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ABSTRACT

A study examined the educational and occupational plans of Australian fourteen-year-olds as part of program of research on the transition to adulthood. A twenty-item questionnaire was administered to 969 students in 243 schools across Australia. The questionnaire contained items pertaining to respondents' State of residence, school system attended, year of schooling, school rurality, family background, sex, achievement in basic skills, achievement difficulties experienced, support of significant others, and self-concept of ability. Factors found to affect student achievement in primary school included school rurality, family rurality, ethnicity, large family size, family socioeconomic status, and sex. Failure to master basic literacy and numeracy skills at the primary school level was directly linked to learning difficulties at the high school level. Successful mastery of basic skills at the primary level was also connected to self-conceptions of ability and plans to complete high school. Being non-English born and from a socioeconomically-advantaged family also had a positive effect on the decision to complete high school and seek further education. Family socioeconomic status and self-concept of ability exerted the two largest effects on occupational aspirations, with sex and family size also figuring as factors. (The questionnaire is appended.) (MN)

ACER Research Monograph No.10

SCHOOL AND WORK IN PROSPECT: 14-YEAR-OLDS IN AUSTRALIA

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Cover photograph courtesy of 'THE AGE'

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ACKNOWLEDGMENTS

Nine hundred and sixty-nine students in 243 schools across Australia told us about themselves, their schools, their families and their futures. We are grateful for their perseverence with what must seem 'just another questionnaire'. We are also grateful for the assistance, readily given, by the principals and staff in the primary and secondary schools attended by these students. They not only helped us locate students as they transferred to secondary schools, and between secondary schools, but administered our questionnaires as well. We hope that they will see our findings and the light these shed on educational processes as some compensation for their time. Mike Plunkett and his staff at the Swinburne Computer Centre graciously provided the advice and computing facilities that made our analyses possible. We recognize that they did this at some inconvenience to their own program of work and we are more than grateful. Several of our colleagues at ACER, the Director of the Bureau of Labour Market Research, and the members of the Advisory Committee for the Social Context of Education Division read a draft of this report, pointed out our errors and excesses, and suggested where refinements should be made. Theirs was an important contribution we wish to acknowledge. Margaret Taylor turned our words into text and our numbers into tables, bringing order to the whole operation with a degree of care and efficiency we have come to rely on.

Structure of the Report

The work reported here pertains to one component of a program of research directed at youth in transition from school to work or to further education. While other components of the program have focused on youth actually undergoing this transition, the present study looks at the precursors of these events in the form of social processes involved in the development of educational and occupational ambitions, preferences and decisions. The several influences examined include State of residence, school system attended, year (grade) of schooling, school rurality, a variety of family background characteristics, the sex of the respondent, achievement in basic skills, achievement difficulties experienced, the support of significant others, and the student's self-concept of ability. We examine in several stages the patterns of cause and effect among those variables and, ultimately, the effect that they have on decisions about when to leave high school, whether to undertake further education, and about the kind of occupation expected. That is, we consider in sequence: influences on achievement in basic skills among primary school children aged between 10 and 11 years in 1975; the transition from primary to secondary school; learning difficulties in high school; the development of an individual's self-concept of ability; and, finally, the influence of all these factors on educational and occupational preferences.

In Chapter 1 we describe the origins, substance and progress of the overall program and discuss in detail the theoretical framework which guides and integrates our efforts. This discussion provides the context for the remainder of the report which focuses exclusively on the results from phase one of the study we have called 'The Development of Vocational Decisions'. These results are used to describe the educational and occupational plans of some 969 14-year-olds in schools across Australia during 1979.

Chapter 2 describes the research design for phase one of 'The Development of Vocational Decisions'. We respond again to the ERDC's concern that research reports should serve a training function by reporting the judgments, compromises, and preferences underlying this design.

Chapter 3 is a methodological chapter which discusses details of the way in which we measured the constructs of interest, considers what it is precisely that we want to know from these data, proposes a structural equation model to capture the theoretical arguments guiding the investigation and a statistical model to provide measures of effect, and discusses the assumptions and limitations entailed in each of these.

Chapter 4 describes achievement in the primary school. We estimate the effects, other things equal, of sex of student, several school and school system influences, rural-urban location and family background on three measures of school achievement (Literacy, Numeracy, and Word Knowledge).

In Chapter 5 we concentrate on the transition from primary to secondary school, and the enduring effects that learning, or not learning, these reading and numeracy skills in primary school has on learning in high school. This is undertaken within a theoretical framework that links a variety of ascribed characteristics (State, school, family background, sex) to learning difficulties in the first years of high school, through achievement in primary school. We consider as well those factors which affect the delivery of remedial teaching to those in need of it, and the way in which all of these influences affect the student's evaluation of his/her own capabilities.

Chapter 6 examines the influences of all of the foregoing on the educational and occupational decisions and preferences of these students. We consider: what it is that makes students want to leave school at the legal minimum age; who plans to complete high school, who plans to leave early, and why; why some students decide that they will never undertake further education, why some plan to get more education after high school, and who plans to go on to tertiary studies; and, finally, what it is that influences the preference for one class of occupations rather than another.

In Chapter 7 we attempt to summarize our findings by considering the multiple influences at work in each of the four stages of the model: achievement in primary school; achievement in the early years of high school; the development of self-evaluations of academic capabilities; and, finally, the educational and occupational decisions that 14-year-olds make.

Reading the Report

At some risk of appearing repetitious to those who may read all our words, we have provided several routes the reader might take according to his/her inclinations.

Route 1. The most basic description of the project and its findings is contained in Chapter 7 where we report the findings, conclusions and recommendations, and in the first few pages of Chapter 2 where we describe the basic theoretical model. The final section in Chapter 3 - 'Informing Policy Decisions' - may be of interest as well for what it has to say about the nature of the policy research and the level of statistical sophistication needed to usefully inform policy decisions.

Route 2. Reading Chapter 1 in addition will place the present investigation within the context of the research program of which it is a part.

Route 3. Chapters 4, 5 and 6 provide the more detailed findings summarized in Chapter 7.

Route 4. Those wanting a statement of our measurement procedures, and methodological and statistical orientations as well will find this in Chapter 3.

Route 5. Readers interested in the machinery behind the survey and its day-to-day operation will find a description in the second part of Chapter 2.

CHAPTER 1

A PROGRAM OF RESEARCH ON THE TRANSITION TO ADULTHOOD

In this chapter we describe the origins of the overall research program of which the present study is one component. In this way the context of the present investigation, and its linkages to other components of the program are outlined. Since research reports should be reasonably self-contained we present again the program description detailed in an earlier report (Williams, et al., 1980a) rather than simply refer the reader to that document.

Background

In February 1978 the Education Research and Development Committee indicated its interest in supporting research in the general area of the transition from school to work. This indication took the form of a request to the educational research community for proposals outlining the form that a study of school leavers might take. The broad aims of the study had been defined by the ERDC Priority Area Advisory Group concerned with demographic effects and social change, and took the following form.

1 To obtain information about the post-school experience of school leavers which might be seen as having implications for the structure, timing and content of secondary education.

2 To feed back into school decision making the perceptions of ex-students about the strengths and weaknesses of their school experience.

3 To identify critical points in school experience where particular types of failure or particular choices made have predictable long term effects.

4 To test the association between school attainment and length of schooling and the relationship of both to post-school options of students.

5 To examine the relationship between social background, sex, ethnic origin and geographical location on the one hand, and school and post-school achievement and options on the other.

In March 1978 we responded to this request with a proposal that linked ongoing ACER work in this area to a research design addressing the concerns of the ERDC. One of the major components of this design was the proposition that the subjects of the study should be the nationally representative samples of 10-year-old and 14-year-old students involved in the Literacy and Numeracy Study conducted by the ACER in 1975 (Keeves and Bourke, 1976; Bourke and Lewis, 1976; Bourke and Keeves, 1977). In short, we proposed to follow up the 6628 10-year-olds and 6247 14-year-olds sampled in 1975 and so build on to the existing Literacy and Numeracy Study data those data that would allow us to address the concerns expressed in the terms of reference.

A follow-up study of these two groups seemed particularly appropriate for the following reasons. First, by October 1978, the time at which we would begin data collection, members of the '14-year-old sample' were now aged 17 or 18 and were either early school leavers of one or two years standing, or in their final years of high school and facing the transition from school to work or further education. Second, the '10-year-olds' would be 13 or 14 years of age and approaching their first major vocational decision, whether or not to leave school at the minimum age. Third, we had information already pertinent to the often-voiced concern that schools were failing to prepare students in the basic skills of reading, writing, and numeracy necessary for successful performance in the world of work. Fourth, we had available already defined samples that were representative of both State and National populations in these age cohorts. Fifth, because we could anticipate following these individuals through 1980 we were in the fortunate position of being able to study the process of school-work transition at two stages in a quasi-longitudinal study: the early antecedents, in the form of those processes leading to the formation of early vocational preferences, among the younger sample; and the transition from school to work, along with early career formation, among the older sample.

An Integrating Framework

The unifying concern of the terms of reference is with the social processes characteristic of status attainment, both educational and occupational. Accordingly, we have adopted the basic arguments of status attainment models to provide a framework within which to link these terms of reference, and integrate the several investigations they suggest.

Status attainment models have their origins in the study of social mobility and, over the past fifteen years, have derived much of their structure and impetus from the concern that societies provide equality of opportunity for their members. In their basic form the models link educational, occupational, social and economic attainments in one generation to those in the next, principally through educational attainments (see, for example, Jencks et al., 1972). Status attainment oriented research looking at occupational attainment and social mobility in Australia is exemplified in the work of Broom and Jones (1976), Jones et al. (1977), and Broom et al. (1980). The general status attainment model also subsumes studies that focus on only a part of its structure; for example, on the social processes that affect educational attainment, or on the transition from school to work. Keeves (1972), Connell et al. (1975), Radford and Wilkes (1975), Poole (1978) and Rosier (1978) are well known examples and more may be found in the review undertaken by Sturman (1979) as a part of this project.

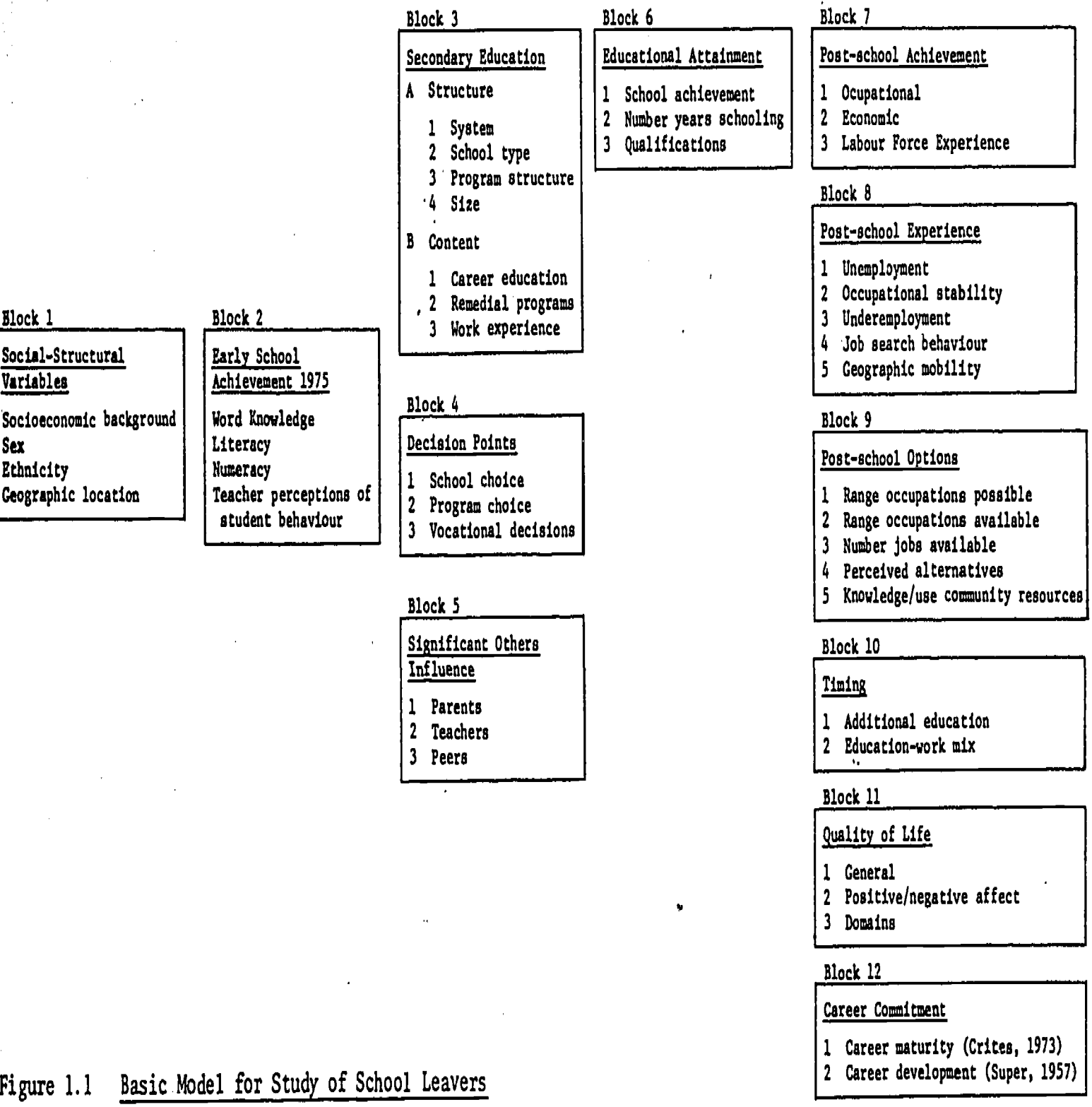

Figure 1.1 Basic Model for Study of School Leavers

The status attainment model we have adopted to guide and integrate our research efforts is portrayed in Figure 1.1. In this model we define twelve blocks of variables linked in a hypothesized causal process over time - technically this is a block-recursive model, to use Blalock's (1969:71) term. The nature of the status attainment processes hypothesized is captured in the spatial ordering of the blocks of variables. Three interpretive rules specify these hypothetical processes. First, variables within each block are affected by all variables in blocks to the left of them — the causal ordering of the variables runs from left to right. Second, the causal relationships among blocks of variables not separated horizontally are unspecified and, hence, unexamined within this model. Thus, although we postulate that the occupational attainments captured in blocks 7 through 9 are outcomes of social structural variables along with educational achievements, experiences, and attainments (blocks 1 through 6), we do not hypothesize cause-effect relations among these blocks. One could do this, of course, and estimate such a model, but for our present purposes we choose not to because of the tenuousness of the supporting arguments we would need to make. Variables within these blocks are seen simply as multiple occupational attainment outcomes of the processes captured in the model. Similarly, we do not specify causal relations among blocks 3 through 5. Third, the causal relationships among variables within blocks remain unspecified with the variables seen as multiple causes or effects. Literacy and Numeracy, for example, are seen as multiple outcomes of social-structural differences, and multiple influences on the variables in blocks 3 through 12.

The model illustrates a postulated system of social processes characteristic of the attainment of educational and occupational statuses. Four general characteristics of this system capture its overall meaning. First, the social-structural variables in block 1 are treated as givens - they are predetermined or exogenous variables and the explanation of their variation lies outside the scope of the model. As such, they are seen as potential antecedents of all the remaining variables within the model, those specified in blocks 2 through 12. That is, we are hypothesizing that some part of the observed variation in educational achievements, experiences and attainments (blocks 2 through 6), and in occupational attainments (blocks 7 through 12) is a function of membership in groups defined by socioeconomic criteria, by sex, by ethnicity and by geographic location.

Second, the social processes represented are processes in time and are causal in nature. Thus, characteristics ascribed at birth - the social-structural variables noted in block 1 - influence achievement in school (block 2). Socioeconomic, sex, ethnic, and geographic (regional, rural-urban) differences in educational achievement are well established. In turn, these sets of ascribed and achieved characteristics affect the school experiences we have noted in blocks 3, 4 and 5. Because of the time sequence implied the components of the 'structure', 'content' and 'decision points' of education, along with the influence of significant others, would necessarily be those associated with

educational experiences subsequent to the achievements measured in 1975; that is, experiences in 1976 or later years. Following the same pattern, ascription, early achievement and the several facets of school experience all affect educational attainment (block 6). Social origins, early achievement, the program structure of the school, career education, choice of school, and the encouragement of parents, for example, all serve to affect later achievement in school, and early school leaving. Similarly, the model hypothesizes that all of the preceding variables contribute to the explanation of the observed variation among individuals in their occupational attainments, experiences, options, post-school education, career commitment and the overall quality of their lives (blocks 7 through 9) - multiple occupation-related outcomes of ascribed chacteristics and achievement within the education system.

Third, to this point we have considered, by implication, only the direct effects of variables; for example, the effects of the social-structural variables (block 1) on occupational attainments (blocks 7 through 12). However, while it is possible that one's ethnicity or geographic location affects occupational attainments directly - through ethnic discrimination and restricted job opportunities, for example - it is also likely that these ascribed characteristics affect occupational attainments because they influence educational attainment which, in turn, affects occupational attainments. In other words, the model also allows for an examination of the indirect effects that a variable may have on others by way of intervening variables.

Fourth, in recognition of the imperfect nature of social theories, and of the likelihood that 'luck' contributes to attainments more often than we think (cf. Jencks et al., 1972), systems of this kind allow for less than perfect explanation of the observed variation in each of the several blocks of variables. In the explanation of this variation some part is attributed to variables specified within the system, and the remainder to unspecified influences extraneous to the system.

We believe we have captured the components of the terms of reference within this model. Consider these terms of reference one by one beginning with point 5.

(a) Point 5 specifies an examination of the relationships between a group of social-structural variables (social background, sex, ethnic origin, geographical location) and the school and post-school achievement, and options of individuals. In Figure 1.1 these relationships are captured in the linkages between Blocks 1, 2, 6, 7 and 9.

