underlying the academic success of Indochinese refugee children in the U.S.A., Caplan, Choy, and Whitmore (1992) found that family sociocultural [“collective

obligation”] values and “. . . the family’s commitment to accomplishment and education . . .” (p. 21) had strong positive impacts on students’ achievements in both literacy and numeracy. Similar findings have since been observed in the IEA *Study of Reading Literacy* conducted by the International Association for the Evaluation of Educational Achievement (Elly, 1992; Lunberg & Linnakylä, 1993; Postlethwaite & Ross, 1992). Reynolds, Hargreaves, and Blackstone (1980) summarised such findings in the following terms: “. . . variations in what children learn in school depends largely upon variations in what they bring to school and not on variations in what schools offer them” (p. 208).

A growing number of researchers, however, have since provided contrary evidence to such claims (Bryk & Raudenbush, 1987; Fraser, Walberg, Welch, & Hattie, 1987; Goldstein, 1987; Hattie, 1992; Lee & Bryk, 1989; Raudenbush & Willms, 1991; Reynolds & Cuttance, 1992; Rowe, 1991b, 1992a). Many of these researchers have been critical of findings from studies such as Coleman, Hoffer, and Kilgore (1982) because the inherent hierarchical nature of the data had not been taken into account. For example, from meta-analytic syntheses of 7,827 studies of factors affecting students’ educational achievements, Fraser (1989) notes:

. . . there is little support for the contentions of Jencks et al. (1972) or Coleman et al. (1966) that, relative to home influences, there are no measurable school resources or policies that show consistent relationships to a school’s effectiveness in boosting achievement. The effects of the home environment on achievement are neither dramatically more than the effects of the schooling variables, nor do they explain a substantial proportion of the variance. (p. 716)

A major problem in many studies attempting to account for the effects of students’ home background factors is the way in which such factors have typically been measured. Whereas numerous studies have included surrogate measures of home background factors, the variables most often chosen have not been measured directly, but rather, have been proxied by other observable attributes such as student self-report estimates of the number of books in the home, access to community and school libraries, and classifications of family social class or socioeconomic status (e.g., Davie, Butler, & Goldstein, 1972; Douglas, 1964; Elly, 1992; Fotheringham & Creal, 1980; McGaw, Long, Morgan, & Rosier, 1989; Postlethwaite & Ross, 1992; Rutter, Maughan, Mortimer, Ouston, & Smith, 1979; Williams & Silva, 1985).

In an Australian study of early reading achievement, the findings of Share, Jorm, Maclean, Matthews, and Waterman, (1983) indicated that the common practice of using proxy measures such as a single index of socioeconomic status (SES) to *measure* home background influences, severely underestimated the relationship between the home and educational achievement. Share et al. showed that although indices of SES were associated positively with reading achievement, specific processes operating within the home such as academic guidance, language models, levels of family literacy, parental participation and aspirations for the child were more directly related to student achievement (Morgan & Lyon, 1979; Topping & Wolfendale, 1985; Winter, 1988). Fraser’s (1989) meta-analytic synthesis of related research concluded:

What might be called ‘the alterable curriculum of the home’ (e.g., informed parent-child conversations about school and everyday events; encouragement; and discussion of leisure reading; . . . interest in the child’s academic progress) is twice as predictive of academic learning as is family SES (p. 711) . . . achievement is more closely linked to family psychological characteristics than to social class (p. 712).

Further:

. . . this chapter has provided considerable evidence supporting the effect of home environment (especially intellectual stimulation and home interventions) and the class environment (especially cohesiveness, satisfaction and goal direction) in promoting

learning, thus suggesting the important role to be played by teachers and parents in attempting to enhance student achievement through changing classroom and home environments. (p. 717)

Quality home background influences have also been found to be important in the development of positive attitudes towards reading (Beach, 1985; Caplan, Choy, & Whitmore, 1992; Purves, 1973; Walberg & Tsai, 1985).

Recognition of the value of parents as reading tutors for children has been the subject of considerable interest by researchers and education professionals (Scarborough, Dobrich, & Hager, 1991; Wareing, 1985; Webb, Webb, & Eccles, 1985). First described by Morgan (1976) and Morgan and Lyon (1979), practical implementation of the *Paired Reading* (PR) technique for parents, for example, was outlined more fully by Tizard, Schofield, and Hewison (1982) and studied extensively by Topping and coworkers (Topping, 1986; Topping & McKnight, 1984; Topping & Wolfendale, 1985). A local Australian variant of the PR technique is the *School, Home and Reading Enjoyment* (SHARE) program (Turner, 1987), which appears to impact positively on participating students and their school communities (Jones, 1989). However, a review by Winter (1988) indicated that whatever effects PR has upon reading achievement and attitudes may be due to features far from unique to PR as proposed by Morgan and Lyon (1979) and advocated by Topping (1986). Winter argued that whenever parents are actively involved in their child's education, regardless of specific program-related protocols, educational outcomes are maximised. This view has been supported strongly in a collection of papers published in a special issue of the *Elementary School Journal* edited by Hoffman (1991). Nevertheless, such recognition stands in contrast to the bulk of production-function research concerned with factors affecting student achievement, which typically has not included direct measures of parental involvement or related qualitative aspects of family educational inputs. The same can also be said of the bulk of studies concerned with school effectiveness.

Student Cognitive and Affective Factors

The large literature on student factors associated with reading achievement has focused predominantly on *individual differences* in the cognitive, affective, and behavioral domains, as well as their interactions with presage variables such as gender, race, ethnicity, and socioenvironmental factors. The salient finding from research in the cognitive domain, for example, is that early reading achievement is the major determinant of later reading performance (Beck & Carpenter, 1986; Butler, Marsh, Sheppard, & Sheppard, 1985; Share, Jorm, Maclean, & Matthews, 1984; Stanovich, 1986; Tunmer & Nesdale, 1985). This is especially the case for measures of early phonological awareness which consistently correlate more highly with subsequent reading achievement than do omnibus measures of general intelligence or reading readiness (Mann, 1984; Williams, 1984). Results from studies employing structural equation modeling (Torneus, 1984) show that early phonological awareness skills, mediated by home background influences such as quality parental or other adult inputs, lead directly to later superior reading achievement.

Studies of students' affective characteristics such as attitudes and motivations suggest that favourable attitudes towards reading are related to general success in school and contribute towards positive student self-esteem (Ainley, Goldman, & Reed, 1990; Alexander & Fuller, 1976; Beach, 1985; Purves, 1973; Walberg & Tsai, 1985; Weiner, 1984). From Purves' (1973) international study of students' attitudes towards reading, the one factor that contributed most strongly towards positive attitudes was the extent to which opportunity to read was provided and encouraged, both at home and at school. The evidence for home influences appears to be

particularly important. When students are read to by parents or other adults during their preschool years, such experiences are associated with subsequent positive attitudes towards reading, increased confidence and motivation to read, and are related to enhanced reading and writing skills (Bettelheim & Zelan, 1982; Grimmett & McCoy, 1980; Scarborough, Dobrich, & Hager, 1991; Spiegel, 1981; Wells, 1986).

Student Behavioral Factors

From the theoretical work of Carroll (1963, 1984), Cooley and Lohnes (1976), and Bloom (1976) has come the key operational construct of *active learning time* or its equivalents, *time-on-task*, *engaged learning time*, *perseverance*, or *attentiveness*. These writers argued that although students may differ in their aptitude for learning, the different amounts of time needed to achieve a given level of proficiency is a direct function of the amount of *attention* or effort invested by an individual in a learning task. Findings from related research provide strong support for this view, indicating that *attentiveness* is directly related to achievement outcomes (deJong, 1993; Fisher, et al., 1980; Keeves, 1986b; Lahadern, 1968; Rowe, 1991b; Rowe & Rowe, 1992b, 1992c, 1993). This work suggested that *attentiveness*, defined as: “purposeful activity showing a sustained attention span, perseverance, concentration and not easily distracted” (Rowe & Rowe, 1992a, p. 349), is a crucial variable associated with student behavior at home and at school, through which the effects of learning experiences and attitudes are mediated to influence learning outcomes.

Evidence from studies investigating the impact of maladaptive student behaviors provides strong support for the importance of *inattentiveness* as a major variable having negative effects on student achievement, particularly in literacy. These studies reflect an enduring concern of teachers, parents, and mental health professionals of the extent to which the major characteristics of *externalizing* behavior problems in the classroom—classified as *disruptive behavior disorders* in *DSM-III-R* (APA, 1987) and *DSM IV* (APA, 1994) (i.e., attention deficit/over activity and conduct disorders), adversely affect students’ opportunities for learning and educational development.¹ Students whose behaviors are regarded as inattentive, disruptive, or maladjusted have been shown to be at risk of poor educational attainment (Cantwell & Baker, 1991; Davie, Butler, & Goldstein, 1972; Elkins & Izard, 1992; Hinshaw, 1992a, 1992b; Keller, et al., 1992; Maughan, Gray, & Rutter, 1985; McGee & Share, 1988; Rowe & Rowe, 1992a, 1992b, 1993; Rutter, 1985; Silver, 1990). Moreover, in addition to the consequences for an individual, such behavior problems in the classroom diminish educational opportunities for other students and contribute to teacher stress (Brenner, Sörbom, & Wallius, 1985; Otto, 1986; Wearing, 1989). As noted by Hinshaw (1992a), externalizing behavior disorders “. . . are quite refractory to typical interventions and, like severe under achievement, comprise a major psychological, economic, and social problem” (p. 894) (see also Kazdin, 1987; Loeber, 1990; Robins, 1991).

While students’ classroom behaviors have been found to be partly dependent on factors such as ethnicity (Dunkin & Doenau, 1985), social background (Kahl, 1985), gender (Bank, 1985), as well as cognitive and affective characteristics (Debus, 1985; Sinclair, 1985), findings from a growing number of correlational studies indicate stronger direct associations between poor attention and reading difficulties—both in general student populations and in identified learning disabled groups (Dykman & Ackerman, 1991; Jorm, Share, Matthews, & Maclean, 1986; Levy, Horn, & Dalglis, 1987; Maughan, Gray, & Rutter, 1985; McGee, Williams, & Silva, 1987; McKinney, 1989; Stanton, Feehan, McGee, & Silva, 1990; Stevenson, Richman,

¹The link between academic underachievement and students’ externalizing behavior problems has long been noted (Sampson, 1966). For an excellent historical review of this interest and the related research, see McGee, Share, Moffit, Williams, and Silva (1988).

& Graham, 1985). For example, in their longitudinal study in Dunedin, New Zealand, McGee and coworkers have consistently found poor reading achievement to be strongly related to high ratings of inattention. McGee and Share (1988) estimated that 80 percent of their sample of 11-year old children identified with *Attention Deficit Disorder with Hyperactivity* (ADDH), as defined by *DSM-III R* (APA, 1987), had learning disabilities in reading and written language skills. Due, in part, to a variety of methodological and analytical limitations in these studies, however, both the direction and magnitude of *effect* relationships is not clear. For an explication of these limitations, see Rowe and Rowe (1992a).

From interest in the relationship between students' reading disabilities and problem behaviors, Rutter, Tizard and Whitmore (1970) have proposed four alternative *causal* hypotheses, namely: (a) problem behavior leads to reading difficulties, (b) reading disability produces behavior problems, (c) both problem behavior and reading disability are produced by some third factor, and (d) it may be that all of these hypotheses could be partly true. In a review of the related research, McGee, Williams, Share, Anderson, and Silva (1986) noted: "All hypotheses have drawn support from the literature and the proposed mechanisms underlying the relationship between reading disability and behavior disorder appear to be equally plausible" (p. 597).

On the basis of a more detailed review of the literature concerned specifically with the relationship between ADDH and failure to acquire literacy skills, McGee and Share (1988) concluded: "The evidence the authors have reviewed suggests that a substantial overlap exists between ADDH and learning difficulties and that, as yet, no unique pattern of cognitive or attention deficits has been identified that can discriminate between these two types of disorder" (p. 322). (For a detailed discussion, see Fletcher, Morris, & Francis, 1991). Following Kinsbourne (1984), who argued that attention problems are both *context* and *task* dependent, McGee and Share (1988) further concluded that "ADDH behaviors might best be considered as a disorder of conduct in the classroom, because the child with learning difficulties is excluded from much of the normal classroom activity" (p. 322). This view is consistent with the findings of Day and Peters (1989) who suggested that "learning disabled children seem to be better characterized as 'inattentive in the classroom'" (p. 360).

Teacher Professional Development and Affect Factors

As indicated earlier, Australian Government reports on inservice teacher education during the 1980s emphasized the importance of a functional link between teacher professional development (PD) and the quality of educational outcomes for students. While there was an expanding local and international literature espousing the efficacy of inservice professional development for teachers at the time (Eraut, 1985; Freiberg, Prokosch, Treister, & Stein, 1990; Harris & Fasano, 1988; Ingvarson, 1987; Ingvarson & Mackenzie, 1988; Joyce, Showers, & Rolheiser-Bennett, 1987; Joyce & Showers, 1988; Sutton, 1987; Walberg, 1986), there is little evidence for direct effects of teacher PD on student achievement. One exception includes the study by Aitkin & Zuzovsky (1991) which found, using multilevel analysis, that teachers' recent participation in professional development was an important contributor to science achievement for Israeli primary school students drawn from ethnic minority groups.

However, there is growing evidence for the positive effects of PD on teacher affect and changes to their classroom practices (Hill, Holmes-Smith, & Rowe, 1993; Rowe, 1987; Rowe, Hill, & Holmes-Smith, 1994; Rowe & Sykes, 1989; Smylie, 1988). For example, Rowe's (1987) cross-sectional evaluation among teachers trained in the ELIC program documented their claims that participation had markedly improved their competence as "observers of children's learning behaviors," and "notably enhanced their professional repertoires of literacy teaching skills"

(p. 10). Above all, typical of the comments from teachers was: “ELIC has recharged my batteries; my confidence as a teacher has grown dramatically” (p. 10). Similarly, findings from Smylie’s (1988) study indicated that the effects of PD impacted positively on changes to teachers’ classroom practices and on changes in their professional self-perceptions or “personal teaching efficacy” (p. 25). Using structural equation modeling techniques, findings from Rowe and Sykes’ (1989) study indicated strong positive effects of professional development on teachers’ professional self-perceptions and particularly those concerned with *energy, enthusiasm, and job-satisfaction*. Such outcomes point to a need to determine whether these affects are consistent over time and the extent to which they influence student outcomes.

From the research literature there is some evidence for the effects of teacher behavior on student achievement (Brophy, 1986; Brophy & Good, 1986; Lanier & Little, 1986) and mounting evidence that teachers’ self-perceptions and related affective factors (i.e., *efficacy*—Stipek & Weisz, 1981) interact with and impact on their professional practices (Ashton & Webb, 1986; Dunkin & Biddle, 1974; Lee, Dedrick, & Smith, 1991; Levis, 1985; Rosenshine & Furst, 1971; Ryans, 1960). A major proposition at the outset of the present study was that teachers’ professional self-perceptions are crucial input components of any attempt to evaluate the benefits of inservice programs or to monitor educational outcomes, since both the identification and evaluation of outputs at the student level are necessarily mediated by the relative saliency of *teacher effects*. That is, since inservice program effects on students are not independent of the mediation effects of teachers who deliver them to students, it is important to examine the relative impact of professional development on teacher affect and to estimate, in turn, teacher affect influences on student outcomes.

School Organizational Factors

During the last decade, there has been a growing body of research suggesting that administrative and social organizational features of schools are important factors influencing both teachers and students (Ainley, Goldman, & Reed, 1990; Lee, Dedrick, & Smith, 1991). The current interest in the effects of school organizational factors, focused mostly on student achievement outcomes, stems mainly from two sources: research on effective schools (for comprehensive reviews, see: Bosker, Creemers, & Scheerens, 1994; Reynolds & Cuttance, 1992; Reynolds, et al., 1994; Rosenholtz, 1985; Scheerens, 1992) and the relative effectiveness of public and private schools (Anderson, 1990; Coleman, Hoffer, & Kilgore, 1982; Lee & Bryk, 1989; Steedman, 1983). In fact, organizational factors are increasingly seen as important determinants of effective schools (Chubb, 1988; Chubb & Moe, 1990; McNeil, 1986; Metz, 1986; Newman, Rutter, & Smith, 1989), with frequently cited features including the school’s organizational culture, ethos, or climate (Grant, 1988; Lightfoot, 1983; Rutter, Maughan, Mortimer, Ouston, & Smith, 1979).

Many of these studies, however, have had difficulties in demonstrating direct empirical links between school organization or climate and student outcomes. The reasons for these difficulties are both methodological and substantive (Bidwell & Kasarda, 1980; Bossert, 1988; Ecob, Evans, Hutchison, & Plewis, 1982; Goldstein, 1980; Ralph & Fenessey, 1983; Rowe, 1989, 1992a). Briefly, the methodological difficulties stem from ignoring the essential multilevel nature of data at the student level and higher levels, operationalizing teacher level and school level variables as aggregates, and using these aggregates as explanatory variables in single-level regression models to estimate the magnitude of their effects on student level outcomes. The substantive difficulties arise from a general failure to realise that it is more appropriate to conceptualize the link between schools and students as *indirect*, mediated by teachers (Lee, Dedrick, & Smith, 1991).

According to this view, school organization factors influence how teachers view their work and how they teach. In turn, teachers' perceptions and practices influence students' learning. While strong relationships have been demonstrated between student achievement and teachers' levels of *efficacy* (Ashton & Webb, 1986) and *commitment* (Rosenholtz, 1985), these studies are limited because their analyses did not take hierarchical relationships into account. However, using multilevel modeling, Rowe (1990b) showed that teacher energy/enthusiasm—due mainly to participation in inservice professional development programs—had significant effects on students' reading achievement.

The most widely cited summarizations of school organizational characteristics as alterable correlates of educational achievement have been provided by Edmonds (1979a, 1979b, 1981), Purkey and Smith (1983), and Tomlinson (1980). A more recent summary has been provided by Levine and Lezotte (1990). Common to each of these summaries, however, is the tendency to produce *recipes* for effectiveness based on disparate and often anecdotal *findings* reported in the literature, rather than on empirical research evidence. Fortunately, a notable exception is the large-scale empirical work of Postlethwaite and Ross (1992), who provide a list of indicators that discriminate between *more effective* and *less effective* schools in students' reading achievement. Nevertheless, the relevant research literature on effective schools is not extensive, with scholarly comment and critique constituting the major proportion and providing the basis for recipe-like systems of performance indicators of the kind proposed by Hopkins (1991) and Scheerens (1993). Lists provided by these commentators illustrate this approach.

Edmonds listed five ingredients of an *effective* school: strong administrative leadership from the principal, high expectations of student achievement, a safe and orderly atmosphere conducive to learning, an emphasis on the acquisition of basic skills, and frequent monitoring of student progress. For a critique of this five factor model, see Scheerens and Creemers (1989). Tomlinson (1980) agreed with Edmonds, but added (among others) efficient use of classroom time involving an active engagement of students in learning activities and the use of parents or aides to help keep students on task. On the basis of a further review of the effective schools literature, Purkey and Smith (1983) provided a *portrait of an effective school* by making a distinction between nine *organizational and structural variables* and four *process variables*, which taken together, define the climate and culture of the school. They asserted that the most important organization-structure variables are: school site management, instructional leadership, staff stability, schoolwide staff development, parental involvement and support, schoolwide recognition of academic success, maximized learning time, and district support.

Purkey and Smith argued that this first group of variables, which can be set in place by administrative and bureaucratic means, precede and facilitate a second group of process variables, namely: collaborative planning and collegial relationships, sense of community, clear goals and expectations, order, and discipline. They noted, however, that although these variables seem to be responsible for a school climate that leads to increased student achievement, it is “. . . difficult to plant them in schools from without or to command them into existence by administrative fiat” (p. 445). The same can also be said of many conclusions drawn from the research on teacher effectiveness. As Brophy and Good (1986) noted: “. . . what constitutes effective instruction varies with persons and contexts” (p. 370). Such cautions have important implications for policy. On the basis of an intensive empirical study of models of school effectiveness, Banks (1992) has provided a further note of caution:

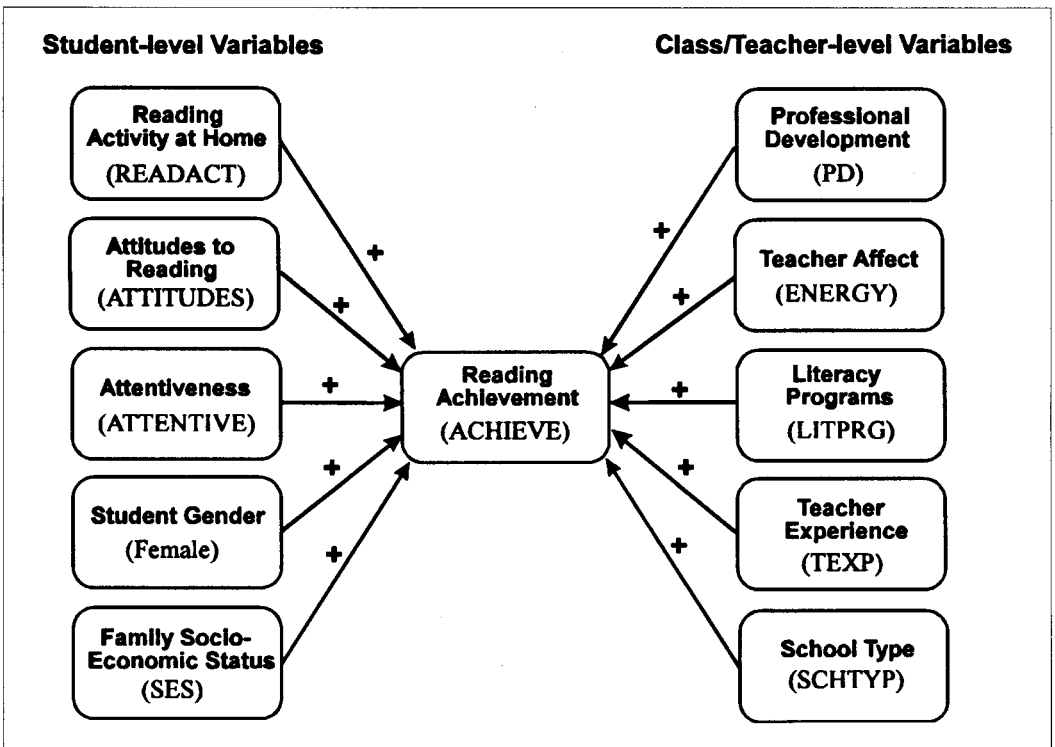
Research on effective schools is being used to shape major policymaking initiatives in Australia and overseas, even though what makes some schools more effective than others remains an open question. Because clear and unequivocal messages to educators and policymakers are yet to emerge from the research, unquestioning acceptance of the current findings should be a cause for concern. (p. 199)

Due to the magnitude and complexity of such school organizational factors, quantitative data on these factors were not obtained for the present study. Furthermore, the available evidence for the importance of these factors is not specific to reading achievement per se. Rather, on the basis of the student and teacher data, the approach adopted involved the identification of those schools in which students consistently indicated high levels of reading achievement over a three-year period (1988-1990) followed by qualitative field investigations in those schools (1991). These investigations were designed to identify and describe school level characteristics that had positive impacts on students' reading achievements.

The Explanatory Models

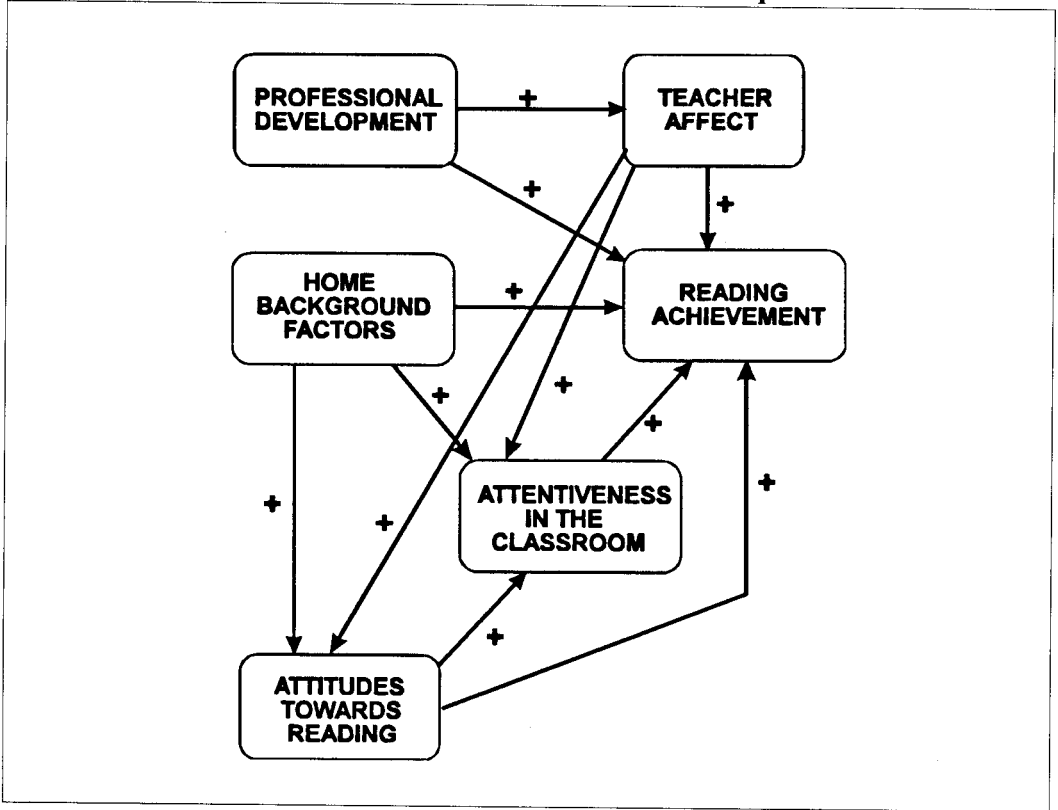
Against this background and in the context of this body of research, the present study was designed to estimate the extent to which students' reading achievements over time are influenced by explanatory factors at the student, teacher, and school levels. To this end, the basic explanatory model tested is schematically presented in Figure 1. This model posits that student Reading Achievement (ACHIEVE) is positively influenced by the effects of five student level variables (Gender [SEX], Family Socioeconomic Status [SES], Reading Activity at Home [READACT], Attitudes Towards Reading [ATTITUDES], and Attentiveness in the Classroom [ATTENTIVE]); and five class/teacher level variables (Teacher Experience [TEXP], Participation in Professional Development [PD], Professional Self-Perception [ENERGY/ENTHUSIASM], whether or not teachers were trained in one or more of three common literacy professional development programs [LITPRG] and School Type [SCHTYP], i.e., government or non-government).