(b) Point 4 concerns the association between educational attainment and post-school options, relationships captured in the linkages between Blocks 6 and 9.

(c) Point 3 focuses on critical points in school experience and their long term effects. We incorporate the decision points in Block 4 and the long term effects in Blocks 6 through 12. Note too that because the research program extends over a three year period with repeated questionnaires to the respondents, variables in Blocks 6 through 12 may be measured at several points in time. By so doing we hope to trace the development of the educational and occupational careers of our respondents.

(d) Point 2 is the subject of two closely linked studies looking at the quality of school life and the influence that this information may have on decision-making within schools. As such, they are outside the context defined by this model and will be treated in later reports.

(e) Point 1 stresses the effects of the structure, timing and content of secondary education on the post-school experience of school leavers. The structure and content variables are included (in a necessarily limited way) in Block 3. In view of the youth of our sample the interpretation we have given to the "timing" variable is that of additional education gained after first entering (or attempting to enter) the workforce; in short, we examine re-entry into education, or an education-work mix, as an outcome of school experience. Thus, we capture the relationships in question in the linkages between Block 3 and Blocks 7 through 12.

As well as allowing for a direct examination of the relationships specified, the form of the model allows us to examine, in addition, the way in which these relationships come about. For example, not only can we address the basic equality of opportunity issue posed in point 5 - subpopulation group differences in achievement and options - but we can also explicate to some degree the way in which these differences, if there are any, come about. Do they come about, for instance, because there are subpopulation group differences in the structure and content of secondary education; because there are subpopulation group differences in the 'decision point' variables which affect achievement and options; because there are different patterns of 'significant others influence' between subpopulation groups that lead to differences in achievement; and so on? In brief we can examine indirect effects of the variables of interest as well as their direct effects on the outcomes specified.

We included other categories of variables as well as those specified in the terms of reference: the literacy and numeracy capabilities and school behaviours of the individuals (data from the 1975 study); the influence of significant others, a consistently demonstrated influence on achievement; variables measuring 'quality of life' as evidence of the affective concomitants of achievement; and a group of variables we have called 'career commitment' which we see as both a cause and effect of status attainment, and one that is likely to change with experience in (and out) of the workforce.

The Research Program

Within this framework we have developed six complementary studies whose nature is indicated below.

1 Literature Review

A review of Australian research on the transition from school to work (Sturman, 1979).

2 A Study of School Leavers

A three-year study of status attainment during the transition from school to work

or further education, and during the early career, based on a nationally representative sample of more than 6200 individuals aged between 14 and 15 in 1975.

3 The Development of Vocational Decisions

A three-year study of the development of vocational decisions among students during the early years of high school, based on a nationally representative sample of individuals aged between 10 and 11 in 1975. The findings from the first phase of this investigation are the subject of the present report.

4 Quality of School Life

The development of a theoretical model that defines the meaning and structure of 'quality of school life'; the development of a measure of this multifaceted construct; and, to address the second term of reference, a survey of the perceptions of students about the 'quality of school life'.

5 Case Studies

Again in connection with the second term of reference, case studies of the quality of school life and of the way in which decision-making in schools is influenced by information about the perceptions that students have of the strengths and weaknesses of their schooling.

6 The Psychosocial Consequences of Unemployement

A study of the psychosocial consequences of unemployment using interview techniques with some 200 individuals from the older sample noted above who are currently living in Victoria.

The several studies complement each other. The literature review provides the established fact - or lack thereof - to form a basis for the second, third and sixth studies noted. Data on unemployed youth obtained in the Study of School Leavers contribute to a preliminary understanding and identification of the sample for the sixth study. And, the 'quality of school life' component contributes not only a theoretically grounded measure of a unique and largely unexamined outcome of schooling, but one integrated into a model of developing vocational preferences (study number 3), and one which provides information potentially useful for school decision making (study number 5).

The First Thirty Months

The status of this research program at the close of 1980 is as follows.

1 A review of Australian research on the transition from school to work was completed by Andrew Sturman and published as Issue Number 13 of the Australian Education Review (Sturman, 1979).

2 A report on phase one of the Study of School Leavers has been published (Williams et al., 1980a), analyses of data from phase two are in progress, a second report is in preparation, and a third questionnaire is in the field.

3 Information on phase one of the School Leavers' study has been disseminated to all respondents as a report entitled 'Between School and Work', as issue No.39 of the ACER Newsletter which contains a description, with illustrative findings, of the first report, and as a third report comprising newspaper reviews of 'School, Work and Career: 17-Year-Olds in Australia'.

4 Data on phase one of the vocational decision-making study was obtained from a nationally representative sample of 14-year-olds in October 1979. The information obtained from these data is the substance of the present report. A second questionnaire administered in October 1980 has provided further data on the vocational decisions of this group and will provide the substance for a second report.

5 A measure of 'quality of school life' from the perspective of students has been developed and field-tested on the 14-year-olds mentioned above. A second, revised questionnaire was administered in July 1980. These developments are detailed in Williams et al., (1980b).

6 Each school involved has received detailed tabular reports on the distribution of responses for individual items in both the vocational decision making and quality of school life questionnaires.

7 Developmental work on the case studies of the quality of school life and the influence of information feedback on school decision-making has been completed and the study began early in 1980. Students in Years 9, 10, 11 and 12 in seven Melbourne schools have provided data by questionnaire and in group and individual interviews. Teachers and school administrators have been interviewed as well and each school has received feedback data on the students' views of their quality of school life.

8 Developmental work on the design of the 'Psychosocial Consequences of Unemployment' component of the research program is complete and fieldwork was undertaken in 1980. Some 200 individuals experiencing varying degrees of unemployment have been interviewed with the view to documenting and explaining the psychological adjustments that take place among the unemployed youth. A report is in preparation.

CHAPTER 2

ACHIEVEMENT, PLANS AND PREFERENCES

In the first part of this chapter we describe the model guiding the investigation, the methods that operationalized the theoretical arguments made explicit in its structure, and the data that allow us to describe achievement in the primary school and vocational decisions in the early years of secondary school. The second part of the chapter is devoted to a description of the judgments, compromises, preferences and procedures used in developing the survey itself, from the selection of a sample to the encoding of data.

Two Sets of Constraints

It is important to keep in mind that the study was developed within two sets of constraints rather than designed as an 'ideal' investigation (whatever that may mean) of the development of vocational decisions. First, the main substantive thrusts were defined by the terms of reference of the overall program and the model developed had to embody these in its structure. Second, for the following reasons we imposed the design constraint of basing the study on a followup survey of the 10-year-old sample from the Literacy and Numeracy study in 1975:

1 we had a ready-made national sample and, thus, could make inferences for Australia as a whole;

2 the sample was of about the right age in that they were approaching their first 'transition' decision, namely, whether or not to leave school at the minimum legal age; and

3 we had already extensive basic skills achievement data on the sample while they were in primary school, data pertinent to the terms of reference and data which would allow us to address an under-researched question, namely, influences on achievement in the primary school.

Thus, in looking at the influences of geographical location, family background, ethnicity, and sex, among others, on achievement in the primary school we speak to the fifth term of reference. By extending the model to examine the effects of achievement in primary school, along with the other influences noted, on vocational decisions in early secondary school we focus on the concerns of the third and fourth terms of reference.

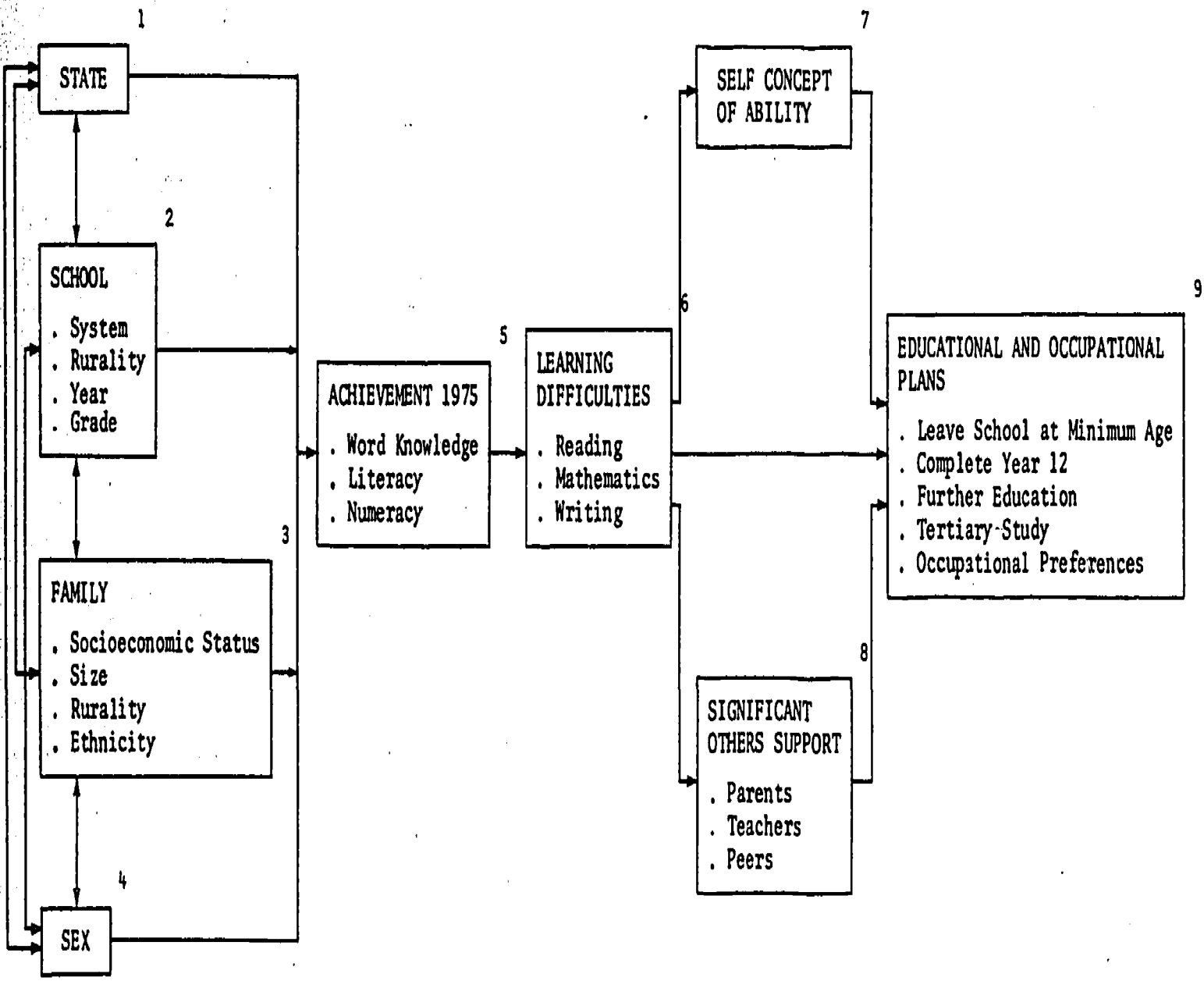

Figure 2.1 Basic Vocational Decision Making Model

The Model

The present study was designed around the model shown in Figure 2.1. This model captures only a part of what one might want to know overall about influences on career decisions, though an important part, we would argue. Since we have two contacts with these students, and because questionnaires should be completed within one class period, we chose to ask skeletal information in the first questionnaire sufficient to describe the fundamental structure of the model. The basic processes described in phase one can then be fleshed out with additional information collected during the second contact. Moreover, the findings from the phase one analyses allow a more focused phase two questionnaire.

In the simplified model that guides phase one of this study we have linked nine blocks of variables in a hypothesized causal sequence spanning the later years of primary school and the early years of high school. Four general rules govern the interpretation of this postulated system of relationships:

1 the variables noted in blocks 1 to 4 are taken as givens - they are predetermined or exogenous variables and the explanation of their variation lies outside the scope of this model;

2 the social processes represented are processes in time and are causal in nature such that each block of variables is argued to be influenced by all blocks lying to the left of it;

3 the causal relationships among blocks of variables not separated horizontally are unexamined; and

4 that part of the variation in each variable not explained by hypothesized causes within the system is attributed to unknown factors arising outside the system and captured in a disturbance term.

Thus, we hope to control for some of the effects of geographical location, partly in the form of differences in State educational systems, by incorporating State as a variable. School system (Government, Catholic, and Independent) has been included because of the seemingly widespread belief that the nature of education differs between the systems, a notion supported, though not unequivocally, by our early analyses (Williams et al., 1980a:61). We have included school rurality as well as another component of geographical location to address the belief that pupils in rural schools are disadvantaged in ways that affect their achievement.

The educational and occupational attainments of parents have been combined into a measure of family socioeconomic status seen to have influence principally through the between-family differences in the example, encouragement and the environment it

engenders. The foundation for family size effects is a resource sharing argument where the resources are both parent-child contact and the economic resources of the family. The basis for postulating family rurality effects rests on the notion of sociocultural differences between rural and urban families and is discussed later in connection with the development of the rurality index. The justification for supposing ethnic group differences rests on the possibility of language difficulties for those from non-English speaking families, ethnic discrimination within schools, and subcultural differences in value orientations, analogous to supposed rural-urban differences. For similar reasons, the sex of these adolescents is included as well.

These ascribed characteristics of the individuals in our sample are seen to influence their achievement in school as this is reflected in measures of Word Knowledge, Literacy and Numeracy. We take a more fine-grained approach to achievement as well by considering the various sub-test components of these global measures in addition to the total test scores. All the preceding ascribed and achieved statuses of these individuals are present prior to entry into secondary school and are postulated as influences on the several occupational and educational experiences and decisions formed there (blocks 6 to 9).

Development of the Survey

The substance of this section is a description of the development of the project from its initial design through to the final stage of merging the newly obtained data with that available from the 1975 Literacy and Numeracy survey. Information of this kind is usually given only a summary treatment in research reports. It is reported here in some detail in response to a concern within the ERDC that research reports ought to serve a training function, and might do so by providing a more elaborate description of practices adopted, judgments made, and pitfalls encountered during the project. Details of the procedures we followed are provided in the remainder of this chapter. Readers less interested in knowing the details of the day-to-day operation of the survey may safely skip this section.

Sampling

The 6628 10-year-olds who took part in the Literacy and Numeracy study in 1975 were located in 272 primary schools in all parts of Australia at that time. By 1979 these students had transferred to secondary schools and we estimated that something like 1400 secondary schools were involved. In view of this, and in common with the other component studies in the program, it became necessary to strike a compromise between the way in which the terms of reference could be addressed, priorities within the program, finite funds and finite staff time. The result of this compromise was the

decision to followup only a nationally representative 20 per cent sub-sample of these students, some 1200 in all. The sub-sampling was accomplished by abandoning the over-sampling of schools in the less populous states required to produce State estimates in the Literacy and Numeracy study. We settled on a sample of 50 of the original primary schools containing some 1200 students. Most were located in NSW and Vic. as Table 2.1 shows and, while not adequate for State estimates, the sample was suitable for national estimates and the Australia-wide generalizations that these allow.

Tracing the Sample

In August 1978, letters and lists of student names were sent to the principals of the 50 primary schools in question. We asked for their assistance in locating the 25 students sampled from each of their schools in 1975, noting that we guaranteed the confidentiality and anonymity of this information now as we did then. The schools were most co-operative and we are grateful for the time and effort they expended to assist in this project. Eighty per cent of the schools responded within a few weeks, and this figure increased to 90 per cent after a reminder letter was sent in September.

There were some information gaps in the school lists returned by the primary school principals. Some students had moved interstate to unknown addresses or had gone overseas, and others could not be identified in school records. All these students were deleted from the sample. Another group of students was still attending primary school in 1978; in November, the principals of these schools were contacted and asked for information about the 1979 school locations of the students. Table 2.1 outlines the structure of the sample at December 1978.

Early in 1979, letters were written to the Directors-General in all States requesting permission to contact the principals of the government secondary schools in this sample. In February, letters were sent to the principals (except in New South Wales, where contact was delayed until April) explaining the tracing procedure and its purpose. Accompanying the letters were lists of students' names, addresses, and date of leaving primary school. Principals were asked to confirm the enrolment of students at their schools, to check the accuracy of home addresses, to state the students' current form levels, and to identify where possible the destinations of students who had transferred to other schools.

When all lists had been returned, it was found that 82 students from the original sample could not be traced to a secondary school. No further attempt was made to trace these students. However, where we knew that a student had transferred to another school, a letter was sent to the principal of the new school.

According to the lists, the remaining 1,113 students from the original 50 primary schools were located, at the end of 1978, in 255 secondary schools. In very few cases did the single primary school grouping of 25 students proceed to a single secondary school.

Table 2.1 Structure of Full Sample (1975) and Sub-sample Traced in December, 1978 and December, 1979

State	Full Sample 1975		Sub-sample 1978				1979	
	Primary Schools	Students	Primary Schools	Secondary Schools	Students (1975)	Students Traced	Secondary Schools	Students
NSW	40	979	17	80	423	393	77	363
Vic.	40	980	13	78	313	275	80	250
Qld	39	978	8	47	198	173	40	152
SA	40	986	5	26	125	119	23	97
WA	40	966	4	15	100	90	14	83
Tas.	38	915	1	2	35	22	4	19
ACT	19	450	1	5	25	20	4	15
NT	16	374	1	2	21	21	1	20
	272	6628	50	255	1230	1113	243	1002

The general pattern tended to be that the group would split three ways: a large cluster of students would be found attending one secondary school, a small cluster attending another, and the remaining students would be scattered in ones and twos across several other schools. During 1979 a number of students transferred from one secondary school to another, so that secondary schools were constantly being added to and deleted from the master list. The deletions occurred when the transferring student was the only one in the sample at that particular school. Thus, for example, between February and June 1979, 40 schools were deleted and 35 schools added to the list because of student transfers (the remaining five students transferred to schools that were already in the sample).