Figure 1. Schematic representation of the basic explanatory model.



The preceding model, however, does not allow estimation of the interdependent effects among the factors (constructs). To this end and for substantive purposes, the baseline covariance structure model tested in this study is schematically depicted in Figure 2 and the three-wave, latent longitudinal model is shown in Figure 3.

Figure 2. Schematic representation of the baseline structural equation model.

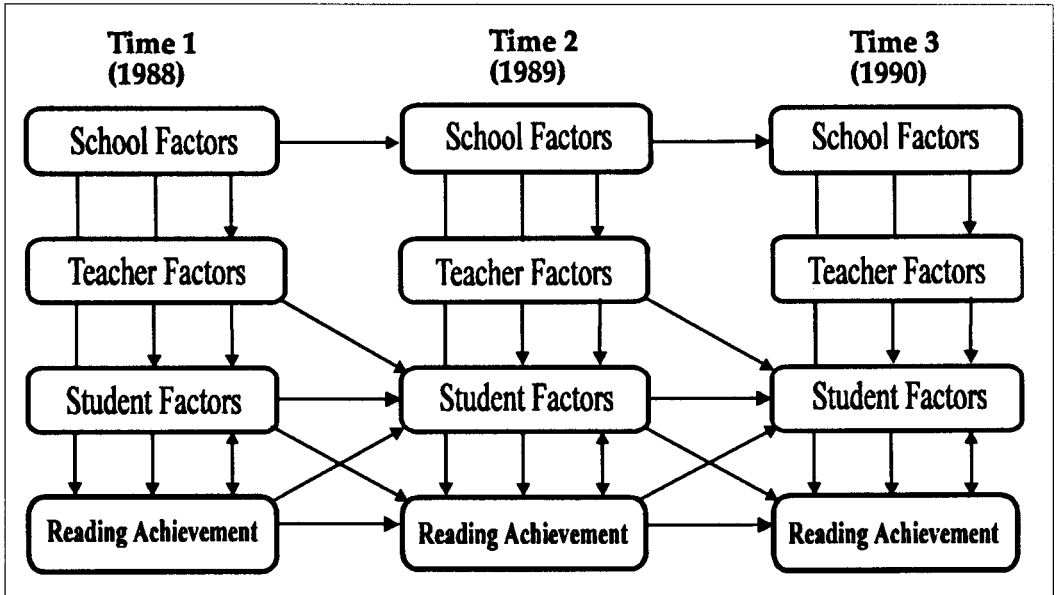


For simplicity, Figure 2 presents the hypothesized structural relationships among the latent constructs of interest at the first time point (baseline). As a means of clarifying the proposed effect relationships, the hypothesized directions of influences are given by unidirectional arrows. Estimation of the effects among the constructs, indicated by plus signs (+) and their relative magnitudes, constituted the initial objectives of the study. At the teacher level, the model posits that teachers' participation in inservice professional development has direct positive effects on their professional self-perceptions (Teacher Affect), which in turn, have positive effects on students' Attitudes Towards Reading, Attentiveness in the Classroom, and on students' Reading Achievement. At the student level, the model posits that Home Background Factors have both direct and indirect positive effects on Reading Achievement, as well as on the mediating latent variables of students' Attitudes Towards Reading and Attentiveness in the Classroom.

Figure 3 presents a schematic version of the proposed three-wave, latent longitudinal model, showing the hypothesized structural relationships among latent factors at the student, teacher, and school levels over three time points (i.e., three years). Several features of this model are worth noting. First, the model requires estimation of the auto regressive effects of the student and school level factors on themselves, over time. Second, the model allows for estimation of

the reciprocal effects among the factors. Third, since it is usual for students to be taught by a different teacher each year or by multiple teachers during any one school year, the effects of teacher level variables were estimated at each time point only.

Figure 3. Schematic three-wave model.



Method

Design

Based on the major research question, the following sample design procedures were aimed to address the dual needs of the study, namely, (a) to obtain stable cross sectional baseline data and (b) to provide for the conduct of detailed longitudinal investigations. To this end, the present study employed a longitudinal, three-wave panel design involving: (a) repeated measures on five cohorts of students (initially at grade levels 1, 3, 5, 7, and 9) nested within classes/schools, and (b) repeated measures on schools. The second design involved cross sections of students nested within schools that were changing over time. Hence, the design was both longitudinal and cross sectional as illustrated in Table 1.

Sample Characteristics

For simplicity, specific details of the target populations, sampling strata, and design are not reported here, but are available elsewhere (Rowe, 1990c). In brief, the study was conducted in a stratified probability sample of students and their teachers in government, Catholic, and independent elementary and secondary schools, involving a cohort of students initially in Grades 1, 3, 5, 7, and 9 located in four education regions (two metropolitan and two rural), within and without the teacher professional development literacy programs of interest, (i.e., ELIC, LaRIC, CLIC, and Reading Recovery).

Table 1
Sample Cohorts by Grade Level and Date

Date	Grade Levels									
	Cohort 1		Cohort 2		Cohort 3		Cohort 4		Cohort 5	
1988	1		3		5		7		9	
1989		2		4		6		8		10
1990	1		3		6		7		9	11

* *Note.* In 1990, for each of the participating schools, an additional class of Grade 1 students was included in the elementary school sample, and a further class of Grade 7 students was added to the secondary school sample. The reason for these additions was to examine the cross-sectional stability of within-school effects on students' reading achievements.

The sample design procedures were aimed to address the dual needs of the study, namely, (a) to obtain stable cross sectional baseline data and (b) to provide an opportunity for conducting detailed longitudinal investigations. Thus, the sample design employed within each of the sample strata was a three-stage cluster design in which schools were selected with probability proportional to their enrollment size (PPS) at the first stage, one intact class selected randomly (at each grade level) within each selected school at the second stage, and all students in the selected classes were included at the third stage. On the basis of an estimated intraclass correlation of 0.2 and an average cluster size of 20, the level of sampling precision within each stratum involved the specification of sampling tolerances of ± 5 percent for 95 percent confidence limits (Ross, 1988a, 1988b). To satisfy these sampling error constraints, it was calculated that a designed sample of at least 164 classes, each of ≥ 20 students would be required (i.e., $n = 164 \times 20 = 3280$). However, given the longitudinal nature of the study and the potential sample and data attrition over time, a more generous target sample of 280 classes (i.e., 5,600 students) was drawn.

Procedure and Measures

Following invitations to sampled schools and their parent communities to participate in the project, pre-study briefing sessions for teachers from those schools were held to provide detailed information about the objectives, design, and administrative requirements of the study and to distribute the relevant data-gathering instruments. Two major instruments were used, both in the form of questionnaires. A similar procedure was used prior to each of the three subsequent data-collection stages.

Student Level Variables

On a Student Record form, two sets of indicators of home background factors were recorded. First, with the informed consent and cooperation of parents, family socioeconomic indicators (SES) were obtained which included: the number of years of mother's education, father's education, and mother's and father's occupational classification—as measured on the Australian Bureau of Statistics 8-point scale (Castles, 1986). Second, a measure of students' Reading Activity at Home (READACT) was obtained from self-report responses on three Likert-type items, each measured on 4-point rating scales: (1) "Do you read books, magazines, or

newspapers at home?" (2) "Do any of your family or friends read books or stories to you?" (3) "Do you talk about books or stories you have read with your family or friends?" For each item, students were asked to respond in one of the following categories: Never, Not Very Often (defined as: once or twice per month), Often (once or twice per week), Every Day (coded 0 - 3, respectively). Student Gender (SEX) was coded 1 for females and 0 for males. Additional sociodemographic data included: country of birth for student, mother and father; the number of years student has lived in Australia; the number of persons who live in the student's residence; and the extent to which English is spoken at home (five indicators).

Students' Attitudes Towards Reading (ATTITUDES) were indicated on three items: (1) "Do you ENJOY reading?" (2) "Do you find reading USEFUL?," and (3) "How WELL can you read?"— each measured on 5-point ordinal scales: *Not at all*, *Not very much*, *Moderately*, *Quite a lot*, and *Very Much* (coded 0 - 4). In the event that some students had difficulty with reading and/or understanding the self-report items, teachers used the response form as an interview schedule to assist students in making their responses.

Table 2
Items Measuring Attentiveness in the Classroom

1. Cannot concentrate on any particular task; easily distracted	• • • • •	Can concentrate on any task; not easily distracted
2. Perseveres in the face of difficult or challenging work	• • • • •	Lacks perseverance; is impatient with difficult or challenging work
3. Persistent; sustained attention span	• • • • •	Easily frustrated; short attention span
4. Aimless activity	• • • • •	Purposeful activity

On a Teacher Record form, a measure of students' Attentiveness in the classroom (ATTENTIVE) was obtained from four teacher rated items each measured on 5-point ordinal scales following the bipolar format advocated and used by Kysel, Varlaam, Stoll, and Sammons (1983). The psychometric characteristics of this domain and its constituent items for the present sample have been reported by Rowe and Rowe (1989, 1993). On the scale provided for each paired behavioral statement, teachers were asked to mark a category nearest to the statement which best describes typical behavior of the student. The relevant items are shown in Table 1. Scores on each item were coded 1 - 5, from negative to positive behavior.

Reading Achievement (ACHIEVE) was assessed in two ways: (a) scores on a criterion/domain-referenced reading comprehension test and (b) teacher ratings on a criterion-referenced profile of student reading behaviors.² For 5-6 year old students, the Primary Reading Survey

² In the design of this study a conscious decision was taken to not depend primarily on standardized test results to measure students' reading achievement. Whereas the use of such tests for the measurement of learning outcomes is typically justified on the grounds of maximum reliability, this has often been at the expense of validity. Moreover, there has long been criticism of the utility of such tests as measures of either learning or competence (e.g., Darling-Hammond, 1994; Frederiksen, 1984; Lacey & Lawton, 1981; Linn, 1986; Newmann & Archibald, 1990; Wigdor & Garner, 1982). Such criticism has since gained credence in the areas of standards monitoring and performance assessment, where new approaches to obtaining more curriculum-specific and *authentic* (Wiggins, 1989) measures of assessment are being tried (Lesh & Lamon, 1992; Moss, 1994; Murphy, 1990; Nisbet, 1993; O'Connor, 1992; Resnick & Resnick, 1992; Shavelson, 1994; Taylor, 1994), but it is a criticism that has been largely ignored in almost all studies of factors affecting student learning outcomes.

Test, Level AA (ACER, 1979) was administered. For older students, selected sub-tests from the *Tests of Reading Comprehension* (TORCH) battery (Mossenson, Hill, & Masters, 1987) were administered. The TORCH tests are a set of 14 untimed reading tests for use with students in Grades 3 to 10 that assess the extent to which readers are able to obtain meaning from text. These tests use an item-response modeling (IRM) approach (Masters, 1982) that provides vertically calibrated estimates of reading ability on a common scale that ranges from zero to 100. Such tests have particular advantages in a study of the present kind since they allow meaningful comparisons to be made across age groups and over time.

All students were rated by their teachers on the English Profiles—*Reading Bands* (Victoria, 1991)—a developmental, IRM-scaled inventory of nine bands (labeled A-I), each consisting of multiple indicators describing reading behaviors. A full account of the development of the Reading Bands is given by (Griffin, 1990; Griffin & Jones, 1988; Griffin & Nix, 1991; Rowe, Hill, & Holmes-Smith, 1994). For each band of indicators, students were assigned a score of: (0) for no evidence, (1) beginning, (2) partial, and (3) for complete evidence—that the indicators listed are consistently displayed by the student. The ratings for each band were added together to give a total score out of 27.

A key assumption underlying the English Profile Reading Bands is that they form a cumulative scale similar to that described by Guttman (1944). Using the Guttman method of scaling, lower bound estimates of *true reliability* for the Reading Bands were computed for large samples of students at each year level (Preparatory - K to Grade 11) and are summarised in Table A1 of the Appendix. The results indicate that the profiles do function as cumulative scales or growth continua and that teachers are consistent in their use of the scales. Further evidence regarding the reliability of teacher assessments using the Reading Bands of the Victorian English Profiles is available in the form of test/retest reliabilities and interrater reliability estimates. These are summarised in Table A2 of the Appendix. The limited evidence regarding interrater reliability shown in the third column of Table A2 are Pearson product-moment correlations between the ratings of two or more teachers who rated the same student. These data derived from naturally occurring instances (mostly team-teaching situations) in which two or more teachers in the same school were able to provide an assessment of the same student. The results indicate a satisfactory level of interrater reliability among teachers. Prior to administration, pilot versions of all instruments were extensively trialed in schools to check on validity and reliability, the results of which were used to refine item content, nomenclature, and presentation format.

Class/Teacher Level Variables

Teachers were asked to respond to a pre-trialed questionnaire instrument designed to obtain information about: Background Training and Experience; Professional Development, Professional Self-Perception, and several literacy-focused aspects related to Teaching Practices and Resources. Of immediate concern to this report, Teacher Experience (TEXP) was measured in terms of the number of years of full-time service. Information about Professional Development (PD) was gained from three questions:

1. How many professional development inservice programs have you attended in the last three years which have involved language and literacy learning?
2. How many inservice programs, other than those related to literacy, have you attended in the last three years?
3. In general, to what extent has your professional development as a teacher been enhanced by participation in inservice programs?

The third question invited teachers to respond in one category of a five-point Likert-type scale, ranging from *Not at all* to *Very much*.

Measures of teachers' Professional Self-perception were obtained from responses on a semantic differential instrument consisting of 34, seven-point evaluative scales adapted from the Professional Self-Perception Questionnaire developed by Elsworth and Coulter (1977). On the adapted semantic differential instrument used in the present study, teachers were required to provide a self-rating on each scale in terms of *myself as a teacher*. From a five-factor solution of 273 teacher responses on this instrument, Rowe and Sykes (1989) found that the first factor (Energy/Enthusiasm) accounted for 47.2 percent of the total variance, while the remaining four factors accounted for only 20.8 percent of the variance between them. To illustrate the relevant items, Table 3 presents those items specifically related to the Energy/Enthusiasm scale.

Table 3
Self-Report Items Measuring Teacher Energy/Enthusiasm

unenthusiastic	•	•	•	•	•	•	•	enthusiastic
burnt-out	•	•	•	•	•	•	•	energized
indifferent	•	•	•	•	•	•	•	eager
unfulfilled	•	•	•	•	•	•	•	fulfilled

Two further variables at the class/teacher level were considered. First, a dummy variable (LITPRG) was included to indicate whether or not teachers of the intact classes in the sample had been trained in one or more of the common literacy professional development programs (coded 0 for not trained and 1 for trained). Second, a further dummy variable (SCHTYP) was included to indicate *School Type* (coded 0 for government schools and 1 for non-government schools). Although this indicator is strictly a school level variable, it was treated as a class/teacher level variable.

Analyses

In fitting the single-level and multilevel explanatory models as illustrated schematically in Figure 1 and Figure 3, maximally reliable composite scores for multiple-indicator variables at the student level (i.e., SES, READACT, ATTITUDES, ATTENTIVE, and ACHIEVE) and at the class/teacher level (PD, ENERGY) were calculated. These scores and their reliabilities were obtained from fitting one-factor congeneric measurement models to the relevant ordinal-scaled indicator items for each construct. In so doing, use was made of a weighted least squares (WLS) method of parameter estimation, fitted to the appropriate polychoric intercorrelation matrix and an asymptotic covariance matrix of these correlations using PRELIS (Jöreskog & Sörbom, 1988) and LISREL 7 (Jöreskog & Sörbom, 1989). For specific details of these well-established procedures, the reader is referred to Alwin and Jackson (1980), Brown (1989), Fleishman and Benson (1987), Jöreskog (1971), Munck (1979), and Werts, Rock, Linn, and Jöreskog (1978). Further details including the rationale for this approach to computing composite variables and their reliabilities have more recently been outlined and demonstrated by Hill, Holmes-Smith, and Rowe (1993) and by Holmes-Smith and Rowe (1994).

For explanatory models of the kind illustrated by Figure 2, simultaneous estimation of the measurement properties of the observed indicators and the structural relationships among their associated latent variables were undertaken using LISREL 7 (Jöreskog & Sörbom, 1989). In fitting these models, use was also made of the relevant polychoric/polyserial intercorrelation matrices and their asymptotic covariance matrices using PRELIS (Jöreskog & Sörbom, 1988).

Specific technical details and results of fitting these models to the present data are given in Rowe (1991b) and Rowe and Rowe (1992a, 1992b, 1992c).

Estimates of the proportion of variance in students' reading achievements due to the clustering of students within class/teachers were obtained from fitting multilevel variance-components models to the data using *ML3* (Prosser, Rasbash, & Goldstein, 1991).

Major Findings and Their Implications

Achieved Sample

Of the 100 schools originally invited to participate in the study in 1988, data were received on 5,092 students from 92 schools (72 elementary; 15 secondary, five P-12), including 64 government schools and 28 non-government schools. Frequency details of the achieved student sample by school type, age group, and gender are shown in Table 4. Thus, from a target sample of 280 classes and 5,600 students, data were received from 256 classes on 5,092 students, representing 91 percent of the target sample. Complete data for the four age groups of students were obtained as follows: 5-6 years ($n = 1,368$), 7-8 years ($n = 1,350$), 9-11 years ($n = 1,329$), and 12-14 years ($n = 732$). Complete data were also obtained from 273 teachers of these students, with a mean teaching experience of 13.5 years (range = 34, $SD = 8.0$).

One hundred thirty teachers had been trained in one or more of the literacy, inservice professional development courses of interest. With reference to sampling accuracy, the standard errors of the mean values for each of the response variables of interest for both students and teachers during 1988, and since, have not exceeded ± 3.1 percent, which has been well within the designed five percent limit of the targeted population values for determining the sampling frame.

Table 4
Details of Student Sample by School Type, Age Cohort, and Gender***

School Type	Age Cohort								Totals	
	5-6 Years		7-8 Years		9-11 Years		12-14 Years			
	F	M	F	M	F	M	F	M	F	M
Gov Elem	519	448	497	467	476	496			1492	1401
NG Elem	221	203	304	217	200	222			725	642
Gov Sec							264	310	264	310
NG Sec							133	125	133	123
Totals	740	651	801	684	676	708	397	435	2614	2478
	1391		1485		1384		832		5092	

* Gov = Government School; NG = Non-government school; Elem = Elementary; Sec = Secondary

** F = Female student; M = Male student

Data obtained on student family sociodemographic variables indicated that 94.3 percent of the sample were born in Australia, a further one percent were born in the British Isles, one

percent from South East Asia, with the balance being made up of students born in Southern Europe, Middle Eastern, and South American countries. The mean number of equivalent full-time years of parents' education was: for mothers ($mean = 11.6, SD = 2.9$) and for fathers ($mean = 12.0, SD = 3.4$). The data on parents' occupational classifications indicated that the proportions obtained in each of the eight categories were within 95 percent confidence limits for the Australian adult workforce population (Castles, 1986).

For ease of presentation and interpretation, the major findings from the study are reported at each of the levels of analysis, namely, the student level, the teacher level, the combined student and teacher levels, and at the school level. Further, to assist the reader, the results are reported mostly in summary form using graphs and diagrams rather than in tables, showing overall findings rather than those for each of the four age groups separately—except in those instances where tabulated presentations better illustrate the relevant findings. More comprehensive technical details related to the data and findings are available from the papers published to date (Rowe, 1990a, 1990b, 1991b; Rowe & Rowe, 1992a, 1992b, 1992c; Rowe & Sykes, 1989).

Student Level Results

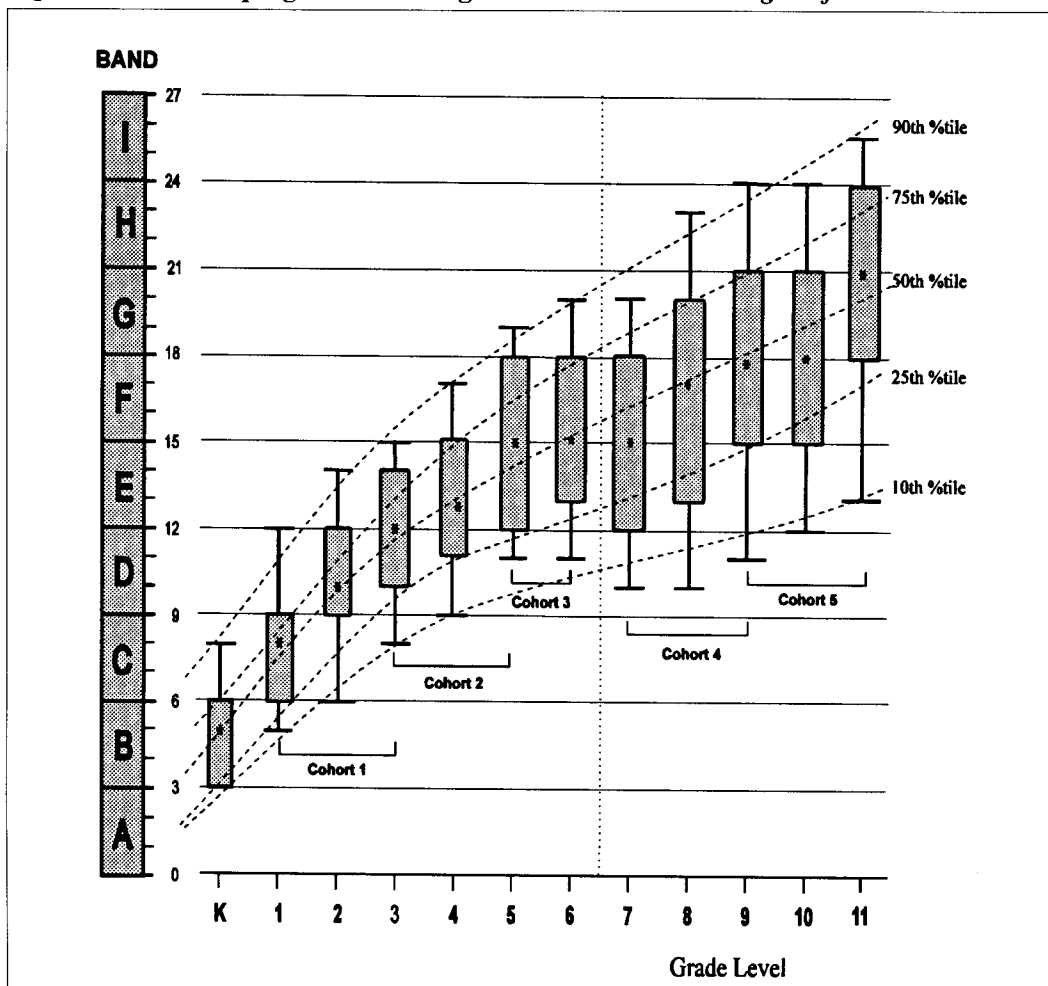
There was positive growth in reading achievement for each of the age cohorts of students. Figure 4 summarizes this growth on the *Reading Profile Bands* using box-and-whisker plots (Tukey, 1977) to describe the *shape* of the distributions for each grade level. The shaded boxes represent the range of achievement for the middle 50 percent of students, with the bottom of each box indicating the 25th percentile and the top of each box showing the 75th percentile. The asterisk in the middle of each box represents the level of achievement for students at the 50th percentile (median). The bottom whisker shows the level of achievement of the 10th percentile, while the top whisker shows the 90th percentile. Lines of best fit have been drawn on each graph for the 10th, 25th, 75th, and 90th percentile values, respectively.