In May 1979, letters were sent to the 250 secondary school principals asking if they would be prepared for the students to participate in two related projects during 1979 and 1980: The Vocational Decision Making Study; and the project concerned with Quality of School Life. Attached to the letter was a project news sheet describing these two projects and a form to be filled in with the names of the principal and project co-ordinator (who would administer questionnaires to students), and the preferred times in July and October for questionnaire administration. A reminder letter was sent out in June, and all but five schools (involving 15 students, 11 of them at one school) agreed to participate in the project.

The co-ordinators administered the questionnaires to the students in their schools in July and October 1979. Schools had been asked whether the first or last half of each month was most suitable for the administration of the questionnaires, and the latter were dispatched a week before the specified times. Three-quarters of the questionnaires were returned within a month after both testing sessions. Co-ordinators were telephoned in the schools still outstanding, and the remaining questionnaires were returned in the following weeks.

During the course of the year a few more schools were added to and deleted from the sample due to student departures and transfers. Other students were deleted from the sample because of death, leaving the country, leaving school for an unknown destination, or inaccurate initial information from the secondary school. In the Northern Territory, the one remaining school encountered administrative difficulties, so another school was substituted in its place. The final figures for schools and students in the sample at the end of 1979 are given in the right-hand columns of Table 2.1.

Approximately four per cent of the students in the sample were absent from the testing sessions. School co-ordinators had been asked to retain the questionnaires of absent students for a few weeks in case they returned to school, and in this way the non-response rate was kept as low as possible.

Table 2.2 Comparisons of the Original Sample and the Sub-sample (weighted data)

	Original Sample Percentage %	Sub-Sample Percentage %
State		
ACT	1.5	1.5
NSW	33.9	33.8
Vic.	27.3	27.2
Qld	15.3	15.6
SA	9.4	9.5
WA	8.6	8.4
Tas.	3.2	3.3
NT	0.8	0.8
Sex		
Male	50.2	45.5
Female	49.8	54.5
Non-response	-	-
No. of Siblings		
0	3.0	2.7
1	23.4	22.4
2	30.4	31.6
3-5	35.4	35.6
more than 5	6.2	6.9
Non-response	1.6	0.9
Country of Father's Birth		
Australia	67.9	71.1
Outside Australia:		
English speaking	12.7	10.8
Non-English speaking	18.9	17.3
Non-response	0.5	0.8
Country of Respondent's Birth		
Australia	89.6	92.0
Outside Australia:		
English speaking	6.1	4.6
Non-English speaking	4.2	3.3
Non-response	0.1	-
1975 School Type		
Government High School	79.6	81.9
Independent Catholic	18.2	16.1
Independent Non-Catholic	2.1	2.0
Non-response	0.1	-
1975 School Location		
Metropolitan	60.6	58.3
Non-Metropolitan	39.4	41.7
1975 Year Level		
Year 4	26.7	27.3
Year 5	64.9	64.6
Year 6	8.2	8.1
Non-response	0.1	-
Proportion of Sample Achieving Mastery		
Literacy	52.3	53.6
Numeracy	74.6	75.9
Sample Size	6628	969

Table 2.3 Estimates of Sample Bias in the Sub-sample (weighted data)

Variable	Original Sample N=6628 mean	Original Sample N=6628 standard deviation	Sub-sample N=969 mean	Sub-sample N=969 standard deviation	Bias[a]
Sex	1.50	0.50	1.55	0.50	0.09
Age in 1975 (in months)	125.40	3.42	125.32	3.47	0.02
Years in Australia (to 1975)	9.51	1.67	9.68	1.30	0.10
Family Size	2.59	1.66	2.65	1.75	0.04
No. of Schools Attended	1.88	1.28	1.73	1.12	0.11
Location of 1975 School	1.39	0.49	1.42	0.49	0.05
Word Knowledge	15.77	10.43	15.71	10.36	0.01
Mastery 14R	0.53	0.50	0.54	0.50	0.02
Mastery 14N	0.75	0.43	0.76	0.43	0.03
Grade	4.81	0.57	4.80	0.58	0.02

[a] Bias is the difference between the means of the original sample and the means of the sub-sample, divided by the standard deviation of the former.

The Effects of Sub-sampling

Table 2.2 illustrates some of the effects of sub-sampling in the form of percentages of the original and sub-sample respondents in each category of several variables. Overall, there is little variation between the samples for the variables listed in Table 2.2. The most marked difference is in the sex variable: there were 10 per cent more females than males in the sub-sample, whereas the numbers in the original sample were more evenly distributed. Referring back to the school lists it was found that, purely by chance, three girls schools had been included in the selected sample of 50 schools but no boys schools; the remaining schools were all coeducational.

Compared to the original sample, the sub-sample showed a slight under-representation of students with fathers born in English-speaking countries, and a slight over-representation of students with Australian-born fathers. There was a similar, though smaller, difference between English-born and Australian-born students in the two samples.

Comparisons between the categories of school type, school location, year level, number of siblings, and achievement of mastery showed almost identical patterns of representation; in most cases the differences between the samples were of less than one per cent.

To investigate this matter further we calculated measures of bias for ten variables. Bias is defined as the difference between means in the two samples divided by the standard deviations of the original sample (cf. Bachman et al., 1978:258). These data are presented in Table 2.3. Reasons for the bias in the sex variable have already been

Table 2.4 Comparison of the Correlation Coefficients for the Original Sample and the Sub-sample (weighted data)

	Sex	Family Size	Ethnicity: English Born	Ethnicity: Non-English Born	School Location	School Type: Catholic	School Type: Independent	Word Knowledge	Mastery of Literacy	Mastery of Numeracy
ex		.006[a]	-.022	-.031	.020	.064	-.003	.025	.119	.030
		.067[b]	-.028	.016	.023	.197	-.001	-.003	.130	.040
amily Size	.061[c]		-.060	-.077	.091	.149	-.043	-.121	-.099	-.098
			-.037	-.032	.107	.153	-.026	-.167	-.127	-.108
nglish-Born				-.186	-.101	-.069	.009	.016	-.019	-.005
	.006	.023		-.161	-.156	-.099	.027	.034	-.020	.009
on-English-Born					-.235	.051	-.022	-.125	-.099	-.052
	.047	.045	.025		-.263	.107	-.035	-.160	-.074	-.074
chool Location						-.042	-.111	-.021	-.026	-.025
	.003	.016	.055	.028		-.039	-.122	-.001	-.027	-.019
atholic							-.069	.035	.052	.052
	.133	.004	.030	.058	.003		-.063	-.015	.040	-.016
ndependent								.083	.030	.008
	.002	.017	.018	.013	.011	.006		.059	-.010	-.003
ord Knowledge									.555	.461
	.028	.046	.018	.035	.020	.050	.024		.562	.457
astery of Literacy										.405
	.011	.028	.001	.025	.021	.012	.040	.007		.408
astery of Numeracy	.010	.010	.014	.022	.006	.068	.011	.004	.003	

Correlation coefficient based on original sample

Correlation coefficient based on sub-sample

bsolute difference between correlation coefficients

noted. Two other sources of bias deserve comment. Apparently we have lost some of the students from migrant families and this shows up in the bias estimate for 'years in Australia'. We have lost as well proportionately more of the mobile students as the bias estimate for 'number of schools attended' shows. However, at worst the degree of bias is eleven per cent of a standard deviation and averages a little less than five per cent. We take this as further support for our assumption that the sub-sample is representative of the larger sample from which it was drawn.

We take this investigation further still by providing comparisons of correlations in the two samples, plus comparisons of partial regression coefficients, in order to look at potential bias in relationships. To do this we compare correlation matrices across the two samples and estimate a simple model containing three equations in each case. The three equations regress Word Knowledge, Literacy and Numeracy separately on sex, family size, ethnicity, school, and location (metropolitan/non-metropolitan - see Bourke and Keeves, 1977:241). Thus, we estimate three equations twice, with each of the educational outcome variables considered in terms of the predictors for each of the two samples.

Pearson product moment correlation coefficients for the two samples are given in Table 2.4. In the upper right triangle of the table are the correlation coefficients for the two samples with the coefficients for the sub-sample the lower figure in each pair. For example, the correlation between family size and school location is 0.091 for the original sample and 0.107 for the sub-sample. In the bottom left hand triangle are the absolute differences between the coefficients; for the example just cited this is 0.016. We note that the signs of the coefficients do not vary much between the original sample and the sub-sample and that the differences between the coefficients are slight, with the exception of that between sex and Catholic school. This difference is to be expected for the simple reason that three all-girl Catholic schools were included in the sample by chance and this affected our sex ratio, as noted earlier.

The six regression equations are summarized in Table 2.5. Each column represents an equation using the sample named. Coefficients which do not reach significance at the five per cent level of confidence are marked with an asterisk. The standard errors of the coefficients have been adjusted to take design effects into account. We note that, first, the sign of the significant coefficients does not vary between the two groups and second, that the magnitude of the coefficients is similar in both groups. In short, the relationships within the two samples are quite similar.

On the basis of these analyses we argue that sample biases do not constitute a major problem. Although there are slight differences between the two samples these would not appear to distort seriously generalizations to the total age cohort under examination.

Table 2.5 Comparisons of the Partial Regression Coefficients for Simple Model Estimated in the Original Sample and Sub-sample (weighted data)

Independent Variables	Word Knowledge		Mastery of Literacy		Mastery of Numeracy	
	Original Sample	Sub-sample	Original Sample	Sub-sample	Original Sample	Sub-sample
Sex	0.37*	0.12*	0.11	0.13	0.02*	0.04*
Family Size	-0.86	-1.07	-0.04	-0.04	-0.03	-0.03
English-Born	-0.60*	-0.07*	-0.07	-0.07*	-0.03*	-0.01*
Non-English Born	-3.95	-4.71	-0.16	-0.14	-0.08	-0.09
Catholic	1.74	0.87*	0.08	0.05*	0.08	0.00*
Independent	5.46	3.52*	0.08*	-0.07*	0.01*	-0.02*
School Location	-0.75	-0.44*	-0.05	-0.05*	-0.03	0.01*

* not statistically significant at five per cent level of confidence

CHAPTER 3

ESTIMATING THE MODEL

In this chapter we discuss the way in which we chose to move from theory to fact - from the hypothetical constructs and patterns of relationships postulated in Figure 2.1 to those real-world operations we used to measure the constructs and to estimate the magnitude of relationships. Under the heading 'Measurement' we discuss the operational form of the constructs in question and, at the same time, describe the characteristics of the sample. Having established the nature of our data we consider what we would like to know from the data in order to address the terms of reference for the study ('What Do We Want to Know?'). This is followed by a discussion of how we might bridge the gap between the verbal theory embodied in our model and the measures of the constructs contained in our data to provide the information we need ('Structural and Statistical Models').

Measurement

The questionnaire administered to students in October 1979 is shown in Appendix A. This, along with the questionnaires and tests administered to the respondents in 1975 (see Keeves and Bourke, 1976; Bourke and Lewis, 1976; Bourke and Keeves, 1977) and some additional census data, provide the measures of the constructs outlined in the model shown in Figure 2.1. The operationalization of each variable used in these analyses is considered below. Variables in the questionnaire but not included here were designed for other studies whose analyses will be reported at a later date.

Measures other than Rurality

State. This refers to the State or Territory in which the respondent was living in 1975, at the time of the Literacy and Numeracy study. In the interests of simplicity we use 'State' to refer to either State or Territory. State is an unordered categorical variable and, as such, is captured as seven dummy variables, one for each State with the exception of NSW. (We use State name abbreviations throughout.) For example, respondents living in Vic. are scored 'one' on the dummy variable for Vic. and all others are scored 'zero'; respondents living in the ACT are scored 'one' on the ACT dummy variable and all others are scored 'zero'; and so on. In order to estimate the effects of the State variables it is necessary to omit one of them as all the information is contained in N-1 variables and the total. The omitted group becomes the reference group for the interpretation of the State effects. In this case we chose to omit NSW simply because it is the most populous State and therefore is a reasonable point of reference to assume;

thus, all State effects are relative to NSW, the reference group. Each coefficient estimated for one of these dummy variables is interpretable as 'the effect on the score on the dependent variable of being in a category rather than the omitted category' (Lansing and Morgan, 1971:275). Thus, an effect for Vic., for example, is interpreted as the effect of being in Vic. rather than being in NSW. This fact restricts the kinds of interpretations that can be made. We cannot, for example, talk about the overall influence of State of residence, nor can we say which State has the greatest effect. Suits (1957) and Lansing and Morgan (1971) provide more detailed discussions of this technique.

Actually, two variants of the dummy variable technique were available to us. The second approach available in the use of dummy variables is that sometimes called Multiple Classification Analysis (MCA) (Andrews et al., 1973). The coefficients in both approaches bear a simple relationship to each other. The difference is that 'MCA coefficients are all expressed as adjustments to the grand mean, not deviations from a single class which must be excluded from each set when dummy variables are used' (Andrews et al., 1973:6). Thus, using this technique one can provide comparisons of State effects, and we illustrate these in Chapter 4.

However, the usefulness of this knowledge is limited for the simple reason that we cannot give an exact meaning to whatever State effects we find. To know that, other things equal, students in one State score higher, on the average, than students in another tells us no more than that. It does not explain what it is about the two States that causes the difference. Given our data we can only speculate. Moreover, since States other than NSW, Vic. and Qld are represented by relatively small numbers of individuals in our sample (see below) we cannot place a great deal of confidence in the size of the State effects we get. We will show later, for example, that our sample of SA students is not adequately representative of students in that State.

Nevertheless, we can guess that there will be important State effects for a variety of reasons, not the least of which will be State differences in educational practices and provisions. For this reason it is important to control for State effects even though we may not be able to give them an unequivocal interpretation. Since it does not matter which procedure one uses to control for State we adopted the one most economical in its use of our resources, the first procedure mentioned above. These same considerations are pertinent to the other variables treated in this way - school system, ethnicity and grade. However, in each case we present both types of coefficients.

The sample is distributed across the six States and two Territories as follows: ACT = 14; NSW =353; Vic. = 241; Qld = 151; SA = 91; WA = 79; Tas. = 19; and NT = 21. The total sample size is 969.

School system. School system attended in 1975 is captured in an analogous way with two dummy variables, one representing attendance at a Catholic independent school and the other attendance at a non-Catholic independent school. Those attending Government schools are the omitted group on the basis that they represent the bulk of the school population and, hence, all school system effects are interpreted relative to the Government school group. We refer to the three types of schools as Government, Catholic, and Independent from this point on. In 1975 82 per cent of the sample (780) were enrolled in Government primary schools, 16 per cent (165) attended Catholic primary schools, and 2 per cent (24) were students at Independent schools. The distribution of the sample according to school system attended had changed slightly by 1979 because of the students' transition from primary to secondary schools. In 1979, 78 per cent of the sample were in Government schools, 6 per cent were in Independent schools, while Catholic school attendance remained the same at 16 per cent. We used the 1975 system distribution for the present data analysis because the focus in on achievement in the primary school. As with State effects, an unequivocal interpretation of school system effects is not really possible, and for the same reasons.

Ethnicity. Several pertinent indicators of ethnicity were available from the 1975 data. At that time students were asked to report the country of their birth, that of each parent, the number of years they had lived in Australia, the language they used at home, their parents use and their own use of English, and whether the family read an English newspaper (Bourke and Keeves, 1977: 323-334). These measures tap two basic dimensions of ethnicity - migrancy and language.

Ethnic groups were not specially sampled in the 1975 study and as a result these indicators do not show a great deal of variation; 92 per cent of these students were born in Australia; 93 per cent spoke English at home; and 96 per cent spoke English to their friends. While a composite 'migrancy' index has been developed with these data (Bourke and Keeves, 1977:159), we chose to represent the migrancy and language components of ethnicity in a single indicator based on the father's country of birth, and to use only coarse categories to retain a reasonable proportion of the sample in each category. Three categories analogous to those employed by the Australian Bureau of Statistics in their labour force surveys (cf. Australian Bureau of Statistics, 1979) were used: Australian-born (71 per cent); English-born (11 per cent); and non-English-born (17 per cent). Students in our sample are defined as 'English-born' if their fathers were born outside Australia but in an English-speaking nation, and 'non-English-born' if their fathers were born outside Australia in a non-English-speaking nation. Ethnic group membership is an unordered categorical variable as well and is represented by two dummy variables. Australian-born respondents are the omitted group and ethnic group effects are interpreted relative to this group.

Table 3.1 Occupational Distributions of Parental Occupations and Respondent's Occupational Plans (weighted data)

Occupational Category	ANU-1 Scale Score	ANU-2 Mean Score	Father %	Mother %	Respondent's Occupational Plans %
Upper Professional	1	782	8.4	0.6	17.0
Grazier	2	662	0.9	0.0	0.6
Lower Professional	3	623	4.3	10.9	24.0
Managerial	4	629	7.8	0.6	1.1
Shop Proprietors	5	500	3.5	2.5	0.3
Farmers	6	594	3.4	0.1	1.1
Clerical Workers	7	510	11.4	18.6	13.1
Armed Services, Police	8	489	1.3	0.0	6.4
Craftsmen	9	485	22.7	3.0	15.4
Shop Assistants	10	438	0.6	5.6	2.2
Operatives	11	403	9.6	6.0	0.7
Drivers	12	443	8.8	0.5	0.8
Service Workers	13	432	7.7	17.2	14.8
Miners	14	420	1.0	0.0	0.1
Farm Workers	15	467	2.1	0.2	1.6
Laborers	16	389	6.4	0.6	0.7
Home Duties				33.6	
			N = 853	N = 871	N = 839

The category 'non-English-born' is somewhat problematic in the sense that it contains individuals from a variety of language and cultural groups. Non-English-born students in our sample come from families with fathers born in Germany, Greece, Italy, Yugoslavia and The Netherlands, in the main, though other European nations are represented. Considering these groups as one, that is, as 'non-English-born', almost certainly obscures important group differences. Whatever ethnic group effects we demonstrate for this category of students will be average effects across all these constituent subgroups and will be weighted toward those with Greek, Italian and Yugoslav backgrounds, the three largest subgroups among the non-English-born. A more fine-grained analysis is desirable but not possible with the data we have.