The distributions indicate a period of rapid growth during the first few years of schooling, coinciding with the period during which young people acquire basic literacy skills and thereafter show a consistent rate of growth up to Grade 9. It is noticeable, however, that the range of reading achievement increases markedly over the years of schooling, with more than four band widths separating Grade 9 students at the 10th and 90th percentiles. Of particular concern is the flattening out of the growth trajectory at the 10th percentile, indicating a trend of less than one band width of growth between Grades 4 to 9.

Figure 4 also provides evidence of a discontinuity between elementary and secondary schooling for reading achievement, with a dip in the rate of progress of students in the first year of secondary school (Grade 7). This pattern has been observed frequently in previous studies using common measures over elementary and secondary schooling. Perhaps the most striking feature of this pattern is its similarity with that shown by pediatric percentile growth charts for height and weight during the prepubertal to early adolescent transition period. It is possible that what has become known as an *educational phenomenon* may also have developmental psychophysiological correlates.

The findings related to students' progress on the Reading Profile Bands over time have been particularly useful in the development of benchmarks' for the expected range of student achievement in reading. Using the data from the Literacy Programs Study for teachers' assessments of student progress on the *Reading Profile Bands* (from Grade 1 to Grade 11), recording sheets for *Records of Achievement* (see Broadfoot, 1986) and for reporting to parents have been constructed. These recording sheets were constructed using the nutshell statements contained in the *English Profiles Handbook* (Victoria, 1991).

Figure 4. Students' progress in reading on the Victorian Reading Profile Bands.



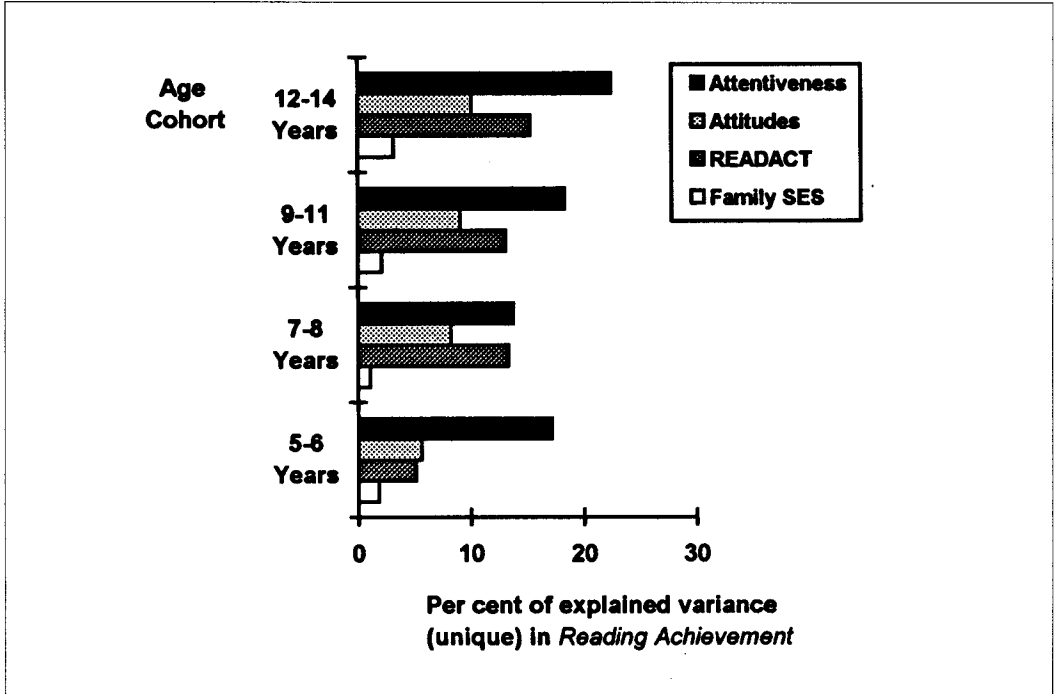
Note. Data for the Preparatory Grade (K) sample ($n = 2280$) were obtained from a further study reported by Rowe, Hill, and Holmes-Smith (1994). These data have been included here for completeness.

To determine the proportions of unique variance in Reading Achievement (ACHIEVE) accounted for by the home background measures (i.e., SES and READACT),³ students' Attitudes Towards Reading (ATTITUDES), and Attentiveness in the classroom (ATTENTIVE), the composite scores for students' Reading Achievement (ACHIEVE) were regressed onto each linear combination of the relevant manifest (composite) variables. The results of these analyses for the four age groups are presented graphically in Figure 5.

From the data summarized in Figure 5, it is clear that the family SES variables (i.e., mother's education [MEDUC], father's education [FEDUC], and father's occupation [FOCC]) account for very small proportions of the variance in students' reading achievement, ranging from 0.3 percent (7-8 year group) to 3.2 percent (12-14 year group). The correlations between SES and ACHIEVE were likewise very small (5-6 years, $r = 0.096$; 7-8 years, $r = 0.048$; 9-11 years, $r = 0.070$; 12-14 years, $r = 0.053$).

³ Since 48 percent of mothers indicated *Home Duties*, mother's occupation was excluded from the estimation of family SES. Further, separate analyses for female and male students in each age group were computed, but are not presented here. While there were significant gender differences in favour of girls on all variables (with the exception of SES variables), the magnitudes of the intercorrelation estimates were very similar.

Figure 5. Percentage histogram showing proportions of explained variance (unique) in Reading Achievement for four factors by age cohort.



The comparative contributions of each SES indicator towards Reading Achievement are shown in Table 5. These findings indicate that the best positive predictors are MEDUC and FOCC, but that in general FEDUC is a negative predictor. This result suggests that students' Reading Achievement is positively influenced by mothers' inputs and possibly by family income (from fathers' occupational status), while fathers appear to spend less qualitative time with their children in respect of reading activities. By comparison, the home background variable of Reading Activity at Home (READACT) contributes strongly to the proportion of variance in students' reading achievement, for each of the four age groups (see Figure 5). Although students' Attitudes Towards Reading also contribute positively towards their reading achievement, the strongest influence, regardless of age group, is from Attentiveness, ranging from 13.4 percent (7-8 year group) to 22.9 percent (12-14 year group).

With the student as the *unit of analysis* (for illustrative purposes here), the magnitude of the influences of home background factors (i.e., family SES and Reading Activity at Home) on Reading Achievement, as well as on the mediating variables of students' Attitudes Towards Reading and Attentiveness in the classroom were assessed using structural equation modeling (i.e., Jöreskog & Sörbom, 1989). For simplicity of presentation, the findings are summarized in the explanatory model depicted by Figure 6.1. (Note: The plus signs [+] indicate the relative magnitude(s) of the effect(s) among the latent constructs).

These findings indicate that regardless of age and gender, family socioeconomic status has little direct or indirect influence on students' Reading Achievement. However, Reading Activity at Home has significant, positive influences on Achievement, as well as on the mediating variables of Attitudes Towards Reading and Attentiveness in the classroom. In fact, the magnitude of the effects of READACT on ACHIEVE increase across the age groups, suggesting that

Table 5

Regression of Reading Achievement on Family SES Variables^a Showing Parameter Estimates (b) and Standard Errors (S.E.) for Four Age Cohorts^b

Age Cohort	Statistic	MEDUC	FEDUC	FOCC	R ²	% of Variance
5-6 Years (n = 1368)	<i>b</i>	0.083*	-0.024	0.005	0.010	1.0
	S.E.	0.035	0.036	0.029		
	T-value	2.384	-0.068	1.902		
7-8 Years (n = 1350)	<i>b</i>	0.001	0.054	-0.013	0.003	0.3
	S.E.	0.034	0.035	0.029		
	T-value	0.009	1.529	-0.460		
9-11 Years (n = 1329)	<i>b</i>	0.089*	-0.036	0.104*	0.018	1.8
	S.E.	0.035	0.036	0.029		
	T-value	2.518	-1.004	3.625		
12-14 Years (n = 732)	<i>b</i>	0.119*	-0.123	0.156*	0.032	3.2
	S.E.	0.047	0.049	0.039		
	T-value	2.524	-2.536	3.968		

Note. The multiple R² values are adjusted for the degrees of freedom

* Significant beyond the $p < 0.05$ level by univariate 2-tailed test

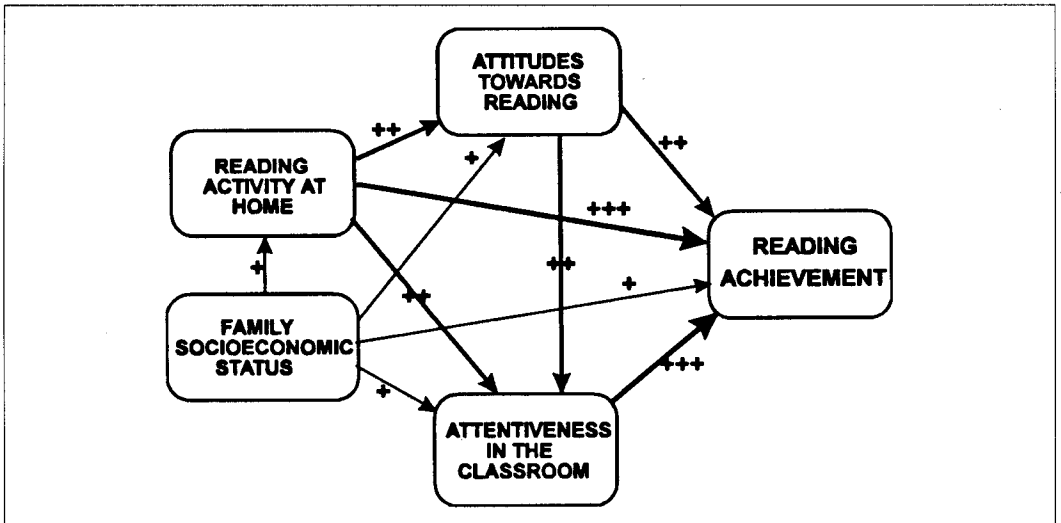
^a MEDUC - Number of years of mother's education

FEDUC - Number of years of father's education

FOCC - Occupational classification on 8-point ordinal scale

^b Age cohorts with complete data

Figure 6.1. Schematic structural equation model showing the effects of home background factors on reading achievement, mediated by attitudes towards Reading and Attentiveness in the classroom.

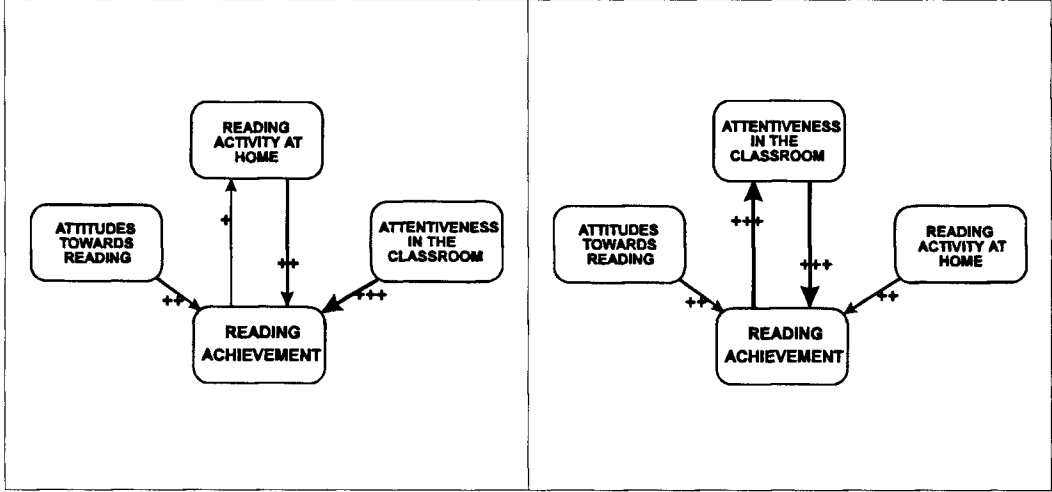


Reading Activity at Home has an increasing influence on achievement as students progress through elementary and secondary schooling (see Rowe, 1991b). Moreover, there is a strong positive interdependence between students' Attitudes Towards Reading and Reading Activity at Home, both of which have significant positive influences on achievement. The strong positive associations between Attitudes and Attentive behaviors in the classroom underscore the importance of Reading Activity at Home as a powerful influencing variable.

Results related to the magnitude of the reciprocal effects between Reading Activity at Home and achievement, show that the effects are interdependent. That is, while achievement does have significant, positive influences on Reading Activity at Home (for all student age groups), the influence of Reading Activity at Home on achievement is notably stronger (Figure 6.2). Similarly, the findings indicate a strong reciprocal relationship between Attentiveness and reading achievement (Figure 6.3), suggesting that while inattentive behaviors lead to reduced reading achievement, reading achievement—mediated by attitudes and reading activity at home—leads to increased Attentiveness in the classroom, to the benefit of all concerned (Rowe, 1991b; Rowe & Rowe, 1992b).

Figure 6.2. Schematic structural equation model showing the reciprocal effects between reading activity at home and reading achievement, mediated by attitudes and attentiveness in the classroom.

Figure 6.3. Schematic structural equation model showing the reciprocal effects between attentiveness in the classroom and reading achievement, mediated by attitudes and reading activity at home.



Literacy Program Effects

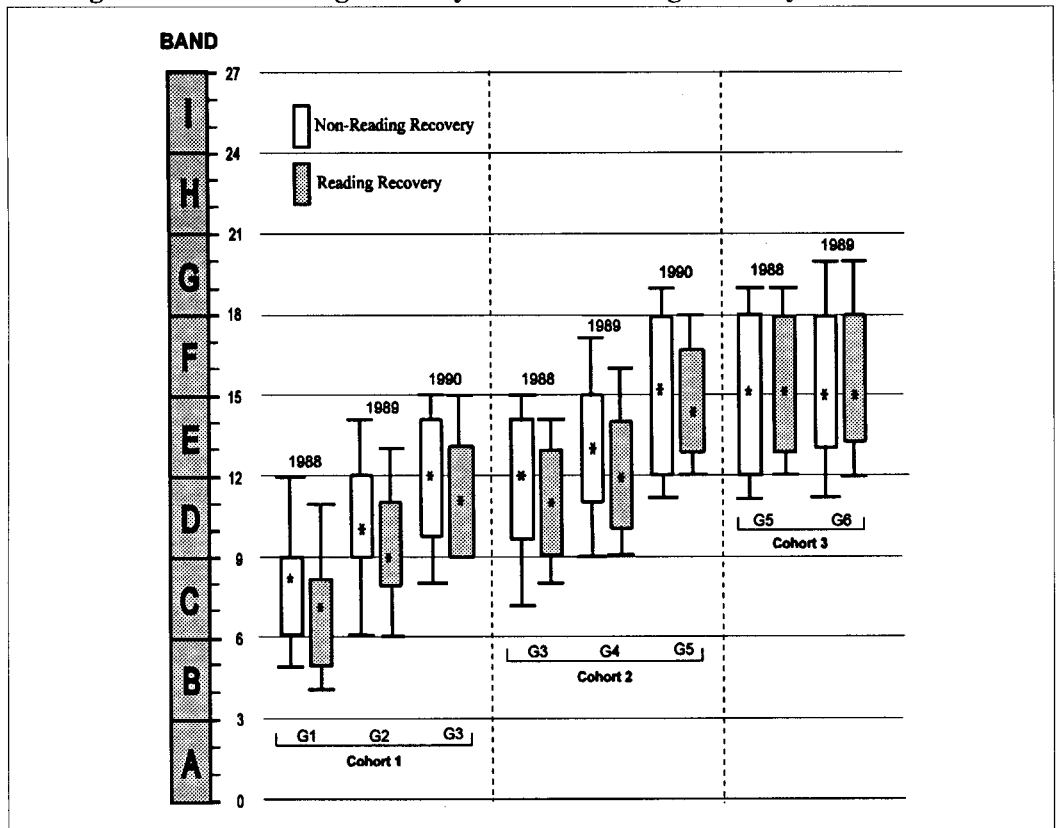
A major aim of the present study was to examine the impact of teacher professional development literacy programs (LP) such as ELIC, LaRIC, CLIC, and Reading Recovery on students' reading development over time. The numbers of students whose teachers had been trained in the literacy programs of interest at the outset of the study (1988) indicated that 53 percent of the sample of students in government schools and 41 percent of students in non-government schools were taught by teachers who had been trained in at least one of these programs.

In general, students' reading achievement measures (on the tests of reading comprehension and the Reading Profile Bands) for those taught by LP trained teachers did not differ significantly

from those taught by non-LP trained teachers. This finding suggests that, independent of teacher exposure or non-exposure to specific Literacy Programs, students' achievements in reading appear to be relatively uniform. While there was strong evidence of significant improvement in the reading achievement measures for all students over the three data-collection stages of the study, there was greater variability in the range of achievement measures of students taught by LP trained teachers compared with those of students taught by non-LP trained teachers. One exception to this finding was that for those students who had participated in a Reading Recovery (RR) program (147), the variation (range) of RR students' test and profile scores were smaller than those of their non-RR peers. This finding suggests that the Reading Recovery program (Clay, 1985) appears to be meeting its intended purposes for those students involved.

The data summarized in Figure 7 for Reading Recovery and non-Reading Recovery students on the Reading Profile Bands indicate that although the reading achievement distributions of those students who had participated in a Reading Recovery program were generally lower than those of their non-RR-exposed peers, the lower limits of the distributions for the achievement measures are higher. These findings indicate that those students who had been identified as readers at risk and placed in a RR program have benefited notably from participation. In fact, some RR students were achieving beyond the 80th percentile level of their non-RR-exposed peers. Moreover, in spite of the small numbers involved, the earlier gains made by RR students who were in Grades 5 and 6 during 1988 and 1989 appear to have been sustained.

Figure 7. Box plots showing distributions on the Victorian Reading Profile Bands for three age cohorts of Reading Recovery and non-Reading Recovery students.



Note. 50 percent of cases lie within the box; the whiskers indicate the 10th and 90th percentiles, respectively; *indicates the 50th percentile (median value).

Policy Implications

Above all, the results provide strong empirical support for the benefits of Reading Activity at Home, regardless of family socioeconomic status and the related value of recognising the important contributions which parents can make to the educational development of their children. Moreover, these effects have been stable over time (1988-1990). From a more detailed analysis of the READACT items, it is disappointing that so many students in the 5-6 and 7-8 year-old groups indicate that they never or rarely share reading activities with family members or friends. For students in these age groups, high scores on the reading alone item and the shared reading items in particular are strongly associated with positive attitudes towards reading, high levels of attentiveness in the classroom, and high scores on the measures of reading achievement. For older students, related positive associations are mainly with reading alone and discussing reading. This latter finding suggests that, while students may spend less time reading to others and being read to by others as they become independent readers, it is clearly in their interest to participate in activities which encourage discussion of reading materials, both at home and at school.

Given the importance of either direct or indirect parental involvement in students' educational progress, it is clear that the work of schools needs the support of programs designed to assist parents to take an active role in the development of their child's reading skills. The results show that it is important that school based measures to prevent early reading difficulties (such as the Reading Recovery program [Clay, 1985]) should be coupled with an early intervention program designed to encourage and assist parents, where necessary, to take an active role in partnership with teachers. Findings from the study suggest, however, that parental literacy is likely to have a significant impact on such a role. In this context, government policy has a major role to play. Programs of the type which provide opportunities through which both parent and child literacy are enhanced would appear to have particular merit.

In view of the salience of the reciprocal relationship between attentiveness and reading achievement, at least two directions for appropriate classroom management and intervention/treatment are suggested. First, given the mutuality of learning outcomes and behavior, there is a clear need to focus intervention strategies in both domains simultaneously (Rowe & Rowe, 1992b). Second, there is a clear need to enhance the positive mediating effects of home inputs on students' attitudes, achievement, and attentiveness in the classroom (Rowe, 1991b) or *time on task* (Carroll, 1963, 1984).

Teacher Level Results

A central aim of the project was to examine the nature and impact of teacher inservice literacy programs such as ELIC, LaRIC, and RR on students' reading achievements over time. Following Elsworth and Coulter (1977), it was argued that the notion of change in professional self-perception and level of adjustment holds particular promise as a criterion for judging the effectiveness of teacher inservice training programs. Further, apart from its influence on performance, changes in self-perception (mediated by participation in professional development) may provide useful indicators of teachers' adjustment to professional role demands. Where teachers aspire to be professionally competent and also perceive themselves to be professionally competent, they may then be regarded as *well adjusted* in the sense of being able to realise their professional aspirations, rather than being thwarted or frustrated. What is suggested here is that "if . . . teachers are to self-actualize in their professional roles, they should not only possess that knowledge and skill regarded as necessary for competent role performance; they should also see themselves as competent" (Elsworth & Coulter, 1977, p. 4).

That is, on the one hand, inservice training programs should provide teachers with opportunities to develop professional knowledge and skills, and on the other, assist in the development of a positive professional self view.

From factor analyses of the 34-item *Professional Self-Perception Questionnaire* (Elsworth & Coulter, 1977) used in the study, five stable dimensions of teachers' professional self-perceptions have been consistently identified: *Energy/Enthusiasm*, *Orderliness*, *Warmth and Supportiveness*, *Creativity*, and *Clarity*. The first factor (Energy/Enthusiasm) accounted for the largest proportion of the variance by far (47.2 percent), while the remaining four factors accounted for only 20.8 percent of the total variance between them. This finding suggests that Energy/Enthusiasm-related indicators are the most consistent and salient concerns of teachers in terms of professional self-perception. (For specific technical details of these findings, see Rowe & Sykes, 1989).

To examine differences on the five affect dimensions for teachers trained and not trained in literacy inservice programs (i.e., ELIC, LaRIC, CLIC, RR), both univariate and multivariate analyses were computed. The results showed significant positive differences in favour of teachers trained in these programs on all five dimensions, suggesting the efficacy of these professional development programs in terms of teachers' professional self-perceptions.

In terms of teachers' participation rates in inservice programs, as well as their evaluation of personal enhancement due to participation in such programs, there were significant differences between the four education regions (labeled A - D) from which the teacher sample was drawn. The mean ratings on these variables for teachers located in regions A and B were markedly higher than those for their counterparts in regions C and D. Similarly, there were significant differences between the regions on the mean scale scores for the Energy/Enthusiasm and Clarity dimensions of professional self-perception, with teachers in region B recording notably higher mean ratings on all five affect dimensions than their colleagues in the other three regions. Moreover, it was interesting to observe that teachers in region B also had significantly higher mean participation rates in both literacy and non-literacy professional development programs than their peers in the other three regions. A subsequent check of personnel records for the previous three years revealed that, per capita of teacher population, teachers in region B had less than half the number of absentee days of their nearest regional rival (region A). While this finding may be mere coincidence, it is sufficiently suggestive of a positive impact of professional development on teacher affect to warrant further investigation.

Results from the explanatory modeling indicated strong, positive effects of professional development on teachers' professional self-perceptions, particularly those related to Energy/Enthusiasm. The reciprocal effects of Professional Development and Energy/Enthusiasm were significantly positive and especially the direct effect of Professional Development on Energy/Enthusiasm. These findings provided explanatory potency to the observations from the raw data, namely, that those teachers who had frequently participated in inservice programs during the *last three years*, regardless of program type, consistently gave self-perception ratings towards the positive ends of the semantic differential scales. Alternatively, those teachers who had none or minimal inservice participation rates tended to provide ratings at the negative ends of the scales.

Policy Implications

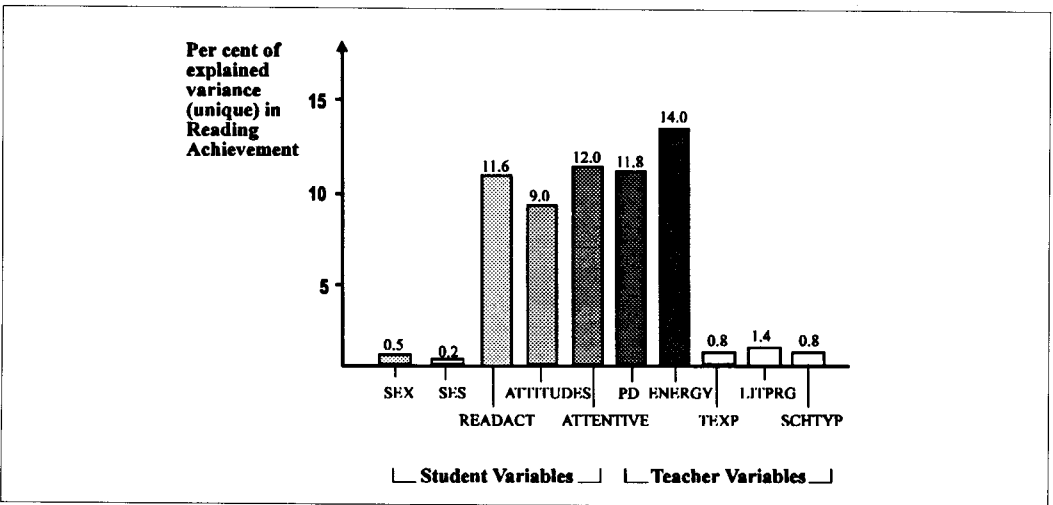
The policy implications of these findings are clear. The results provide overwhelming support for the efficacy of inservice professional development for teachers and suggest that teachers' professional self-perceptions constitute important criteria for evaluating the intended benefits of inservice programs and may also be crucial, not only in monitoring teacher commitment and

adjustment to professional role demands, but also in monitoring outcomes for students. Moreover, the results have important implications for the design and adoption of particular models of inservice program delivery for teachers. Consistent with related research (Rowe, 1987), these findings clearly suggest the utility of professional development programs of the ELIC, LaRIC, and RR kind, not just for literacy, but also for other curriculum and school management domains.