Father's occupation. We have adopted the traditional approach to the meaning assigned to 'father's occupation' as a component of family background (for an alternative approach see Wright, 1977). It is seen as an indicator of the relative social and economic standing of the family within the community. Accordingly, we assign occupations a prestige rating where 'prestige' is defined as 'popular evaluations of the general "goodness" (in the broad sense of "desirability") of occupations' (Goldthorpe and Hope, 1972: 21). Overall, the most desirable occupations carry with them the highest social standing and the highest economic status.

Respondents were asked to give the present or last main occupation of their father or guardian, and to describe what he/she does (see Appendix A). A number of possible coding schemes exist for assigning prestige scores to occupations. The most detailed and recent is a three-digit score assigned to each of the more than 400 occupational codes used by the Australian Bureau of Statistics. This is known as the ANU-2 scale (Broom et al., 1977). The following occupational prestige scores are illustrative: independent medical practitioners - 915; teachers (tertiary qualifications) CAE - 780; primary school teachers - 630; policemen - 508; salaried carpenters and joiners - 466; waiters - 389; railway porters and ticket collectors - 341.

Predating this scale are 99-category, 16-category, and 6-category condensations of the full range of occupations (Broom et al., 1965). For reasons of economy we adopted the 16-point ANU-1 scale to code the occupations such that each occupation received a score between 1 and 16 according to the category in which it fell. These categories are listed in Table 3.1 which describes the distribution of occupations among the respondents' fathers and mothers, along with the distributions of the respondents' own expected occupations. Subsequently, category means from the more detailed ANU-2 scale were substituted for these to better represent the range of occupational prestige in the sample (see Broom et al., 1977:113).

Table 3.2 Education of Parent - 'How much education have your mother and father had?'

Response Alternatives	Father %	Mother %
Primary school only	14.1	13.6
Some secondary school	38.8	38.6
Finished secondary school	19.7	28.3
Further training (not degree or diploma)	13.6	10.4
Tertiary (university, college degree or diploma)	13.9	9.1
N	766	792

Mother's occupation. Respondents were asked to report their mother's occupation as well and their responses were assigned prestige scores in the same way as for fathers. Note that 34 per cent reported their mothers as engaged in home duties, an occupation for which prestige scores are not available (see Table 3.1).

Expected job status. All respondents were asked to describe the job they expected to have when their education had been completed and this too was assigned a status score in the same way.

Parent's education. All members of the sample were asked to indicate the highest level of education attained by their parents (see Appendix A, Question 8). The distributions obtained are shown in Table 3.2.

Family SES. In our previously published analyses (Williams et al., 1980a) we examined the separate effects of parental occupation and education rather than consider these as indicators of the more abstract construct 'socioeconomic status'. We did this because of the likelihood that there were meaningful differential effects of these attainments on the educational and occupational attainments of the respondents. In general this turned out not to be the case, with father's occupation demonstrating consistent effects while father's and mother's education showed no consistent pattern of influence. Thus, in the interests of parsimony we decided to use a composite index of family socioeconomic status in the present investigation.

In the construction of the index, four indicators of the social and economic statuses of families were considered: father's education; mother's education; father's occupation; and mother's occupation. Given the problem of assigning a prestige score to 'home duties' we treated mother's occupation as a dichotomy - 'home duties'/all other occupations. While family size is sometimes included in indices of socioeconomic status we chose not to do this for two reasons. First, in a theoretical sense it is not a measure of status in the way that occupational, educational and economic attainments are but, rather, can be seen in some part as a consequence of these attainments and the

Table 3.3 Factor Analyses Used to Produce Family Socioeconomic Status Index

Socioeconomic Indicators	Two Factor Solution-Varimax Rotation		One Factor Solution	Standardized Factor Score Coefficients
Father's Education	-0.69	-0.04	0.70	0.43
Mother's Education	-0.58	-0.20	0.58	0.29
Father's Occupation	-0.55	0.07	0.55	0.26
Mother Employed	0.10	0.27		
Proportion of Total Variance Explained	0.29	0.03	0.37	

differences in life-styles and life-chances that accompany them. Second, family size does not seem to behave like these attainments in influencing the educational and occupational attainments of adolescents. It exerts a powerful and consistent negative, and largely unexplained, influence on attainment and deserves a separate consideration for this reason alone.

Correlations among the four indicators in question were factor analyzed, two factors retained on the basis of the eigenvalue-one criterion, and the solution subjected to a varimax rotation. Father's occupation and the two education measures defined one factor and mother's employment the other. On this basis we selected the first three indicators for the SES composite, obtained a principal component solution and estimated factor score coefficients for each. These coefficients were used to weight each indicator in forming the composite family SES measure. These analyses are summarized in Table 3.3.

Family size. This measure was available from data obtained in the 1975 survey and is measured as the number of siblings. The percentages with various numbers of siblings are as follows: 0- 3%; 1- 23%; 2- 32%; 3- 21%; 4- 9%; 5- 7%; more than 5- 7% (c.f. Table 2.3).

Year of school. Because the Literacy and Numeracy sample was an age sample rather than a year (grade) sample, the students are spread over several primary school grades. In 1975 less than one per cent were in Grade 3, 27 per cent were in grade 4, 65 per cent were in Grade 5, and 8 per cent were in grade 6. We provided for a statistical control on the student's grade in school. As with State, school system and ethnicity, year of school is represented by dummy variables. Grade 5 is the omitted reference group and the two dummy variables 'Grade 4' and 'Grade 6' identify those in lower and higher grades respectively. The effects then are interpreted as being relative to Grade 5 students.

Students are spread across these grades for at least two reasons. First, regulations governing age at entry result in students up to a year apart in age entering the same grade. Second, students may be held back a year if they experience difficulties in learning, or advanced a year if they show intellectual promise; however, we are uncertain of the extent to which this happens. The effects of this on achievement in the primary school among the members of an age sample are threefold. First, relative to those in Grade 5, the students in Grade 6 will have had an extra year of schooling in which to learn the skills being tested, and those in Grade 4 will have had one year less in which to learn these skills. Second, to the extent that physical and intellectual development makes a difference those in Grade 6 should do better because they are older, and those in Grade 4 should do worse, on the average, because they are younger. Third, if there is grade retardation and grade advancement on the grounds of ability differences among students then, on the average, those in Grade 4 will show lower ability and those in Grade 6 higher ability and, hence, higher achievement. Thus, we predict that, on the average, Grade 6 students will show higher levels of achievement, and Grade 4 students lower levels of achievement, relative to those of our sample in grade 5.

There is another aspect to this argument. If developmental differences are important then, because the 10-year-olds in Grade 6 will be among the youngest in their grade, they will be those least able to handle Grade 6 work, other things equal. On the other hand, the 10-year-olds in Grade 4 will be among the oldest in their grade and developmentally those most ready to handle Grade 4 work. On the basis of our earlier analyses (Williams et al., 1980a) we suspect that ease of learning and success in school contributes a good deal to one's views about the value of schooling, one's commitment to it in the long term, and how individuals see their own capabilities. Thus, we suggest the possibility of a 'frog-pond' effect (cf. Davis, 1966) in which, other things equal, these Grade 6 students will see themselves as less capable and will have less of a commitment to schooling than students in Grade 5, while those in Grade 4 will see themselves as more capable and likely to stay at school longer, on the average.

Word knowledge. Word knowledge was measured in 1975 with the test developed for the IEA studies of educational achievement (Thorndike, 1973). Respondents were required to make judgements of similarity or difference in meaning for 40 word pairs. A correction for guessing was applied.

Literacy and Numeracy. These measures were obtained from the 1975 data on respondents and are fully described in Bourke and Lewis (1976). The several Literacy tests measure reading and writing skills. We restricted our examination to the reading skills measured. The reading tests involved measures of word attack skills, reading vocabulary, language conventions, comprehension and reading for information.

Table 3.4 Problems in Reading, Mathematics and Writing - 'While you have been at secondary school how often have you had serious problems with reading, mathematics or writing?'

	Response Alternatives				
	All the time %	Often %	Sometimes %	Never %	N
Reading	1.9	5.4	34.7	58.0	881
Maths	3.8	14.5	56.6	25.1	916
Writing	1.3	6.0	34.9	57.9	869

These components were measured with the following subtests: words in context; reference materials; continuous prose; linguistics; information-news; and comprehension-news (see Bourke and Keeves, 1977:Ch.4). In addition, items were selected from these subtests to form two further scales: 'social', combining measures of skills that could be learned outside the classroom; and 'classroom' which focused on 'materials that are met within normal schoolwork' (Bourke and Keeves, 1977:47).

The Numeracy tests include measures of the ability to read measuring instruments, to add, subtract, multiply and divide, to read graphs and tables, to do money and time calculations, to use decimals and fractions, and to interpret plans and maps. These numerical skills were tapped with the following subtests: addition; subtraction; multiplication; division; recall/manipulation; application; whole numbers; measurement; and money. As with Literacy, social and classroom measures were also developed (see Bourke and Keeves, 1977:Ch.5).

Problems with Reading, Mathematics and Writing. Students were asked to report the extent of problems experienced (in high school) in these three subject matter areas on a four-point scale ranging from 'all the time' to 'never' (see question 3, Appendix A). The distributions of responses are shown in Table 3.4.

Help with Reading, Mathematics and Writing. The measures were obtained in an analogous way (see question 4) on a response scale ranging from 'all I need' to 'none'. The distributions of responses are shown in Table 3.5. The question of access to remedial help is raised later in the report.

Table 3.5 Help in Reading, Mathematics and Writing - 'How much special help have you been given at school with the problems you have in these areas?'

	Response Alternatives				
	All I need %	Quite a lot %	Some %	None %	N
Reading	10.0	7.5	26.5	56.0	867
Maths	11.7	15.5	43.2	29.6	908
Writing	8.1	8.1	21.0	62.8	856

Table 3.6 Parent, Teacher and Peer Support - 'Indicate with whom you have already discussed each of the following topics'

	Numbers of times Topics Discussed						
	0 %	1 %	2 %	3 %	4 %	5 %	N
Parents	5.0	8.8	16.4	24.4	29.1	16.4	927
Teachers	50.3	27.8	14.4	4.5	2.7	0.3	927
Peers	35.6	21.8	14.3	15.7	9.2	3.4	927

Self-concept of ability. Our measure of this construct is taken from the first question in the questionnaire: 'How good are you at school work compared to other students in your class?' (see. Appendix A). Responses were distributed as follows: a lot above average - 7%; a little above average - 29%; about average - 52%; a little below average - 11%; a lot below average - 1%.

Significant others support. We devised measures of parent, teacher and peer support from responses to question 9 in the questionnaire. In that question students were asked to indicate with whom among parents, teachers and friends they had already discussed six topics: school work; choosing school subjects; job plans; tertiary education; early school leaving; and personal problems (see appendix A). Seeing that the latter topic is of a different order to the preceding five it was omitted from the calculations. Careers teachers or school counsellors were rarely mentioned so we limited the measures to parents, (other) teachers and friends. A simple sum of the number of times each was mentioned for the given topics provided the measure in each case; thus, scores range between zero and 5 on these three variables. The distributions of responses are shown in Table 3.6.

Leaving school. We asked the question 'When do you think you will leave school?'. Twenty-one per cent said they would leave at the minimum legal age, a further 26 per cent planned to stay longer but leave before Year 12, and 53 per cent planned to complete high school (see Table 3.7). Two dichotomous variables were constructed from these responses. In the first the variable identified those who planned to leave at the

Table 3.7 Educational Expectations - 'When do you think you will leave school?'

Response Alternatives	%
The year I reach school-leaving age	20.9
After that year but before completing Year 12	25.7
At the end of Year 12	53.2
	N = 918

Table 3.8 Post-school Plans - 'What do you plan to do right after you leave secondary school?'

Response Alternatives	%
Full-time job, no further study	32.5
Part-time job and part-time study (including apprenticeship)	29.0
Full-time study to get diploma or certificate	13.4
Full-time study to get a degree	14.8
Other	9.3
	N = 921

minimum age, and those who planned to stay longer. This variable is identified as 'Leave at minimum age' in the tables. The second variable identifies those who will not complete Year 12, no matter when they leave, and those who will. This is identified as 'Complete Year 12' in the tables. In this way we are able to address two questions: 'What causes students to plan on leaving school as soon as they can legally?'; and 'What influences their decision to stay on at school to Year 12?'.

Plans for further study. The question about further study plans (question 6) was phrased as follows - 'What do you plan to do right after you leave secondary school?'. The response alternatives and the distribution of responses are shown in Table 3.8. We constructed two dichotomous variables to answer the following questions: 'Who has further study plans of any kind?'; and 'Who will enter full-time study after leaving secondary school?'. Thus, the first variable groups those with no further study plans on the one hand, and those with any kind of further study plans in the other. The second variable groups those going on to tertiary education versus those who do not plan to do so.

Sex. This is a teacher-report measure obtained in the 1975 survey. Males are coded '1' and females '2'. Somewhat less than 50 per cent of the retained sample are males for reasons noted in Chapter 2.

Measures of Rurality

One of the terms of reference requires that we look at the effects of geographical location on educational and occupational attainments. We have allowed for this, in part, by including State as a variable in the model; however, this is a crude measure of geographical location and, in fact, almost certainly reflects school system and economic differences as much as differences due to geography. To address the question more directly we chose to concentrate on a rural/urban interpretation of geographical location for at least the reason that rural youth are thought to be disadvantaged:

> educational disadvantage for children in country areas...includes isolation, non-access to cultural facilities such as theatres, libraries and television, the range and level of local employment and the educational levels and incomes of families. (Schools Commission, 1975: 75)

A measure of family and school rurality was developed for the 14-year-old sample (cf. Williams et al., 1980a:39) and we develop here a similar measure for those of the 10-year-old sample who provided data for the present investigation. We use analogous arguments, data and procedures, and provide a description of these taken almost verbatim from our earlier report in the interests of making this volume reasonably self-contained.

The concept. The Schools Commission also points out that no adequate definition of 'country' exists (Schools Commission, 1975: 73), a fact noted elsewhere as a problem of long standing (Willits and Bealer, 1967). Nevertheless, definitions of rurality do exist and tend to focus on three dimensions of the rural-urban continuum: ecological; occupational; and sociocultural.

Ecological definitions tend to rely on spatial and population density measures of rurality such as distance from major centres and city size. Occupational definitions rest on the relative dominance of agricultural and related occupations in the local workforce. Sociocultural definitions draw their distinctions in terms of value and behavioural differences along the lines of the Gemeinschaft-Gesellschaft characterization of social groupings, and related distinctions (for example, folk v. modern, organic solidarity v. mechanical solidarity). Social groupings of the first kind are characterized by traditional values, close personal ties based on friendship and kinship, consensus, and informality. The formal, contractual and impersonal relationships characteristic of modern urban societies with their emphasis on utilitarian goals, competition, and weak family ties define social groupings of the second kind. For further discussion see Schnore (1966), van Es and Brown (1974), and Falk and Pinhey (1978).

While it is convenient to think of a simple rural-urban dichotomy it is not entirely logical. The distinction is not either/or but, rather, one of degree. Individuals come from backgrounds and/or attend schools that are more or less rural (or urban). 'Rurality', the term we choose to use, is seen as a continuous variable. Population and distance from major centres, for example, are continuous variables, and so too is the relative dominance of agricultural occupations in the workforce. And, although phrased as an ideal-type distinction, one could not defend the Gemeinschaft-Gesellschaft distinction as a logical and/or empirical dichotomy. Thus, we see individuals living in major metropolitan areas as having a low degree of rurality, those living in small isolated, country villages as having a high degree of rurality, and those living in the variety of non-metropolitan cities and towns as rural to some intermediate degree.

The measure. We were able to operationalize these definitions in part to form an index of rurality for individuals and for the primary schools they attended in 1975. Work in progress by Mr K. Ross has linked 1971 census data at the collector's district level to most of the 6628 individuals in the sample where the collector's district in question

contains the 1975 home address of the respondent. He generously made these data available to us.

From the variables available in the census data we selected ten variables thought to approximate the ecological and occupational definitions of rurality and these are detailed in Table 3.9. The pertinence of the two occupational indicators is self-evident. We thought to come close to ecological indicators with the 'type of dwelling' variables and the two 'services' variables, 'TV' and 'sewerage'. The four 'vehicle' variables were seen as potential occupational/ecological indicators, especially the 'three or more vehicles' variable which we predicted would define farms.

To construct a rurality index we factor analyzed the correlation matrix defined by the ten variables, retained factors with eigenvalues greater than one, and rotated the solution using varimax criteria. The results are shown in the first part of Table 3.9. We chose the occupational indicators as the critical ones and thus focused on the variables which defined the second factor. Some further refinement was undertaken to eliminate multiple indicators not independent of each other and indicators with little variance. Four variables were retained for the final index. These are shown in the second part of Table 3.9 with their principal component loadings and with the factor score coefficients used to produce the index for each individual.

While there are some minor differences between these analyses and those undertaken with the older sample, the end results are virtually indistinguishable. Thus, our index measures the same theoretical construct in both samples and we choose to think that this construct is the rurality of the respondent's family (in 1975).

As a result, each member of the sample has a rurality score based on occupational and ecological characteristics of the census collector's district in which his/her home address was located in 1975. Necessarily our indicators are restricted to ecological and occupational characteristics of rurality in which the occupational measures are positively weighted and the ecological measures (TV and sewerage) are negatively weighted. It follows that the most rural of the sample live(d) in areas where a high proportion of the workforce is engaged in agriculture, forestry and fishing, where there is a high proportion of dwellings with three or more vehicles, and where only a small percentage of these dwellings have TV and sewerage. At the other extreme, respondents living in urban areas should show the reverse pattern, and they do. Those living in non-metropolitan centres lie between these extremes for the most part; however, those respondents in major non-metropolitan centres such as Broken Hill in NSW, Sale in Vic. and Elizabeth in SA receive scores similar to those living in the Metropolitan centres for obvious reasons.

We take this index for each respondent as a measure of the relative degree of rurality of his family of origin. Our explanation for any effects of family rurality on subsequent educational and occupational attainments, and hence our justification for

Table 3.9 Factor Analyses Used to Produce Family and School Rurality Indices

Collectors District Variables	Ten Variable Solution - Varimax Rotation			Four Variable Solution	Standarized Factor Score Coefficients
% Workforce in Agriculture, Forestry, Fishing	a	0.69	a	0.87	0.43
% Workforce in Manufacturing	a	-0.54	a		
% Dwellings: Separate Houses	0.71	a	a		
% Dwellings: Self Contained Flats	-0.70	a	a		
% Dwellings: Television	0.54	-0.31	a	-0.27	-0.13
% Dwellings: Sewerage	a	-0.50	a	-0.68	-0.34
% Dwellings: No Vehicles	-0.72	-0.51	-0.31		
% Dwellings: One Vehicle	a	a	0.97		
% Dwellings: Two Vehicles	0.76	0.32	-0.32		
% Dwellings: Three or more vehicles	a	0.82	a	0.85	0.42
Proportion of Total Variance Explained	0.35	0.21	0.12	0.50	

a indicates factors loading less than 0.3.

including this construct within the model relies on notions of: ecological disadvantage arising from isolation and lack of access to cultural facilities; occupational disadvantage arising from the restricted occupational models and job opportunities in rural areas; and 'disadvantage', from the point of view of attainment in an essentially urban society, that accrues from socialization within a Gemeinschaft milieu.

It is important to keep in mind that we were not constructing the 'ideal' index of rurality but, instead, working from available data. The construction of such an index is a major research project in itself. Thus, while we realize that our rurality index is limited in its coverage of all the relevant dimensions of rurality the point is that we have a measure that taps the underlying construct where no such measures currently exist. The fact that the indicators are primarily occupational is more of a strength than a weakness; the most rural families are those with many of their neighbours engaged in agriculture, forestry or fishing, while the most urban live in areas where few people engage in these rural occupations.

School rurality. We have developed, in addition, an index of primary school rurality in the form of the average of the family rurality scores of respondents within each school. Twenty-five students were sampled from each primary school in 1975 but non-response and other sources of missing data have reduced this to an average of 19.

The meaning of this index needs careful consideration. In effect we are measuring the rurality of the student population within the school in a way analogous to the somewhat more common measures of socioeconomic and intellectual composition used in 'structural effects' analyses; see for example Davis (1966), Farkas (1974), and Hauser (1974). Thus, by including this variable within the model we are able to examine the effects of the degree of rurality of a respondent's school peers on his/her subsequent attainments.

However, we would like to be able to attribute more than just a compositional effect to this variable. Ideally, we want to use the index as a measure of the degree of rurality of the school, and the education it provides, in order to examine the supposed disadvantaging effects of a rural education. Rural schools are seen as disadvantaged by isolation, in terms of the facilities and curriculum options they can provide for their students, and in terms of the staff and other resources they can command. Various programs of compensatory funding have been provided in an attempt to overcome this. In short, we argue that, on the whole, students from rural families attend rural schools, and students from urban families attend urban schools. Given that the correlation between family and school rurality is 0.74 this seems a reasonable approximation.

What Do We Want to Know?

What we have hypothezised in developing the model that guides this investigation is that the potential influences on achievement in the primary school, and on educational and occupational preferences in high school, are many: State and school system differences in the practice and provision of education; opportunity to learn basic skills in school; family and school rurality; the social and economic attainments of one's family of origin; ethnicity; and so on. What we would like to know is the manner and magnitude of each influence holding constant the effect of all the others. Take the potential influences of a rural background as an example. We would like to know, first, how the degree of rurality of one's family affects the learning of basic skills in primary school. Are there direct effects on this early learning which mean, ceteris paribus, that growing up in rural areas affects one's learning irrespective of whatever differences in State, school, socioeconomic background, and the other variables noted in Figure 2.1 are associated with where one lives? In addition, we would like to know whether there are indirect effects of family rurality; other things equal, are the educational and occupational preferences of rural youth affected because rurality affects the nature of the education they get and, through this, decisions about education and occupation. As well as knowing how, we would also like to know how much; for instance, how important is a rural education for achievement in basic skills in primary school, and how important is it compared with the effect of sex, or that due to school system attended, or family background, or the several other influences noted in the model?

Ceteris Paribus

Given that there is a sizeable number of factors affecting achievement and ambitions we need to examine the effects of each influence one by one holding constant the effects of the other variables in the model in order that the influences of several variables are not confounded. In short, we need to have 'other things equal' when talking about, for example, the effect of literacy on educational preferences, or the effect of family size on achievement, or the effect that a non-Government school education has on one's degree of Literacy and Numeracy. Such effects are often called 'net effects' because they are 'net of' the confounding influence of the other variables in question.

The effect of a non-Government school education is a particularly appropriate example to deal with in detail. On the average, students attending independent schools do better on all the usual measures of educational attainment. There is a tendency to attribute these differences to differences in the nature of the education provided and, while this may be true, we have no way of knowing with just this information because independent schools recruit from the upper socioeconomic levels in the population and we know that family socioeconomic status affects achievement for a variety of reasons.

It could well be that those observed school system differences simply reflect average socioeconomic differences between the school system populations. Thus, in this simplified example what we need to do is control for the confounding effect of socioeconomic status in order to examine the net effect of school system. One way of doing this is to compare individuals of the same socioeconomic status across the three school systems; that is, control for the confounding effects of student socioeconomic background. If their average achievement still differs then, in this simple model, we might attribute the difference to some kind of difference between the systems, perhaps the nature of the education provided. (Obviously, it is not due to socioeconomic differences between the groups of students compared.) In short, we could say that, other things equal (socioeconomic background only, in this case) there may be school system effects on attainments. We could calculate socioeconomic background effects net of school system effects in much the same way.

If we could elaborate this simple model to deal with the effects of State, School, Family and Sex on school achievement as postulated in Figure 2.1 then we could proceed as follows. Family size, for instance, is related to many of the other variables in blocks 1 through 4; thus, if we want to examine its unique influence on achievement we would have to look at its effects with these other influences controlled. In essence, we would be asking whether differences in achievement accompany differences in family size among respondents living in the same State, attending the same school system, attending schools with the same level of rurality, in the same grade, from the same family background and ethnic group, and of the same sex. To estimate the unique (net) effects of these other variables on achievement the same process would be repeated as many times as there are variables.

One sometimes meets the objection that 'other things are not equal'. This is true, of course, and is the point of the whole exercise. We can even show just how unequal things are by showing how advantageous it is to have various combinations of levels on these variables simply by adding together their net effects. Thus, we could look at the relative advantage of being born female in a high socioeconomic status family in South Australia and attending an Independent school.

Structural and Statistical Models

Thinking in terms of the effect of a variable, other things equal, raises the question of the exact nature of the 'other things'; which variables should be controlled, and why. The answer is dictated by one's theory or model. The variables to be controlled are the other theoretically defined 'causes' of the phenomenon of interest, and they must be controlled because the model postulates that their effects will confound those of the variable of immediate interest. A theoretical justification must be advanced for each

variable controlled if we are to make sense of the statistics produced, and this justification can be captured in the form of an explicit causal model:

> if....we choose a group of social phenomena with no antecedent knowledge of the causation or absence of causation among them, then the calculation of correlation coefficients, total or partial, will not advance us a step toward evaluating the importance of the causes at work....In no case...can we judge whether or not it is profitable to eliminate a certain variate unless we know, or are willing to assume, a qualitative scheme of causation. (Fisher, 1946: 190-191)

In short, to give meaning to the patterns of statistical relationships we observe in our data we must postulate an underlying, theoretically-derived structure of social processes thought to give rise to these observed relationships among measured variables. Figure 2.1 details the structural model we have developed to explain basic skills achievement in the primary school along with educational and occupational preferences in the early years of high school. It is this model which defines the 'other things' that must be held 'equal', the other causes of the phenomenon of interest.

The fundamental distinction between explanation and prediction has the same origins. The model also prescribes which variables one may use in concert to explain, statistically, variation in this same phenomenon. For example, the logic of the structural model shown in Figure 2.1 dictates that individual differences in the school achievement variables of block 5 are explained by a statistical model that includes only variables from blocks 1 to 4. By contrast, a purely statistical model would probably include the variables in blocks 6 to 9 as well and would account for more of the variance in the achievement variables and thus offer a better prediction equation for achievement scores. The point, of course, is that the statistical model implied by the structural model leads to substantive interpretations; it makes sense to think of 'family effects', other things equal, when the 'other things' are other postulated causes of achievement. It makes little sense to interpret family effects on achievement, other things equal, when the other things are a mixture of the causes and the effects of achievement. We use Duncan's (1975:6) comment to summarize this point:

> One can do a passably good job (of prediction) without knowing much about the subject matter...one cannot even get started (on explanation) without a firm grasp of the relevant scientific theory, because the starting point is, precisely, the model and not the statistical methods.

Structural Equation Models

A structural equation model is one in which the patterns of relationships postulated in a structural model are expressed as a system of equations. Social science research using structural equation models has developed rapidly over the past ten years and Bielby and Hauser (1977) provide a detailed review. The term subsumes a variety of techniques with one of the best known being 'path analysis' (Wright, 1934). Three characteristics are basic. First, the models are used typically with non-experimental data, though they are not limited to this (see, for example, Alwin and Tessler, 1974). Second, the models

postulate hypothetical constructs. And, 'A third common element relates to systems: the models are typically built up of several or many equations which interact together' (Goldberger, 1973:1).

It is clear that our data are non-experimental, and that we postulate constructs such as family rurality (but do not attempt at this point to deal with measurement models involving latent variables and their indicators). And, we postulate a system of structural equations to explain the variation in, and covariation among, educational and occupational attainments. We can present these equations in summary form by using the block numbers shown in Figure 2.1. Thus, the structural equation explaining achievement in primary school has the following general form:

$$X_5 = b_{51}X_1 + b_{52}X_2 + b_{52}X_3 + b_{54}x_4 + b_{5a}x_a$$

Its interpretation is straightforward; achievement in primary schools (X_5) is influenced by State (X_1), School (X_2), Family (X_3) and Sex (X_4) differences among individuals. Not all of the differences among individuals can be explained by these four groups of influences. Undefined influences on achievement are represented by the error term (X_a). The b's or structural coefficients, are measures of the relative influence that each block (or variable) has on achievement. They represent the net effect of each variable, other things equal, and are the statistics that tell us what we want to know. Since the influences shown are unlikely to be equally important the b's will differ from block to block (variable to variable) and tell us something about the relative importance of these influences on achievement.

Similarly, we can write the remaining summary equations defining the variables in blocks 6 through 10 as follows:

$$X_6 = b_{61}X_1 + b_{62}X_2 + b_{63}X_3 + b_{64}X_4 + b_{65}X_5 + b_{6c}X_c$$

$$X_7 = b_{71}X_1 + b_{72}X_2 + b_{73}X_3 + b_{74}X_4 + b_{75}X_5 + b_{76}X_6 + b_{7d}X_d$$

$$X_8 = b_{81}X_1 + b_{82}X_2 + b_{83}X_3 + b_{84}X_4 + b_{85}X_5 + b_{86}X_6 + b_{8e}X_e$$

$$X_9 = b_{91}X_1 + b_{92}X_2 + b_{93}X_3 + b_{94}X_4 + b_{95}X_5 + b_{96}X_6 + b_{97}X_7 + b_{98}X_8 + b_{9f}X_f$$

Note that because we have not postulated a causal relationship between X_7 (Self-Concept of Ability) and X_8 (Significant Other Support) the equations defining these blocks of variables contain the same terms (blocks 1 through 6) but do not include each other. The equations for X_9 (educational and occupational preferences) contains terms representing blocks 1 to 8 as the model postulates that the variables subsumed in these all affect occupational and educational preferences.

Statistical Models

For the purposes of this report we take the simplest statistical model appropriate and estimate the structural coefficients as partial regression coefficients using ordinary least squares regression procedures. Thus, in the first equation noted above b_{53} is in reality $b_{53.124}$, the partial regression of X_5 on X_3 controlling X_1, X_2 and X_4. The structural coefficients for the error terms - b_{5a}, b_{6c} and b_{7d} and so on - are estimated as the square root of the proportion of unexplained variance, $1-R^2$, in each equation.

In each case we use 'missing-data' correlation routines which calculate correlations on all cases for which there are paired data. Thus, the correlations are based on somewhat different numbers of cases.

Interpretation of Structural Coefficients. The basic interpretation is straightforward. Take the coefficient $b_{53.124}$ noted above. Its interpretation is, other things equal (X_1,X_2,X_4), a one-unit difference among individuals in X_3 is associated with a 'b'-unit difference among these same individuals in X_5. Assume that $b_{53.124}$ was estimated as 0.3. This coefficient could be interpreted as, among individuals at the same level on X_1, X_2 and X_4 (in the same State, attending similar schools, and of the same sex), a one-unit difference in family characteristics (X_3) is associated with a 0.3-unit difference in achievement (X_5).

Metric and standardized coefficients. Two forms of the structural coefficients are used for somewhat different though complementary purposes (Wright, 1960). The difference between these coefficients is a difference in the units of measurement. With metric coefficients the original units of measurement are retained. When these are 'natural' metrics - such as years, months, dollars, miles - these coefficients provide concrete interpretations of the effect in question. However they suffer from the limitation that one cannot (usually) compare them with other coefficients in the same equation to estimate the relative importance of several causes, because of the different measurement scales involved - to use a time-honoured phrase, one would be comparing apples and oranges.

To talk of relative effects one needs to interpret the standardized coefficients in which all the units of measurement are standard deviations. The interpretation then is that if $b_{53.124}$ was 0.01 for example, other things equal, a one standard deviation unit difference in X_3 is associated with a 0.01 standard deviation unit difference in X_5. (It is possible also to adjust the coefficients to include standardized and metric scales in the one coefficient if it is meaningful to do so; for example, other things equal, each unit difference in family characteristics is associated with a '0.n' standard-deviation difference in Literacy).

One general caution not always heeded needs comment. One cannot compare metric coefficients within equations to talk about relative effects because of the different measurement scales involved; standardized coefficients must be used. And, one cannot compare standardized coefficients between equations or across groups because the standard deviations are likely to vary; metric coefficients must be used. Specht and Warren (1976) provide a more detailed discussion of these issues.

Association and effect. Statistically the structural coefficients are measures of association and in the discussion so far we have talked of them in this way. However, we would like to infer more than mere association, as our structural model suggests. We would like to infer cause and effect such that a structural coefficient represents the net effect of one variable upon another. In short, we would interpret $b_{53.124}$ - the partial association between achievement and family influences - as, other things equal, characteristics of one's family affect how well one does at school. There is no logical way to make this inferential leap (see Blalock, 1968) but it is important - probably necessary - to do so for at least the following reason. We are providing theoretical/substantive interpretations of statistics, and the language of theory is the language of cause and effect (in contrast to the language of statistical models which is the language of probability). In short, we need to move back into the realm of theory to be able to provide meaningful interpretations of the structural coefficients estimated by the statistical model. Dubin (1969) provides an illustration of the trouble one gets into trying to talk theoretically in the language of statistics. Besides, causal thinking is so much a part of our thought processes and language that, even if we did talk about measures of association, they would be interpreted explicitly or implicitly as measures of effect; it is simply not meaningful or useful to think about social processes in other ways. Blalock (1964) and Blalock and Blalock (1968) discuss these issues in detail and review the pertinent literature.

Assumptions and Limitations

Five categories of assumptions cover most of the potential problems concerning the tenability of our conclusions. First, we assume that our model contains all of the important causes of educational achievement in basic skills and of educational and occupational preferences, and that these variables are in their appropriate functional form. This is the issue of model specification (see, for example, Heise, 1969). To the extent that we have not achieved this state, then our estimates are in error.

Second, we have addressed already the question of response bias. Our sub-sample most likely does not quite capture the cohort of individuals in question, however, our analyses seem to show that this underrepresentation is fairly minor in extent and, thus, we feel reasonably confident that we can generalize to the total cohort of youth in the age group specified.

Third, we have not considered the question of measurement error but have assumed perfectly reliable measures. Obviously, this is an unlikely assumption, given the apparent crudeness of our measures, with the result that measurement error will attenuate the relationships shown and conclusions will err in a conservative direction. However, the problem becomes more serious if we have differential measurement error such that one relationship is attenuated more than another with the likelihood that differences in measurement error will be interpreted as differences in effect. There was no feasible way we could design a measurement model into this phase of the study and attain a good response. However, we plan to examine these measurement issues when subsequent questionnaire data are collected.

Fourth, in many cases our data do not meet the statistical requirements needed to satisfy the assumptions of multiple regression by ordinary least squares. While most of the measures approximate interval scales or are dichotomous, the measures of parental education and self-concept of ability are clearly ordinal. The use of dichotomous variables as dependent variables is somewhat problematic and in the case of mastery scores for Literacy and Numeracy the marginal distribution approaches unacceptable limits (see Goldberger, 1964). (In fact, for reasons we will detail in the following section of this chapter, we choose to use dichotomous variables in many instances, and collapse more extended scales to do so). Furthermore, in some cases the variables are not normally distributed. The 'family size', 'achievement problems' and 'help' variables are skewed, as one would expect, and it is doubtful whether we met the homoscedasticity assumption. Multicollinearity, which is always a matter of degree, seems not to be a serious problem, except in one instance. Most correlations are of the order of 0.3 or less, but the correlation between family and school rurality is 0.74 and something of a problem in this respect. However, the statistical techniques we have adopted are relatively robust in the face of all except extreme departures from the norm (Labovitz, 1967; 1970; Zeller and Levine, 1974; Kerlinger and Pedhazur, 1973:48; O'Brien, 1979) with the result that we would argue for our estimates as reasonable approximations. In the case of the extreme departure noted above we examine whether it makes a difference or not as far as the sizes and signs of the statistics are concerned.