Combined Student Level and Teacher Level Results

The data presented in Figure 8 suggested on the one hand, that the student level variables of SEX and SES and the class/teacher level variables of TEXP, LITPRG, and SCHTYP each account for very small proportions of the variance in students' Reading Achievement. On the other hand, Reading Activity at Home (READACT), Attitudes Towards Reading (ATTITUDES), and Attentiveness in the classroom (ATTENTIVE) are strong student level predictors of Reading Achievement. Similarly, both Teacher Professional Development (PD) and Teacher Affect (ENERGY) each account for marked proportions of the variance in students' Reading Achievement.

Figure 8.1. Percentage histogram showing proportions of explained variance (unique) in reading achievement for five student level variables and five teacher level variables.

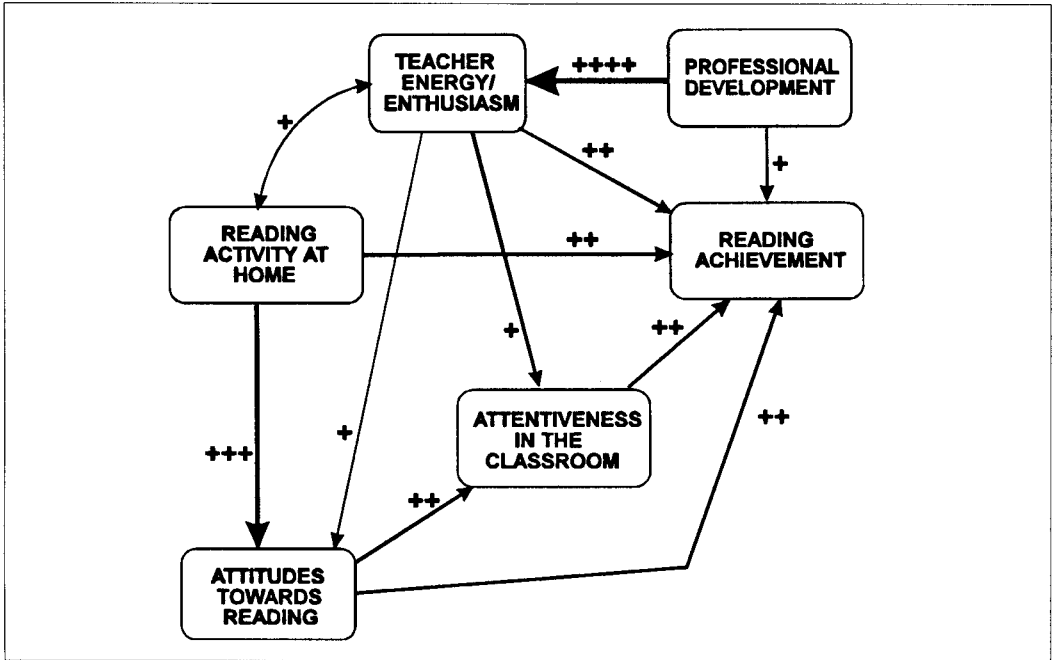


Overall findings from the combined student and teacher level data indicate that teachers' participation in inservice professional development programs have significant, positive effects on their professional self-perceptions (i.e., Energy/Enthusiasm) which in turn, have strong, positive influences on students' attitudes towards reading, attentiveness in the classroom, and reading achievement. The explanatory model shown in Figure 8.2 illustrates the strength of the effect relationships among these factors. For specific technical details, see Rowe (1990b).

All of the findings presented thus far have been based on analyses at a single level. In a study such as the present, teacher and school level effects have crucial implications for analysis, since it is important to account for variation at the student level that may be due to group membership effects. Using multilevel modeling, an important finding was that a large proportion of the variation in students' reading achievement was due to between-class/teacher differences. Much of this variation was accounted for by marked between-class/teacher differences in Teacher

Affect (ENERGY) due to participation in professional development, student Attentiveness in the classroom, and levels of Reading Activity at Home—due in the main to the effects of specific school-home literacy programs and home-based activities of students. Figure 9 summarizes the results of fitting two-level variance component models, showing the proportion of explained variation in students’ reading achievement due to between-class teacher differences for four grade level cohorts over the three years of the study.

Figure 8.2. Schematic explanatory model showing effects among student level and teacher level factors.

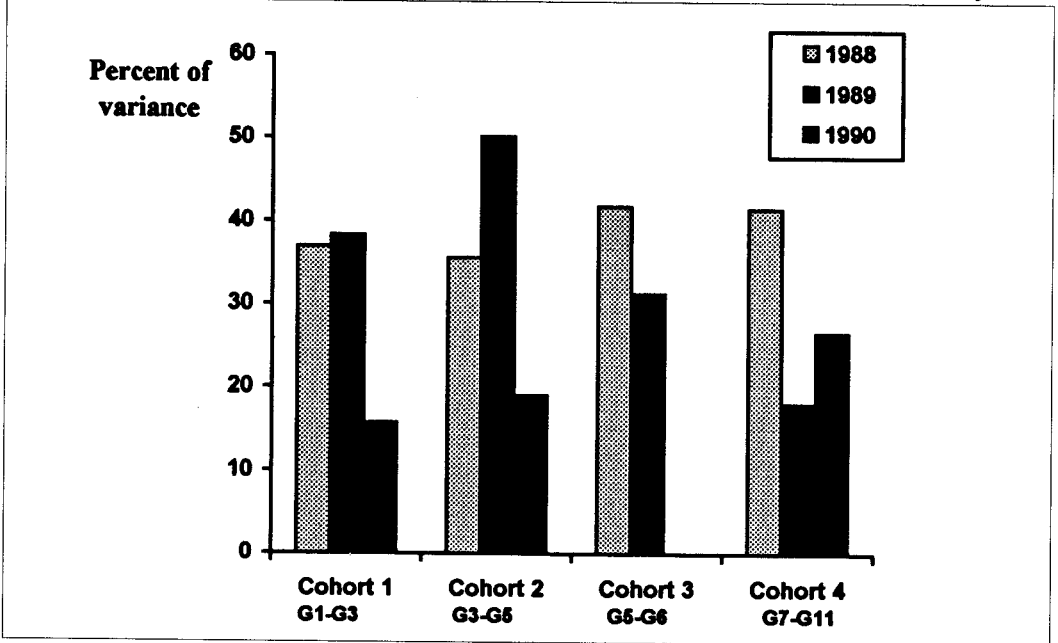


Policy Implications

The finding that teachers’ participation in inservice professional development programs has significant positive effects on their affect levels is sufficient justification for the implementation of policies designed to enhance the professional self-perceptions of teachers and their adjustment to professional role demands. However, the finding that such teacher level factors have significant positive effects on students’ attitudes, behaviors in the classroom, and achievement outcomes is of vital importance.

There is a strong body of research evidence to show that student achievement is mediated by teacher behavior (Ashton & Webb, 1986; Brophy & Good, 1986; Rosenholtz, 1985) and similar evidence that teachers’ professional practices are influenced by their self-perceptions (Lee, Dedrick, & Smith, 1991; Levis, 1985; Rowe & Sykes, 1989; Smylie, 1988). In spite of the prevailing emphasis of policymakers on educational outputs in terms of student achievement, the present findings suggest that teachers’ professional self-perceptions constitute important criteria for evaluating the intended benefits of inservice programs (inputs) and appear to be crucial for monitoring student outcomes. In any event, the results from the study indicate that professional development does enhance teacher affect and appears to be a powerful means of engendering positive outcomes for students.

Figure 9. Percentage histogram showing proportion of variation in students' reading achievement due to between-class/teacher differences for four cohorts over three years.



The strong evidence from the study for teacher and school effectiveness, in terms of students' achievements in reading, has major policy implications. First, it is important to recognise the high quality work which is being achieved by students, parents, teachers, and schools and to encourage and promote such positive outcomes and their associated *good practices* throughout education systems and the general public. Second, it is essential for any government's public credibility that more than mere lip-service is paid to the identification and promotion of excellence or quality in education. Without evidence of the present kind, claims of *excellence* or *quality* and *good/bad practice* are tenuous at best, as well as being at the mercy of purveyors of popular rumour, anecdote, and faddism. As a basis for policy development, substantive findings of this kind prevent the possibility of irrelevant or unimportant factors being granted greater policy priority than can be justified. Third, and perhaps above all, the value of such findings is that they yield information which enables direct diagnosis of problems (if they exist) and assist parents, teachers, and school administrators to implement positive intervention strategies.

School Level Results

Findings from the multilevel analyses were used to identify those schools in which students consistently attained high levels of reading achievement over the three-year duration of the data collections (1988-1990). The approach adopted involved intensive qualitative investigations in the participating schools during the fourth year of the study (1991), designed to identify and describe the characteristics of schools and classroom programs which are most effective in promoting students' achievements in literacy. This field study component of the project known as *Sharing Strategies for Literacy Improvement* (Holmes-Smith & Charlton, 1992) involved on-site visits to selected schools. The visits included discussions with principals, coordinators, librarians, and teachers; examination of curriculum and school management documents; and

observations in classrooms. The outcomes of these investigations have given rise to several propositions that may be used as guiding hypotheses for further investigations.

In those schools in which students had maintained high levels of reading achievement, there was consistent evidence of:

- ***Well established procedures for the early detection of non-readers.*** There is close monitoring of students' reading achievements in the infant years, together with an intervention program to systematically deal with students having difficulties. While the Reading Recovery program is used in many schools, other schools employ similar strategies of their own design.
- ***Quality teachers who are well organised and participate frequently in inservice professional development programs.*** Teachers use structured methods, are methodical, reflective, and collaborative, with a well-developed knowledge of theories and practices of language learning—usually acquired through participation in professional development programs. Teachers have high expectations of students and are highly regarded by principals and other staff. They do not necessarily use the latest methods, but are willing to try new ideas and adapt.
- ***A whole-school focus on teaching and learning.*** Schools have a teaching and learning-focused leadership from the principal and other school leaders. A consistent approach by all teachers in broad curriculum areas is encouraged and there is whole staff involvement in curriculum planning.
- ***Well developed school community relationships.*** There are close links between the school and community with sustained efforts by schools to involve as many parents as possible, mostly through use of deliberate strategies. All schools have programs for parent participation at the lower grade levels. Some have programs for assisting parents to read with their children, including the well-known School Home and Reading Enjoyment (SHARE) program.
- ***Orderly school environments.*** The school environments are characterised by stability, routine, and orderliness. Principals are accomplished managers of their schools, although leadership styles differ.
- ***Effective use of external consultants.*** Either professional school support staff or other experts are used to provide impetus for curriculum development and teaching strategies.
- ***The use of strategies that emphasise the importance of reading.*** A wide range of reading materials is evident everywhere, especially in classrooms. The materials are readily accessible to students and are obviously used. Emphasis is placed on the importance of reading at upper as well as lower grade levels, and in all curriculum areas. Librarians participate actively in promoting reading in cooperation with classroom teachers.

Since *Reading Activity at Home* has been shown to be important to students' reading achievement, some schools have introduced several initiatives designed to improve school-home-community links. The following two examples illustrate the kinds of strategies being used to improve students' reading achievements.

One such initiative, known as *Readers are Leaders*, was used during the 1991 Education Week program at one of the schools. Well known members of the community, including the local mayor, the regional General Manager, an author, and the local football star were invited to read to students. At another school, storytelling evenings are conducted as part of a comprehensive set of strategies that focus on literacy. In this case, families attend storytelling sessions held on three occasions during the year where community members tell or read a story of their own choice. This program, which includes home visits by teachers and a *Parents in Reading Program* based on ELIC principles, consists of a series of six workshops for parents.

The intention is to give parents supportive guidance and encouragement in reading with their children, while working in partnership with teachers.

Discussion and Conclusions

General Summary

In the context of research concerned with factors affecting students' reading achievements, the purpose of the present study was to determine the extent to which students' reading achievements over time are influenced by factors at the student level, at the teacher level, and at the school level. To this end, several explanatory models were proposed and tested using multilevel and covariance-structure modeling. Several outcomes of the study are worth noting.