Fifth, for the most part we have assumed a simple additive model that says, in effect, that the social processes governing achievement and educational and occupational preferences are the same for all individuals in the population of interest. The more complex nonadditive (interactive) models postulate that some or all of the social processes underlying status attainment are different in different subpopulation groups. If this is true, an additive model probably disguises these differences as average effects. In this situation data on each group ought to be analyzed separately because the social processes we are measuring operate differently in each group. This is really another aspect of model specification and to the extent that an additive model is inappropriate our conclusions will be compromised.

We estimated a number of nonadditive models for influences on achievement and, in general, find few consistent differences between groups. Thus, we confine most of the report to the estimation of additive models for three main reasons. First, an additive model provides the simplest overall picture of the processes in question, albeit at the possible expense of averaging out whatever group differences may exist. Second, we wish to keep this report to a manageable size; considering just sex differences, for example, multiplies the interpretation by at least a factor of three (description of each group, plus a comparison). Third, our analyses show nonadditive effects are minor overall.

Informing Policy Decisions

For the most part the problems on which we focus are not susceptible to investigation through experimental designs (cf. Lohnes, 1979:324) and, thus, one cannot 'randomize away' the effects of the multiple influences on the phenomenon under investigation in order to study one or two of particular interest. As a result it becomes necessary to consider explicitly all of the factors implicated and to control statistically rather than experimentally. The theoretical model then becomes quite complex in most cases simply because it has to consider all the factors which influence the main phenomenon under investigation and all of the interrelationships among these factors. In the present study we use structural equation models as a vehicle for this. The complexities of these theoretical models do not lend themselves to simple statistical models but require instead that relatively complex statistical techniques be applied.

The particular statistics used may be unfamiliar to many readers and it is for this reason that we have explained them and illustrated their meaning and interpretation with examples, perhaps more in our earlier report than here. Policy research addresses complex issues. For the most part it is just not possible - and is probably misleading - to address these issues with simple cross-tabular presentations of data. While these might be readily comprehended by most readers without a great deal of effort, their interpretation is so equivocal that their information value is limited.

The results of policy research must reach an essentially lay audience who operate in 'the world of action' rather than within an academic discipline and, as Coleman (1972:3) points out, 'The discourse and the frames of references of the world of action are peculiar to the world of action and different from those of a discipline'. This fact poses a problem for us with the following dimensions: we need to develop complex theoretical models to mirror adequately the phenomenon of interest; this, in turn, implies relatively complex statistics to describe these models; but for the most part, the statistics themselves are outside the realm of lay discourse; and, moreover, even if they were not - or if they were explained - typically they are couched in the abstract language of distribution and probability.

The problem then is one of transforming unfamiliar statistics with abstract interpretations into the concretely interpretable and intuitively meaningful statistics of (relatively) common discourse. We attempt to do this in two ways. First, by explaining the meaning of the statistics with several simple examples. Second, we interpret these statistics, insofar as possible, in the concrete units of years, dollars, percentages, months, pass/fail, do/don't, will/won't and so on rather than in standard deviations, variances, covariances, and probabilities.

To accomplish the second of these tasks we focus on the interpretation of metric partial regression coefficients which, as noted above, retain the units of measurement of their component variables and offer interpretations like: 'Each-additional year of schooling decreases by one month the time it takes to find a job after leaving school, other things equal ...' (Williams et al., 1980a:95). In this case, and in many others in our earlier report, the variables under examination had 'natural' metrics like years and months, and allowed this kind of interpretation. However, when variables have no natural metrics as, for example, in the case of achievement tests, psychological tests, and attitude scales, the interpretations lose a good deal of meaning for a lay audience. For instance, we noted that 'Ceteris paribus, each additional sibling cost ... 0.25 of a point on Literacy, and 0.28 of a point on Numeracy, on the average'. (Williams et al., 1980:63). This has no immediate and obvious meaning for most people because the Literacy and Numeracy tests have no 'natural' metric and, thus, we have no intuitive notion of what '0.25 of a point' means. However, when we examined the same relationship using a dichotomous mastery/non-mastery variable in place of a full distribution we were able to show that, other things equal, each sibling decreased by two to three per cent the likelihood of achieving mastery of these basic skills (Williams et al., 1980a:68). Similarly, in cases where both variables in question were dichotomies we were able to offer interpretations like 'Other things equal, nine per cent more of the students who have mastered the Literacy skills tested stay on to the senior years of high school ...' (Williams et al., 1980a:69). In this way we seem to be able to provide interpretations of somewhat complex and abstract statistics in the simple statistical language appropriate for a lay audience but without the disadvantage of confining our analyses to these simple statistics themselves.

However, this approach is not an unalloyed contribution to the wider understanding of social phenomena. By dichotomizing the more extended distributions of variables we are trading off an increased violation of the statistical assumptions of regression against increased meaningfulness of the statistics for the audience in question. The problem is that: 'As the data themselves become more and more degraded, the chance that the coefficients will reflect the true effects of their carriers becomes less and less even when we have exactly the correct model' (Mosteller and Tukey, 1977:311). Thus we are faced with something of a dilemma. If we attempt to stay close to the assumptions that

the data should meet we will fail to translate our findings into a form that the intended audience will read and (hopefully) act on, and our 'policy research' will be seen as beside the point. On the other hand, if we 'degrade' our data to produce these readable statistics we run the risk that the findings, especially unpalatable findings, will be rejected as spurious. Fortunately, regression coefficients are relatively robust in the presence of violations of the distributional assumptions associated with this technique, so we come down with some assurance on the side of 'degraded' data and readable statistics. In Appendix B we present data that allows comparisons of coefficients for 'degraded' and 'undegraded' data, with reassuring results.

We are prepared to live with these potential limitations for the time being. They are common to most of the research we have seen, though they are not always made explicit. Our over-riding concern has been one of providing social fact on a contentious social issue, fact not only about the size of the problem but, more importantly, about the social processes characteristic of basic skill learning in primary school and the career preferences that develop later on. Moreover, we have been concerned that we provide this information in time to inform whatever policy decisions may be made, for example, in connection with the identification of students 'at risk'. We have not had the time to explore our data as thoroughly as we would like; nevertheless, the comprehensiveness of our theoretical model and the robustness of the statistical model give us confidence in our conclusions. While the exact size of the statistics may be in error, we are certain that the overall conclusions will withstand a more elaborate statistical treatment essentially unaltered.

CHAPTER 4

ACHIEVEMENT IN PRIMARY SCHOOL

In this chapter we report the first of our analyses employing the structural and statistical models discussed earlier. These models are used to formalize and quantify the first stages of the theoretical arguments sketched out in Chapter 2. We focus on the school achievement of 10-year-olds in 1975 and examine the effects of the several influences postulated in Figure 2.1; that is, the effects of those influences grouped under State, School, Family and Sex on the aspects of basic skill learning measured by the Word Knowledge, Literacy and Numeracy tests. We examine in addition these same patterns of effects on the several components of the Literacy and Numeracy total tests; for example, in the case of Numeracy, the subtests measuring basic skills in addition, subtraction, multiplication, division and so on.

The Model

That part of the overall model guiding these analyses is shown in summary form in Figure 4.1 below. We postulate multiple influences on the learning of basic literacy and numeracy skills, influences arising from: the State/Territory in which the student lives; the school system attended (Government, Catholic or Independent); the geographical location of the school on a rural-urban dimension; the school grade of the student in 1975; the ethnicity, rurality, socioeconomic status and size of his/her family; and whether the student is male or female.

What Do We Know?

The explanation of individual differences in achievement in the primary school has not been a growth industry. The greater part of the research done has focused on the achievement and ambitions of high school students. Most likely this is a reflection of a more pressing general concern with understanding the development of the skills and preferences that govern entry into higher education and/or the choice not to do so but enter the workforce instead. However, one might reasonably argue that the foundations for the skills and preferences that adolescents develop are laid down in primary school and, thus, the early stages of this development need a careful examination. Some might even argue that by the end of primary school it is all over: those who have done well in primary school will continue to do well and will aspire to tertiary education and occupations well regarded and well rewarded; those who have not done well in their first five or six years in school will never catch up, for reasons not entirely their own doing, will see little point to an extended schooling, and will leave for a less well regarded and rewarded job before completing high school.

There are a few notable exceptions to this emphasis on investigating the achievements and ambitions of high school students. The first of the IEA surveys on mathematics achievement (Husen, 1967) followed by the well-known six-subject survey in 22 nations (Comber and Keeves, 1973; Purves, 1973; Thorndike, 1973) are probably the best known of these. Similarly well known but restricted by national boundaries are the Plowden Report based on a large survey of primary school children, their teachers and their parents in the UK (HMSO, 1967), and the studies of US students carried out as part of the National Assessment of Educational Progress.

These and other studies like them (for example, Douglas 1964; Douglas et al., 1968) laid the foundation for the well-known, if not well-accepted, finding that what children bring to school seems to matter a lot more than what they find there. This general finding has been reinforced in the several detailed studies of family influence that have taken up Bloom's (1964) notions about the nature of this influence: for example, Dave (1963), Wolf (1964), Marjoribanks (1972), Keeves (1972).

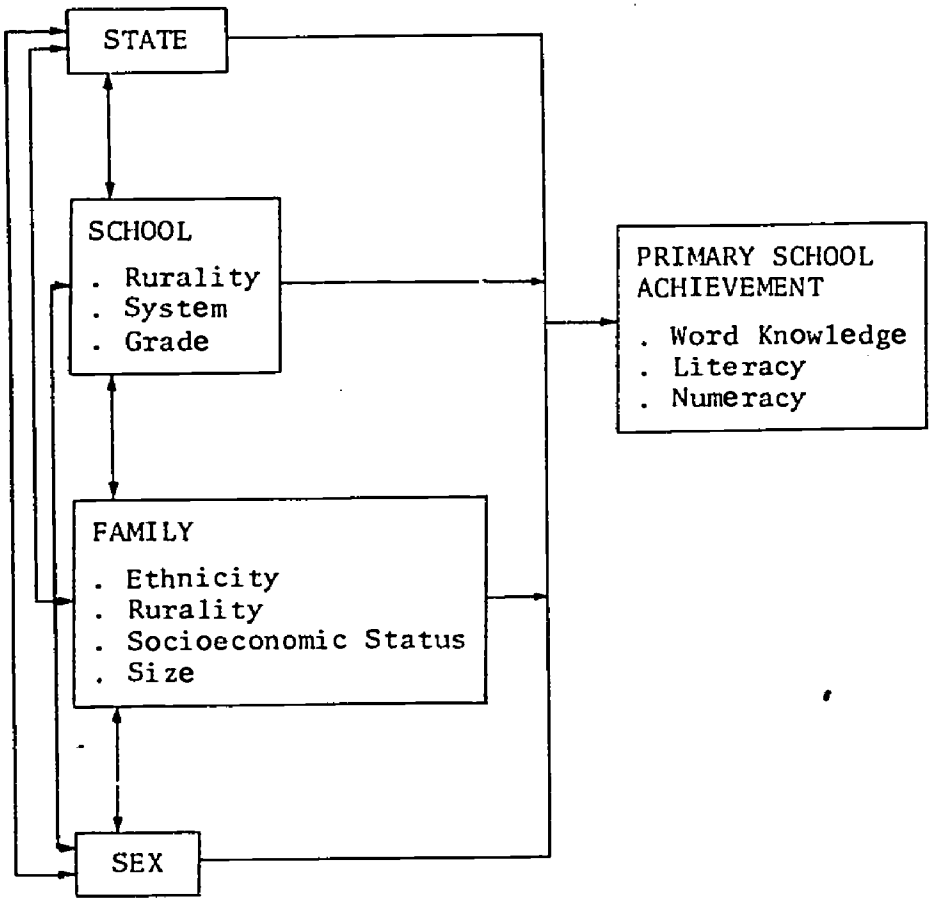

Figure 4.1 Model for Influences on Basic Skills Achievement in Primary School

Research conducted within Australia follows a similar pattern. The IEA surveys and the Literacy and Numeracy surveys of 1975 (Keeves and Bourke, 1976; Bourke and Lewis, 1976; Bourke and Keeves, 1977) remain the major national level data bases about achievement in the primary school. At the State level, Departments of Education sometimes undertake surveys of their own; for example, the Research Branch in Western Australia administered tests in reading, spelling and arithmetic to 1000 students in grades 5 and 7 in 1955, 1960, 1965 and 1970, and examined the effects of school location, class size, and sex on these achievements. Similarly, Duck (1978) looked at the performance of 1664 students in Queensland in 1972 and 1977 to examine the influence of location on achievement. Hammond and Cox (1967) looked at ability, socioeconomic status, personality, and family background influences on the achievement of fifth grade boys. Keeves (1972) developed structural equation models to capture home, school and peer influences on achievement among Grade 6 students in the ACT. De Lemos (1975) looked at ethnic origin and family background effects on achievement in Grades 2, 4 and 6. Marjoribanks (1979) followed his interest in explaining ethnic group differences in achievement using data on samples of 11-year-old South Australian children. He argued that the relationships between achievement, intelligence and the 'cognitive- behavioural' component of attitudes to school varied between ethnic groups and that ethnic differences in achievement were linked to ethnic differences in the learning environments provided within families.

The Australian Studies in School Performance (Keeves and Bourke, 1976; Bourke and Lewis, 1976; Bourke and Keeves, 1977) - the Literacy and Numeracy Study - whose data we build on and elaborate ranks as the most comprehensive national study of achievement in Australian primary schools. The authors' aims, somewhat different to our own, were primarily to develop tests in the basic skills of reading, writing and numeration, to determine the number of children achieving mastery of these skills, and to specify relationships between factors such as sex, ethnicity, age, learning problems and these measures of achievement in basic skills. In their words:

> The students' year level (or grade) was the most important variable for mastery of each test and the related variables, State/Territory and age, were also found to be very important for both the 10 and 14 year-old students. Family size and whether the family received a newspaper in English were of moderate importance and school type, school location, family language, sex and turbulence were of lesser importance. Overall, these variables distinguished very effectively between successful and unsuccessful groups with respect to the proportion of mastery students in specific groups. For the Reading and Numeration Tests at both age levels, the differences in the proportions of mastery students for the highest and lowest student groups were of the order of 60 percent. Students in the highest groups tended to be in higher year levels at non-government schools and to come from small families which receive a newspaper in English every day. Students in the lowest groups tended to be older but in lower year levels and to come from large families. (Bourke and Keeves, 1977:106).

We use analogous data on a subset of the 10-year-old sample, along with information on the student's socioeconomic origins, family rurality, and school rurality not available to these authors in 1975. Moreover, we approach the analysis with a somewhat different set of terms of reference to answer, and use a different, though related, analytic procedure in our attempt to explain why it is that 10-year-olds in primary school differ in their grasp of basic literacy and numerical skills.

Three Structural Equations

The system of relationships hypothesized in the model (Figure 4.1) can be summarized in three structural equations, as follows.

$$\text{WORD.KNOW} = c_1\text{STATE} + c_2\text{SCHOOL} + c_3\text{FAMILY} + c_4\text{SEX} + \text{error term} \quad 4.1$$

$$\text{LITERACY} = d_1\text{STATE} + d_2\text{SCHOOL} + d_3\text{FAMILY} + d_4\text{SEX} + \text{error term} \quad 4.2$$

$$\text{NUMERACY} = e_1\text{STATE} + e_2\text{SCHOOL} + e_3\text{FAMILY} + e_4\text{SEX} + \text{error term} \quad 4.3$$

Equation 4.1 says that individual differences in Word Knowledge scores can be attributed, in part, to the effects of State of residence (STATE), differences between schools (SCHOOL), the influence of a variety of family background factors (FAMILY), and to sex differences (SEX). Some part of these differences, however, is attributable to other influences not specified here and these are contained in the error term. Equations 4.2 and 4.3 have analogous interpretations. We do not assume that each influence operates with the same strength; obviously, some are likely to be more important than others. To allow for this we include measures of effect for each independent variable in the equation, and for the error term. These are the c_i, d_i and e_i in equations 4.1 to 4.3, and it is these that we estimate from the observed relationships within our data.

STATE, SCHOOL, and FAMILY are the summary variable categories shown in Figure 2.1 and represent a total of eighteen variables in all. The c_i, d_i and e_i are the structural coefficients to be estimated, one for each independent variable in each equation. They are estimated as partial regression coefficients and each is interpreted as a measure of the net effect of the independent variable with which it is associated in the equation.

The structural coefficients estimated are shown in Table 4.1 and are based on weighted data from all 969 respondents. Each column represents an equation. The dependent variable is noted at the top of the column, and the independent variables define the rows. The left-hand panel of the table shows these coefficients in their metric form for all variables in each equation. In the right-hand panel the standardized forms of these coefficients are shown.

The standard errors of the coefficients have been adjusted to allow for design effects resulting from the cluster sampling. Similar sampling in another study produced values of the square root of the design effect for partial regression coefficients equal to

ble 4.1 Influences on Achievement in the Primary School

dependent riables	Dependent Variables					
	Metric Coefficients			Standardized Coefficients		
	Word Knowledge	Literacy (Mastery)	Numeracy (Mastery)	Word Knowledge	Literacy (Mastery)	Numeracy (Mastery)
T	*1.62*	*0.20*	*-0.05*	*0.02*	*0.05*	*-0.01*
c.	*-1.11*	*0.04*	*-0.04*	*-0.05*	*0.04*	*-0.04*
d	*0.49*	*0.01*	*-0.02*	*0.02*	*0.01*	*-0.02*
	-4.80	-0.25	-0.22	-0.14	-0.15	-0.15
	-2.56	*0.01*	-0.13	*-0.07*	*0.00*	-0.07
s.	*-3.64*	*-0.05*	*-0.02*	*-0.06*	*-0.02*	*-0.01*
	-2.97	*-0.11*	*-0.24*	*-0.03*	*-0.02*	*-0.05*
hool Rurality	*-0.09*	-0.01	-0.01	*-0.07*	-0.14	-0.17
tholic School	*-0.41*	*-0.01*	*-0.05*	*-0.01*	*-0.01*	*-0.04*
dependent School	*3.80*	*0.02*	*-0.01*	*0.05*	*0.01*	*-0.00*
ade 4	-5.48	-0.19	-0.30	-0.23	-0.17	-0.31
ade 6	5.13	0.25	0.14	0.14	0.14	0.09
glish-Born	*-0.60*	*-0.08*	*-0.03*	*-0.02*	*-0.05*	*-0.02*
n-English-Born	-2.66	*-0.08*	*-0.01*	-0.09	*-0.06*	*-0.01*
mily Rurality	*0.06*	*0.00*	0.01	*0.06*	*0.05*	0.14
mily SES	0.28	0.01	0.01	0.20	0.13	0.11
mily Size	-1.05	-0.04	-0.03	-0.17	-0.15	-0.11
spondent's Sex	*0.10*	0.13	*0.03*	*0.00*	0.13	*0.04*
oportion of plained Variance	0.19	0.13	0.14			

tes

Coefficients less than twice their standard error are shown in italics
State effects are relative to NSW students
Effects for Catholic and Independent schools are relative to Government school students
Effects for English-born and non-English-born ethnic groups are relative to Australian-borns
Effects of Sex are those of being female relative to being male

1.16 (Ross, 1978:143) and we have adopted this figure as a reasonable estimate. Thus, the standard errors of the coefficients have been multiplied by 1.16 to take this into account. Each non-italicised coefficient shown in Table 4.1 exceeds twice its adjusted standard error. Coefficients less reliably different from zero are shown in italics. We have shown all the coefficients to provide complete information and because the application of a statistical decision rule often discriminates between coefficients not very different in size, conferring a degree of apparent legitimacy on one and not on the other. Thus, at times we may want to consider coefficients not reaching significance at this level but this is somewhat unlikely given our sample size. What is more likely is that some statistically significant coefficients will seem practically non-significant and, as a result, we will assign meaning only to a subset of the statistically significant effects. When an effect becomes worth considering is a matter of judgement in the main. By providing the complete set of coefficients with associated significance levels achieved we allow the reader to check our judgments.

Influences on Achievement

We have used the 'mastery' score version of the Literacy and Numeracy total test scores. Thus each student is represented in the data as having mastered or not mastered the basic skills assessed. The Word Knowledge test scores retain their full range of 55 points. As noted earlier, apart from the fact that the Literacy and Numeracy tests were criterion-referenced measures with mastery/non-mastery as the preferred mode of reporting the results, the dichotomous dependent variables offer interpretations of effects in concrete percentage terms. Using the data displayed in Table 4.1 we are able to say, for example, that the coefficients -0.19 and 0.25 in column 2 mean that other things equal, some 19 per cent fewer Grade 4 students, and some 25 per cent more Grade 6 students achieve mastery of Literacy relative to their 10-year-old age peers in Grade 5. Similarly, we interpret the coefficient for sex in the same column to mean that, compared to boys like them in all other (measured) respects, some 13 per cent more females achieve mastery of Literacy. We offer these kind of concrete interpretations wherever possible but note again that we do so in the light of the qualifications made in Chapter 3.

State and School Effects

For reasons soon to become clear we do not interpret the State effects shown. The various States are represented in the sample as follows: ACT by one school and 14 students; NSW by seventeen schools and 353 students; Vic. by thirteen schools and 241 students; Qld by eight schools and 151 students; SA by five schools and 91 students; WA by four schools and 79 students; Tas. by one school and 19 students; and NT by one

school and 21 students. Thus, while the sample allows generalizations for Australia as a whole, State effects are subject to considerable uncertainty.

For example, take the apparent negative effects on achievement that accrue from living in SA. If we were to offer a literal interpretation of these we would say that, other things equal and relative to NSW students, 25 per cent fewer SA students had mastered literacy and 22 per cent fewer had mastered Numeracy in 1975. Given this we might want to raise the question of whether State differences in the practice and provision of education were implicated. However, this assumes that the five SA schools and their 91 students are representative of SA schools and students as a whole. A comparison of the total sample for SA involving 40 schools and 986 students with our SA sub-sample shows the following: 56 per cent of the total sample mastered Literacy whereas only 39 per cent of our sub-sample achieved this level; and 76 per cent of the total sample mastered Numeracy while only 69 per cent of our sub-sample did so in 1975. In short, by chance we selected five SA schools whose students average achievement in these basic skills was lower than that for SA students as a whole. Thus, while we were able to speculate about State effects in our earlier analyses because we had representative State samples (Williams et al., 1980a), the contingencies that led us to using a sub-sample for this study preclude such interpretations here.

School rurality. In contrast to the findings for high school students reported in our earlier analyses (Williams et al., 1980a:60), where we found only minor effects on achievement at age 14, school rurality has marked affects on achievement in primary schools. Other things equal, students attending rural primary schools seem disadvantaged in contrast to their urban counterparts. For each achievement measure the coefficient shown is negative; respectively -0.09, -0.01 and -0.01. The school rurality index as we have scaled it in this case has a range of 29 points; thus, given that each unit of school rurality reduces the proportion achieving mastery of Literacy and Numeracy by 0.01 then, other things equal, each unit of school rurality is associated with one per cent fewer students achieving mastery of Literacy and Numeracy. Thus, the difference between schools at the extremes of the rural-urban continuum is 29 per cent fewer of the most rural students achieving mastery of these skills compared with the most urban of their counterparts, simply as a function of attending a rural primary school. In short, where our earlier analyses offered little support for the conventional wisdom that sees rural secondary school students as disadvantaged, our data on achievement in primary schools suggests that rural disadvantage operates at this more junior level and can be quite marked in its effects. Unfortunately our data do not allow us to explore the reasons for this rural disadvantage, an exploration we see as a particularly worthwhile piece of research.

Before leaving this point, whose substance has potentially important implications for educational policy in the area of compensatory school funding, we need to consider

whether we may be interpreting a statistical artifact. The question arises because of the high correlation (0.74) between family and school rurality which opens up the possibility that this fairly substantial collinearity is producing unstable and somewhat artifactual negative effects for school rurality. The general problem of multicollinearity and its effects has been discussed extensively (for example, Farrar and Glauber, 1967; Gordon, 1968). The basic problem for ordinary least squares regression statistics such as we are using is that as the collinearity between independent variables increases so does the instability of the solution to the point where linear dependence between variables makes a solution impossible. What this means for the statistics we have produced is that the inclusion of both school and family rurality in each of the equations explaining variation in Word Knowledge, Literacy and Numeracy may have produced negative effects for school rurality which are unstable and artifactual to some unknown degree. Gordon (1968) offers a convincing demonstration of how this may come about.

To examine this possibility we estimated these same three equations again, twice: in the first instance we excluded family rurality; and in the second set we excluded school rurality from each equation. In those equations which omitted school rurality, family rurality had effects which failed to reach statistical significance and which were negligible compared with their counterparts in Table 4.1. On the other hand, the set of equations which included school rurality but omitted family rurality produced coefficients for school rurality only marginally different from their analogues in Table 4.1; these (metric) coefficients for school rurality were, respectively -0.04 for Word Knowledge, -0.01 for Literacy and -0.01 for Numeracy. As with the coefficients in Table 4.1, the effects for Literacy and Numeracy reached stastistical significance while that on Word Knowledge did not. In short: omitting family rurality from these equations makes little difference to the effect estimates for school rurality, suggesting that the effects shown for school rurality are fairly stable and, hence, interpretable; and, omitting school rurality from the equations reduces the size of the family rurality coefficients considerably - for example, from 0.14 to 0.03 in the case of the standardized coefficients for Numeracy. Seeing that the sizes of the family rurality coefficients increase when school rurality is controlled, as it is in the equations that produced the estimates for Table 4.1, it seems that school rurality is acting as a moderate suppressor variable (cf. Rosenberg, 1968:Ch.4). On the basis of these findings we go ahead and assign meaning to the coefficients for both family and school rurality.

School system. Like State of residence, and for the same reasons, school system attended - Government, Catholic, Independent - is represented by dummy variables. Government schools constitute the reference group for the coefficients shown in Table 4.1 in the same way as NSW was used as the reference group for State effects. In all, these data show no particular advantage for achievement of attendance at either of the two non-Government school systems. Individuals otherwise equal in all respects

Table 4.2 School, Ethnicity and Grade Effects Expressed as Adjusted Deviations from the Grand Mean

Independent variables	Dependent Variables		
	Word knowledge	Literacy	Numeracy
	Net School System Effects		
Government	-0.01	0.00	0.01
Catholic	-0.42	-0.01	-0.04
Independent	3.59	0.02	0.02
	Net Ethnicity Effects		
Australian-born	0.49	0.02	0.00
English-born	-0.11	-0.06	-0.03
Non-English-born	-2.17	-0.06	-0.01
	Net Grade Effects		
Grade 4	-4.41	-0.16	-0.23
Grade 5	1.07	0.03	0.07
Grade 6	6.20	0.28	0.21

measured but attending a Catholic school score an average of 0.41 points lower in Word Knowledge, one percent fewer master Literacy and 5 per cent fewer master Numeracy. The analogous figures for students from the Independent schools are 3.60 points higher on Word Knowledge, two per cent more mastering Literacy, and one per cent fewer mastering Numeracy. None of these effects reach statistical significance and are negligible in their absolute magnitude.

The same pattern of effects is seen in another form in the first panel of Table 4.2 where we present the school system effects as adjusted deviations from the grand mean. While these adjustments are generally positive for the Independent schools and negative for Catholic schools, the effects are marginal and statistically non-significant.

School system seems not to exert a strong influence on achievement in primary school. Thus, where we reported earlier that 14-year-olds attending Catholic or Independent high schools appeared to do better at Literacy and Numeracy, other things equal, suggesting that the practice and provision of education might vary between the three systems with some consequence, we are unable to demonstrate parallel effects at the primary school level. This finding fits one of the several varieties of belief about the relative merits of an independent school education - namely, that it only matters during the secondary school years. However, these findings and interpretations must be seen as somewhat uncertain, especially for students in the Independent schools. Our sample includes 165 students in Catholic schools but only 24 students who attended primary schools in the Independent system.

Grade. We noted earlier that this was an age sample. While most were in Grade 5 during 1975, 27 per cent were in Grade 4 and eight per cent were in Grade 6. In Chapter 3 we suggested that the grade the student was in was important because it represented differences among students in the opportunity to learn the skills being tested, in physical and mental development, and in ability to the extent that grade advancement and grade retardation was practiced in schools. The statistical procedure adopted to deal with this variable was analogous to that for the school system variables. In this case Grade 5 was the omitted group with Grade 4 and Grade 6 as two dummy variables whose effects are interpreted relative to Grade 5 students. Thus in Table 4.1 the coefficents -5.48, -0.19 and -0.30 indicate that Grade 4 students are at a consistent disadvantage in each of these measures of achievement. On the other hand, the coefficients 5.13, 0.25 and 0.14 show Grade 6 students at a consistent advantage relative to Grade 5 students. Such a pattern of findings offers an obvious interpretation in tune with the findings of the 'time on task' literature (for example, Rosenshine, 1979). Relative to Grade 5 students, those in Grade 4 have had less exposure to the material tested and so, other things equal, do less well. On the other hand, Grade 6 students have had more exposure and, hence, do better than their Grade 5 counterparts.

The magnitude of these grade effects is seen more graphically in the third panel of Table 4.2 as adjustments to the expected average score on each test. Being in Grade 4 lowers the mean of Word Knowledge by 4.41 points, reduces the proportion achieving mastery of Literacy by some 16 per cent, and reduces the proportion of Numeracy masters by 23 per cent. In contrast being in Grade 6 and, as we argue, having been exposed to the material tested, and exposed for a longer time, increases the mean for Word Knowledge and the proportions achieving mastery by about the same amount.

Family Effects

Ethnicity. For reasons already outlined we took country of father's birth as the indicator of family ethnic group membership. This construct was represented by two dummy variables in the analyses, English-born and non-English-born, with Australian-born the reference group. Although these variables are fairly coarse measures of ethnicity we suspected that they would reflect whatever major cultural differences may exist between the three groups. We suspected further, that these differences would be greatest between the non-English-born group and the others, a common Anglo-Saxon heritage producing greater commonalities between the Australian-born and English-born groups. In addition to these cultural differences we are capturing migrancy in the 'English-born' variable, and migrancy and language in the 'non-English-born' variable.

With one exception, the ethnicity coefficients in Table 4.1 suggest that, other things equal, having a father born outside Australia, no matter where, is a mild disadvantage as

far as mastering Literacy and Numeracy is concerned. Compared to the Australian-born group, 8 per cent fewer in each migrant group master Literacy and between 1 and 3 per cent fewer achieve mastery of Numeracy, other things equal. Thus, with the exception of an effect on Word Knowledge for the non-English-born (-2.66) which suggests some language disadvantage for vocabulary, students from both migrant groups differ little from Australian-born students like them in the other respects measured. Moreover, seeing that the differences that do occur are of about the same size in each migrant group, the achievement disadvantage shown is not attributable to problems with language but, rather, has something to do with being a migrant. Whether this 'something' resides in the schools, the families, or both we do not know.

The second panel in Table 4.2 illustrates these effects as adjustments to the grand mean. The effect of having a father born outside Australia in a non-English speaking nation, for example, is to adjust downwards the means of Word Knowledge, Literacy and Numeracy by 2.66, 0.08 and 0.01 points respectively. With the exception of the effect on Word Knowledge in the non-English-born group, the effects are statistically insignificant and small. Ethnic origin seems not to have much of an effect on achievement in the primary school.

Family rurality. Whatever the differences that may exist between rural and urban families, and we discussed several in the value domain, they appear to make a difference only for the learning of basic numerical skills. The standard deviation of the family rurality scores is approximately 10 units in a range of 82. Thus, seeing that each unit of family rurality decreases by one per cent at the proportion of 10-year-olds achieving mastery of Numeracy, other things equal, students from families one standard deviation apart on family rurality differ on the average by some 10 per cent in the proportion achieving mastery of the basic numerical skills measured and this is in the favour of rural rather than urban families. Recall, first, that this is a net effect stemming from as yet unmeasured differences between rural and urban families; and second, that it was shown to be insignificant for achievement in high school at age 14 (Williams et al., 1980a:63). Thus, we can argue that whatever it is that rural families do differently it affects the development of basic numerical skills in young children but fades to insignificance among adolescents. Seeing that the effect is quite substantial a more detailed investigation of the family processes at work could be supported. Why this effect should only occur for numerical skills and then only for children in primary school we do not know and cannot answer with these data. Perhaps the practical day-to-day mathematics of farm management are more a part of rural family life than are the mathematics of urban living.

When considered with the overall negative effects of school rurality we seem to be saying that rural (and urban) living is a mixed blessing as far as the learning of basic skills is concerned. Among students otherwise the same, those from rural families are at

some advantage, especially in numerical skills, but because they tend to go to rural schools this advantage is cancelled by the apparent disadvantages of rural schooling. Some supplementary analyses suggested that these findings are probably not statistical artifacts, so it remains to consider what they mean.

At face value these apparent countervailing influences do not constitute a problem. There is no logical inconsistency in the idea of a rural family contributing to achievement and a local school with all the supposed disadvantages of rural schools depressing this learning relative to what might have been achieved had the rural student attended an urban school. The problem comes about because our indicator of school rurality is the average family rurality of the 25 students sampled in that school and it takes the following form: if we control for a variety of influences on school achievement, including family rurality, what does it mean to find that the average family rurality of the students in the school exerts a negative effect on achievement? The most literal in intepretation is that, other things equal, the more rural one's school peers, the lower one's achievement on the average. Given that a rural family background is an advantage this interpretation is less believable, we think, than one which argues that the average family rurality of students in a school is a reasonable indication of the rurality of the school. If so, and if rural schools are disadvantaged in ways we have indicated, then a negative net influence of this variable is believeable and not at all inconsistent with a positive net effect of family rurality. We take the latter line of argument.

Family size. Family size has a consistent negative effect on achievement. Ceteris paribus, each additional sibling costs 1.05 points in Word Knowledge, and decreases by 4 and 3 per cent respectively the proportions achieving mastery of Literacy and Numeracy, on the average. While small and confounded with birth-order effects, the effects shown are notable for their consistency. Explanations of family size effects on achievement usually invoke a 'sharing-of-parents' or 'sharing of resources' argument (cf. Steelman and Mercy, 1980:581).

Family SES. This variable was constructed as a composite of father's education and occupation along with mother's education. It is included within the model to capture one of the better established relationships in the social sciences, namely, that the social and economic attainments of one's parents have marked effects on one's own life-style and life-chances. The present data show no exception to this law in that 'family SES' exerts a consistent effect on all three measures of achievement. Like family and school rurality the variable has no natural metric so its interpretations are somewhat less concrete than we would like. As we have scaled the variable the standard deviation is about 7.5; thus, other things equal, 10-year-olds whose families are one standard deviation apart in their socioeconomic status differ by about 7 or 8 per cent in the

proportion mastering each of Literacy and Numeracy. In short, we demonstrate what has become a social science truism - it is difficult to 'escape' from the influence of one's social origins, the more so the closer one is to these origins. Traditionally these differences are explained in terms of what parents do, provide and believe in connection with their children (cf. Kohn and Schooler, 1969; Keeves, 1972).