First, an important conclusion which can be drawn is that in the context of a low-stakes research study, the Profile Reading Bands function as an effective framework for monitoring student progress over Grades K to 11. In addition to providing a broad-based and authentic approach to the assessment of student performance, teacher based Profile assessments of the kind employed here are reliable and appear to be sensitive to student growth and change over the years of schooling (see Figure 4).

Second, in terms of home background factors, the present findings support the argument of Share, Jorm, Maclean, Matthews, and Waterman (1983) that the common practice of using a single index of family socioeconomic status (SES) to measure home background severely underestimates the relationship between the home and students' educational achievement. While SES did have positive effects on measures of students' Attitudes, Attentiveness, and reading Achievement, the effects were small and mostly insignificant. In contrast, both the direct and indirect effects of Reading Activity at Home on students' reading Achievement were significant and positive, as they were on the mediating variables of students' Attitudes towards reading and their Attentiveness in the classroom. Furthermore, the magnitudes of the direct effects of both *Reading Activity at Home* and *Attitudes* on *Achievement* actually increased with student age (Rowe, 1991b). An explanation of this finding is that as students progress through primary and secondary schooling, associated increased curriculum demands require that students spend more time on reading activity for assigned homework tasks, thus increasing both the likelihood of students *reading for pleasure* and *for purpose* and positively influencing achievement and attitudes towards reading (Spiegel, 1981).

Third, the findings related to the magnitude of the effects of Reading Activity at Home on Attentiveness was an especially interesting outcome. This result suggested the presence of a positive carryover effect between activities at home and behavior in the classroom which is clearly in the interests of individual students and other students, as well as teachers. That is, these findings indicate that the opportunity to develop and practice attentiveness-demanding skills at home results in positive transference of similar skills to the classroom. This is underscored by the findings related to the reciprocal effects between attentiveness and reading activity at home which indicated that the effects were strongly interdependent for all student age groups (Rowe & Rowe, 1992b). At least three directions for appropriate classroom management and intervention are suggested.

First, given the mutuality of learning outcomes and behavior, there is a clear need to focus intervention strategies in both domains simultaneously. While findings from several studies show positive long term effects of remedial programs on literacy skills (Bradley & Bryant, 1983; Limbrick, McNaughton, & Glynn, 1985), there is little evidence for long term gains on behavioral outcomes by remediation of learning difficulties alone. On the basis of findings

from a study among hyperactive and learning disabled boys, Merrell (1990) notes: "Perhaps concurrent academic and behavioral intervention would be useful in helping many of these students" (p. 294).

Second, there is a clear need to enhance the positive mediating effects of home inputs on students' attitudes, achievement, and behavior in the classroom. Results from this study have provided strong empirical support for the claimed benefits of Reading Activity at Home and the related value of recognising the important contributions which parents can make to the educational development of their children (Hewison, 1988; Topping & Wolfendale, 1985; Webb, Webb, & Eccles, 1985; Winter, 1988). From a more detailed analysis of the READACT items, it was disappointing that so many students in the 5-6 and 7-8 year-old groups indicated that they never or rarely shared reading activities with family members or friends. For students in these age groups, high scores on the *reading alone* item (READ 1) and the shared reading items in particular, were strongly associated with positive attitudes towards reading, high levels of attentiveness in the classroom, and high scores on the measures of reading achievement. For older students, related positive associations were mainly with reading alone (READ 1) and discussing reading (READ 4). This latter finding suggests that, while students may spend less time reading to others and being read to by others as they become independent readers, it is clearly in their interest to participate in activities designed to encourage discussion of reading materials.

Third, given the importance of either direct or indirect parental involvement in students' educational progress, it is imperative that the work of schools be supported by programs designed to assist parents to take an active role in the development of their child's reading skills. Cox (1987) argued that, "School based measures to prevent early reading failure should be coupled with an early intervention programme designed to encourage and assist parents, where necessary, to take a more active role . . ." (p. 84). Consistent with the work of McGee, Williams, and Silva (1988), findings from this study suggest, however, that parental literacy is likely to have a significant impact on the development of such skills. In this context, government policy has a major role to play. Furthermore, in addition to early intervention strategies of the kind advocated and implemented by Pinnell (1989); Pinnell, Lyons, DeFord, Bryk, and Seltzer (1991); and Wasik and Slavin (1993); programs of the type that provide opportunities through which both parent and child literacy are enhanced would appear to have particular merit (Bushell, Miller, & Robson, 1982, 1985; Dundas & Strong, 1988; Topping, 1986; Turner, 1987).

From the combined student level and teacher level data, the overall findings indicate that teachers' participation in inservice professional development programs had significant, positive effects on their professional self-perceptions (i.e., Energy/Enthusiasm) which, in turn, had strong, positive influences on students' Attitudes towards Reading, Attentiveness in the classroom and on their reading achievement. At the class/teacher level and consistent with the work of Rowe and Sykes (1989) and Smylie (1988), the findings provide strong support for a functional relationship between teacher professional development and their professional self-perceptions. Furthermore, the findings provide substantial support for the claimed benefits of inservice training for teachers made elsewhere (Coulter & Ingvarson, 1985; Ingvarson, 1987; Joyce & Showers, 1988; Rowe, 1987). Herein lies sufficient justification for the implementation of policies designed to enhance the professional self-perceptions of teachers and their adjustment to professional role demands.

Finally, the present study has identified that the large variation in students' reading achievement is due to significant between-class/teacher differences. The fact that such teacher level factors have strong positive effects on students' attitudes, behaviors in the classroom, and achievement outcomes is of vital importance, with profound implications. As Slavin and

colleagues' (1994a) evaluations of the *Success for All* program among low SES schools in Baltimore and Philadelphia have shown, students, who regardless of their socioeconomic backgrounds, are taught by well-trained, strategically focused, energetic, and enthusiastic teachers in schools with well-managed and stable environments, and with well-developed school-home-community links, are fortunate indeed (see Slavin, et al., 1994a, 1994b). While it may be impossible to legislate such factors into existence, the fact that students, parents, teachers, and schools make a difference (as shown by the findings of this study) should provide impetus and encouragement to those concerned with the crucial issues of *educational effectiveness*.

Impact of Outcomes

Findings from the *100 Schools Project - Literacy Programs Study* provided considerable impetus and support for the Victorian state government's *Literacy Strategy* between 1988 and 1991 and in particular, for the *Reading Together* policy initiative launched by the then Minister for Education, in April, 1989. In building on findings from the project, the Literacy Strategy stressed the importance of students reading at home and the valuable role which parents play in the educational development of their children. Promotional literature on *Parents as Partners* were produced for use by schools and International Literacy Year (1989) funding was allocated to support schools' home reading schemes. Professional development programs such as ELIC, LaRIC, and CLIC have since become widely available, and Reading Recovery is well established in all state regions.

Outcomes from the study continue to be useful, not only in shaping and supporting policy, but also in meeting accountability requirements. Publications from the research range from articles in local and international scientific journals, conference papers, popular papers, and workshops for school administrators, teachers, and parents. The study has also attracted considerable media interest.

Above all, findings from the present study provided both the impetus and justification for a further four-year longitudinal study of teacher and school effectiveness currently being conducted by the Centre for Applied Educational Research at the University of Melbourne, Australia. Beginning in 1992, this study, known as the *Victorian Quality Schools Project* (VQSP) has been designed to explain variation in students' progress in three literacy domains (*Reading, Writing, and Spoken Language*) and two in mathematics (*Number and Space*) at the student, class/teacher, and school levels. The study involves a cluster-designed sample consisting of five entire grade-level cohorts consisting of 13,900 students, including their parents and teachers, drawn from 90 government, Catholic, and independent elementary and secondary schools. To model the complex network of factors affecting student progress, use is made of structural equation modeling and multilevel path analyses to explore structural relationships within the same levels and between different levels. Findings from the VQSP have been reported in various forms by Hill, Holmes-Smith, and Rowe (1993); Hill and Rowe (in press a, b); Hill, Rowe, and Holmes-Smith (1995); and Rowe, Hill, and Holmes-Smith (1994).

Like its predecessor study described in this paper, a feature of the VQSP is the use of teacher profile assessments designed to obtain authentic measures of educational progress, together with standardized test measures of academic ability. The results of fitting multilevel models to the data using different adjustments, indicate that the proportion of total variation in student achievement ranges from as little as three to seven percent at the school level, to as much as 35-54 percent at the class/teacher levels. Moreover, the effect size of teacher participation in literacy inservice professional development programs on students' progress in literacy (adjusted for intake characteristics and initial achievement) has consistently yielded significant estimates

of 0.4 of a standard deviation. Similar analyses of the impact of measures of teacher quality (i.e., *teacher responsiveness*) on students' *attitudes to learning* yield standardized effect estimates of 0.6.

The most salient findings from both the *100 Schools Project - Literacy Programs Study* and the *Victorian Quality Schools Project* underscore the fact that learning takes place in classrooms through the interaction of students and their teachers, in partnership with parents. The explanation for the large class/teacher effects and small to insignificant school effects is that they primarily reflect variations in teacher quality. The suggestion here is that (Rowe, Holmes-Smith, & Hill, 1993):

. . . it is essentially through the quality of teaching and learning that effective schools 'make a difference.' In fact, on the basis of our findings to date it could be argued that effective schools are only 'effective' to the extent that they have 'effective' teachers. (p. 15)

Such findings are entirely consistent with Scheerens (1993) observation that:

. . . teacher and classroom variables account for more of the variance in pupil achievement than school variables. Also, in general, more powerful classroom level variables are found that account for between-class variance than school level variables in accounting for between-school variance. (p. 20)

The findings also appear to be consistent with Monk's (1992) conclusion based on a comprehensive review of the education productivity research literature, namely: "One of the recurring and most compelling findings within the corpus of production function research is the demonstration that how much a student learns depends on the identity of the classroom to which that student is assigned" (p. 320). Similarly, Reynolds and Packer (1992) observe:

On the causes of school effects, it seems that early beliefs that school influences were distinct from teacher or classroom influences were misplaced, since a large number of studies utilising multilevel modeling show that the great majority of variation between schools is in fact due to classroom variation and that the unique variance due to the influence of the school, and not the classroom, shrinks to very small levels. (p. 173)

Together with the findings presented here, such observations point to a need for a possible refocus in the *educational effectiveness* research agenda for literacy, numeracy, and other school based curricula, to one that is closer to students' experiences of schooling and reexamines class/teacher influences on student learning outcomes as advocated by Brophy and Good (Brophy, 1981, 1986; Brophy & Good, 1986; Good & Brophy, 1984) and more recently by Creemers (1992) and Slavin (1994).

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Appendix

Reliability Properties of the Victorian Reading Profile Bands

Using the holistic rating method for each *band* described in the body of the text, the rating pattern for each student formed a qualitative *cumulative* scale similar to that described by Guttman (1944). Reliability analyses have been computed for the *Reading Profile Bands*, by grade level, using the Guttman method to provide *lower bound estimates of true reliability*. The relevant coefficients given in the table below are *standardized item alpha* estimates and refer to data obtained from both the *100 Schools Project - Literacy Programs Study* and the *Victorian Quality Schools Project* (see Hill, Holmes-Smith, & Rowe, 1993). The sample sizes (*ns*) for each grade level cohort are given in parentheses. For the Reading Bands, concurrent validity estimates with the *Test of Reading Comprehension* (TORCH - Mossenson, Hill, & Masters, 1987) are given in brackets under the reliability coefficient estimates for grade levels 3 through 11. These estimates are expressed as Pearson product-moment, zero-order correlation coefficients (*r*).

Table A1
Guttman Reliability Estimates for the Victorian Reading Profile Bands, by Grade Level

Grade Level	Reading/ (Correlation with TORCH)
Prep (K) (n = 2281)	0.791
Grade 1 (n = 1965)	0.754
Grade 2 (n = 2188)	0.769
Grade 3 (n = 1876)	0.800 (r = 0.501)
Grade 4 (n = 2209)	0.843 (r = 0.426)
Grade 5 (n = 2015)	0.831 (r = 0.515)
Grade 6 (n = 5062)	0.845 (r = 0.471)
Grade 7 (n = 3661)	0.902 (r = 0.520)
Grade 8 (n = 2630)	0.876 (r = 0.490)
Grade 9 (n = 3570)	0.926 (r = 0.465)
Grade 10 (n = 2687)	0.876 (r = 0.478)
Grade 11 (n = 730)	0.898 (r = 0.516)

Table A2

Test/Re-Test and Inter-Rater Reliability Estimates for the Victorian Reading Profile Bands, by Grade Level*

Grade Level	Test/Re-Test Reliability	Inter-Rater Reliability
Grade 1	0.892	0.855
Grade 3	0.908	0.893
Grade 5	0.911	0.871
Grade 7	0.927	0.832
Grade 9	0.929	0.848

*Pearson product-moment correlations

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