Sex Differences

Other things equal, sex differences in Word Knowledge, Literacy and Numeracy are minor with the only statistically significant effects those on Literacy (0.13), at which females traditionally outperform males (cf. Walker, 1976). In this case, 13 per cent more females achieve mastery of Literacy, on the average, relative to males like them in other respects.

Relative Effects

It is important to remember that we have been discussing metric coefficients which are not comparable within the same equation. For example, the fact that the coefficients for school rurality, family rurality and family SES are all equal in the equation for Numeracy provides only the meaning of the coefficients themselves, not a comparison. The standardized coefficients within the second panel of Table 4.1 provide the comparisons because they are standardized to the same metric - standard deviation units. Thus, we see the analogous standardized coefficients are -0.17, 0.14 and 0.11 suggesting that, other things equal, the effects of school rurality are some one and one-half times those of family SES.

These relative effects are particularly interesting for what they have to say about the perennial educational research question - the relative influence of home and school. It seems that we have been able to demonstrate at least parity and perhaps the ascendancy in some cases, of school influences over those of the family. Where the mastery of basic Literacy skills is concerned the relative influence of family and school is of much the same order of magnitude, showing the disadvantages of a rural education, the advantages of having had a chance to learn the material being tested, the intangible advantages of having the right parents, and the disadvantages of too many siblings. The school effects are even more marked for mastery of Numeracy. The largest effect of all stems from our measures of the year level (grade) of the student in 1975, a measure we interpreted as reflecting the amount of opportunity the student has had to learn the mathematics skills tested. We note too that, other things equal, going to a rural primary school is something of a disadvantage for achievement in basic skills. However, this is offset in part by the fact that most students in rural schools come from rural families who appear to facilitate the learning of basic mathematical skills. Family SES and family size effects are consistent with those for Literacy.

The measures of Literacy and Numeracy considered to this point are total test scores, the sum of scores on the variety of sub-tests developed for the Australian Studies in School Performance. Unless one could assume that both Literacy and Numeracy were unidimensional constructs, something that Bourke and Keeves (1977:54) do not, then it is possible that the patterns of effects in question differ from sub-test to sub-test depending on the specific skills being measured. In other words, considering only a total test score may obscure important differences in the patterns of effects on component skills; for example, the apparent disadvantage associated with rural schools may stem from problems in one skill area rather than being an overall disadvantage. Information of this kind has obvious value for the planning of programs designed to offset these disadvantages.

The Components of Literacy

Our examination is limited to the reading components of the Literacy measure. The nature of these and their origins is described in detail in Bourke and Keeves (1977:Ch.4). We considered the following six sub-tests and two composites. Briefly, the nature of the sub-tests was:

1	Words in Context	- 'knowing or deriving the meaning of words in context'
2	Reference Materials	- 'using a variety of approaches to obtain information'
3	Continuous Prose	- 'the understanding of continuous prose'
4	Linguistic Competence	- 'knowledge of syntactical rules'
5	Newspaper Information	- 'finding information in a newspaper'
6	Newspaper Comprehension	- 'understanding continuous prose in a newspaper'

The composite measures were derived from items taken from the six sub-tests and combined to reflect two aspects of a usage dimension:

1	Classroom Usage	- 'materials that are met within normal school work'
2	Social Usage	- 'materials typical of the commercial and industrial world...general fiction and those sections of newspaper which are read as a recreational activity' (see Bourke and Keeves, 1977:47-49.

Estimating the Model

We estimated a separate model for each sub-test and composite using the same set of influences specified in Table 4.1, namely, the State, School, Family and Sex categories of variables. In keeping with our earlier argument about the need to provide intuitively understandable statistics we treated the distribution of each sub-test and the two composites as a dichotomy. In contrast to the total Literacy and Numeracy scores, these

Table 4.3 Influences on Components of Literacy Achievement in the Primary School: Metric Coefficients

Independent Variables	Dependent Variables							
	Words in Context	Reference Materials	Continuous Prose	Linguistic	Information News	Comprehension News	Social	Classroom
ACT	*0.22*	*-0.06*	*0.03*	*0.13*	*-0.16*	*0.12*	*0.14*	*0.20*
Vic.	*0.01*	*0.03*	*0.02*	*-0.01*	*-0.01*	0.09	*0.06*	*-0.01*
Qld	*0.06*	*-0.02*	*0.07*	*0.04*	*-0.04*	*0.05*	*0.03*	*0.05*
SA	-0.23	-0.19	*-0.09*	*-0.03*	-0.25	-0.17	-0.27	*-0.07*
WA	*0.03*	*-0.06*	*0.04*	*0.03*	*-0.07*	*0.03*	*-0.07*	*-0.01*
Tas.	*0.08*	*-0.17*	*-0.01*	*0.04*	*-0.12*	*0.03*	*-0.06*	*-0.08*
NT	*-0.08*	*-0.12*	*-0.02*	*-0.01*	*-0.11*	*0.10*	*-0.03*	*-0.04*
School Rurality	-0.01	*-0.01*	-0.01	-0.01	*-0.01*	*0.00*	-0.01	-0.01
Catholic School	*-0.01*	*-0.02*	*-0.08*	*0.02*	*-0.02*	*-0.02*	*-0.04*	*-0.02*
Independent School	*0.01*	*0.20*	*-0.02*	0.25	*0.16*	*-0.11*	*-0.00*	*0.04*
Grade 4	-0.22	-0.15	-0.14	-0.22	-0.16	-0.14	-0.19	-0.13
Grade 6	0.15	0.27	0.20	*0.10*	0.23	0.18	0.22	*0.10*
English-Born	*-0.10*	*-0.06*	*-0.11*	-0.10	*-0.06*	-0.12	*-0.08*	-0.11
Non-English-Born	*-0.05*	*-0.05*	*-0.01*	*-0.05*	*-0.02*	*-0.04*	-0.10	*-0.03*
Family Rurality	*0.00*	*0.00*	0.01	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Family SES	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Family Size	-0.04	*-0.01*	-0.04	-0.03	-0.02	-0.04	-0.04	-0.03
Respondent's Sex	0.11	0.09	0.13	0.13	0.08	*0.03*	0.09	0.15
Proportion of Explained Variance	*0.12*	*0.08*	*0.11*	*0.11*	*0.08*	*0.09*	*0.11*	*0.08*
Percentage of Sample in High Group	59	48	51	71	47	31	45	57

Notes

1 Coefficients less than twice their standard error are shown in italics
2 Each dependent variable is dichotomized close to the median; proportions in the 'high' group are indicated for each variable
3 State effects are relative to NSW students
4 Effects for Catholic and Independent schools are relative to Government school students
5 Effects for English-born and non-English-born ethnic groups are relative to Australian-borns
6 Effects of Sex are those of being female relative to being male

are not mastery/non-mastery dichotomies. Scores were dichotomized as close to the median as possible to produce two groups for each measure; the 'low' group, and the 'high' group. Thus, we are able to talk about the effects of variables in terms of differences in the proportions of students above and below 'average'. The proportion of students in the high group varied from 31 to 71 per cent as a function of the distributions of scores. We report the metric coefficients from each of these analyses, the proportion of variance explained, and the proportion of students in the high group of each distribution in Table 4.3.

In looking at these data we are attempting to identify consistencies across the six sub-tests and the two composite measures. Consistent effects across all eight measures of Literacy would indicate a pervasive influence on all aspects of basic skill learning in Literacy. Effects on some components but not on others may, depending on the pattern of effects, indicate State differences in curricular emphases, for instance, or the locus of rural school disadvantage. Moreover, by considering the patterns of influence on the sub-tests together with the social and classroom composite measures it may be possible to point out whether it is learning in school or out that suffers. Comparisons between the sub-tests and the composites are somewhat obscured by the fact that some sub-tests contain items that contribute to both composites (Bourke and Keeves, 1977:48-49).

State effects. As noted earlier, the makeup of our sample does not really allow the interpretation of State effects. We present the estimates without comment and caution against the assignment of meaning to these effects.

School rurality. The effects of this variable are consistent across the eight measures which leads us to conclude that whatever it is that disadvantages the students in rural primary schools, it is something fundamental and pervasive. We will suggest some possibilities later after examining its effects on the Numeracy sub-tests.

School system. The effects are minor overall, with one or two exceptions, and are inconsistent across the eight measures. We argue, as we did earlier, that whatever the advantages that may accrue from attendance at a non-government high school, in the primary school there are no real differences between the three systems in terms of outcome.

School grade. The effects are consistent across all literacy component measures and we refer the reader to our earlier interpretation based on 'opportunity to learn' and 'time on task'.

Ethnicity. The effects shown are fairly consistent across all measures. Other things equal, and relative to Australian-borns, some 10 per cent fewer English-borns have scores in the top half of the distribution. As noted earlier, language difficulties seem not to be very important as a comparison of the effects for the non-English-born group

Table 4.4 Influences on Components of Numeracy Achievement in Primary School: Metric Coefficients

Independent Variables	Dependent Variables										
	Addition	Subtraction	Multiplication	Division	Recall/ Manipulation	Application	Whole Numbers	Measurement	Money	Social	Classroom
ACT	*-0.02*	*0.02*	*-0.22*	*0.03*	*-0.05*	*-0.11*	*-0.00*	*0.01*	-0.32	*-0.08*	*-0.04*
Vic.	*-0.00*	*0.05*	*-0.01*	*-0.03*	*0.04*	*0.03*	*0.00*	*0.01*	*-0.01*	*0.04*	*0.02*
Qld	*0.03*	*0.03*	*0.01*	*0.12*	0.11	*0.06*	*0.06*	*0.04*	*-0.04*	*0.01*	*0.10*
SA	-0.15	-0.14	-0.20	-0.19	-0.23	-0.20	-0.29	-0.19	-0.16	-0.20	-0.24
WA	*0.02*	*-0.07*	-0.22	*-0.05*	*-0.05*	*0.05*	*-0.08*	*-0.04*	*-0.12*	*-0.07*	*-0.01*
Tas.	*-0.07*	*0.13*	*-0.14*	*-0.13*	*-0.02*	*-0.07*	*-0.12*	*-0.03*	*-0.06*	*-0.11*	*-0.09*
NT	*-0.01*	*-0.00*	*-0.29*	-0.37	*-0.24*	*-0.07*	*-0.28*	*-0.22*	*-0.21*	*-0.21*	*-0.17*
School Rurality	-0.01	*-0.01*	*0.00*	-0.01	-0.01	-0.01	-0.01	*-0.01*	-0.01	-0.01	-0.01
Catholic School	*-0.03*	*-0.07*	*-0.02*	*-0.05*	*-0.01*	-0.09	*-0.07*	*-0.04*	*-0.03*	-0.09	*-0.03*
Independent School	*-0.01*	*0.11*	*-0.13*	*-0.09*	*0.07*	*0.14*	*-0.01*	*0.11*	*0.00*	*0.06*	*0.07*
Grade 4	-0.16	-0.13	-0.27	-0.28	-0.33	-0.26	-0.36	-0.23	-0.16	-0.29	-0.30
Grade 6	*0.07*	0.12	0.13	0.17	0.13	0.23	*0.11*	0.19	0.17	0.21	*0.12*
English-Born	*-0.04*	*-0.03*	*-0.09*	-0.16	-0.11	-0.17	-0.12	-0.10	*-0.03*	-0.13	-0.11
Non-English-Born	*-0.02*	*0.01*	*0.06*	*-0.03*	*-0.03*	*-0.00*	*0.02*	*-0.01*	*0.01*	*-0.02*	*0.05*
Family Rurality	0.01	*0.00*	*0.00*	0.01	*0.00*	0.00	0.01	*0.00*	0.00	0.01	0.01
Family SES	*0.00*	*0.00*	0.00	0.01	0.01	0.01	0.01	0.01	*0.00*	0.01	0.01
Family Size	-0.02	-0.03	*-0.02*	-0.02	-0.03	-0.03	-0.03	-0.03	*-0.01*	-0.02	-0.03
Respondent's Sex	0.08	0.09	0.07	*-0.02*	*0.06*	*-0.05*	*0.06*	-0.10	*0.02*	-0.07	0.07
Proportion of Explained Variance	*0.07*	*0.12*	*0.09*	*0.14*	*0.16*	*0.12*	*0.17*	*0.11*	*0.06*	*0.12*	*0.14*
Percentage of Sample in High Group	73	56	50	48	54	54	60	45	78	51	56

Notes

1 Coefficients less than twice their standard error are shown in italics
2 Each dependent variable is dichotomized close to the median; proportions in the high group are indicated for each variable
3 State effects are relative to NSW students
4 Effects for Catholic and Indpendent schools are relative to Government school students
5 Effects for English-born and non-English-born ethnic groups are relative to Australian-borns
6 Effects of Sex are those of being female relative to being male

shows. Other things equal, the degree of their disadvantage is of a lesser order. We assume that cultural differences, and the problems of assimilation experienced by these families may lie at the root of these ethnicity effects.

Family rurality. Consistent with our earlier finding for the total Literacy score, the effects are negligible.

Family SES. The pervasive effects we have come to expect are demonstrated by these data and we offer the same interpretation as made in connection with the global mastery of Literacy measure.

Family size. The effects again are consistent across the measures, each sibling difference between families being linked to something like a four per cent difference in the proportions of students in the lower and upper portions of each score distribution. While demonstrating the pervasiveness of family size effects, because the effects are consistent they offer no clues as to why family size affects learning.

Sex. The superior literacy skills of females are reflected in something like a 10 per cent difference in the proportions of girls in the high group relative to boys like them in all other measured respects.

The Components of Numeracy

The nature of these tests is spelled out in detail in Bourke and Keeves (1977:Ch.5) and is summarized below. As with Literacy we consider as well 'Social' and 'Classroom' composites designed to reflect learning out of and in school, respectively. The following sub-tests were considered and where their content is not self-evident we indicate what it is, briefly.

1	Addition	
2	Subtraction	
3	Multiplication	
4	Division	
5	Recall/Manipulation	'the recall of relationships and number facts or the manipulation of numbers'
6	Application	
7	Whole Numbers	
8	Measurement	'measuring length and time ... reading tables and graphs'
9	Money	'use of numbers in problems where amounts of money up to one dollar were involved'

Estimating the Model

As with the Literacy sub-tests we dichotomized the distributions at the median or as close to it as possible. The metric coefficients, proportions of variance explained in each test, and the proportion of the sample in the high group are shown in Table 4.4.

State effects. The same arguments apply here as they did for the Literacy tests and, thus, we offer no interpretation of State effects.

School rurality. Here, as with the Literacy sub-tests, the degree of the rurality of the school exerts a consistent effect across the various component numeracy skills measured. Other things equal, students attending rural primary schools are disadvantaged in most aspects of Numeracy. This consistent disadvantage in both Literacy and Numeracy seems to support the popular notion of a disadvantaged school, one in which reduced provision in the quality and quantity of resources - human resources included - affects learning. The equal effects on 'Classroom' and 'Social' measures suggests that the disadvantage is both within school and without. Perhaps it is as popularly believed: rural schools get the inexperienced teachers who leave as soon as they can, and rural schools are isolated from the extra-school facilities that encourage the informal learning of basic skills. We cannot tell with these data but we suggest that it is a matter worthy of further investigation.

School system. The effects are small and somewhat inconsistent. Neither of the two non-Government systems seems to offer any particular advantage in the learning of basic numerical skills.

School grade. We see the same pattern of effects as in the case of the Literacy tests and we offer the same interpretation.

Ethnicity. Other things equal, relative to Australian-born students, those with fathers born outside Australia in an English-speaking nation show a lower level of learning across most of the sub-tests. The comparable affects for the non-English-born are marginal and inconsistent. While we might predict the reverse on the basis of language difficulties (see Williams et al., 1980a:Ch.4), language seems not to be a factor among the 10-year-olds. We must assume as we did in the case of early school leaving among the members of the 14-year-old sample that the source of these effects lies in between-group differences in the educational expectations and encouragements parents provide.

Family effects. The effects of family rurality, SES and size are reasonably consistent across the range of sub-tests and there is little need to comment again about what these may mean.

Sex. The inconsistencies in the patterns of effects for sex are of interest insofar as they reflect on the debate about sex differences in mathematics achievement. If we examine just the Social and Classroom composites we see that other things equal, females do worse on the measure of extra-school mathematics learning and better on those aspects of Numeracy taught in school. One might argue that this reflects, respectively, sex differences in opportunities to learn extra-school mathematics, in interest/motivation toward mathematics as such, and sex differences in the opposite direction with respect to the interest/motivation to please teachers by doing well in school.

Components or Total Scores?

Other than the inconsistencies in State effects on the Literacy sub-tests for SA, and the effects of English-born and sex on the Numeracy sub-tests, the patterns of effects across the tests have been remarkably consistent. This suggests that we will not err greatly in subsequent analyses if we confine our achievement measures to the total test scores for Literacy and Numeracy, expressed in mastery terms. By so doing we achieve a great deal of parsimony at the expense of averaging out some differences between groups in performance on the several components of Literacy and Numeracy, a trade-off we think worth making to achieve relative simplicity in a complex model.

CHAPTER 5

THE ENDURING EFFECTS OF PRIMARY SCHOOL

In this chapter and the next we consider the way in which the ascribed characteristics and primary school achievements of these students influence achievement-related behaviours in the early years of high school and the development of preferences for some kinds of educational and occupational futures over others.

The Transition from Primary to Secondary School

By October 1979, four years after these students had demonstrated their Literacy and Numeracy achievements in primary schools, the members of our sample were located in 243 high schools across Australia and were now aged between 14 and 15 years. They were approaching a major decision in their lives, namely, whether or not to leave school at the minimum legal age and, we guessed, had given some thought to their educational and occupational futures. Moreover, we argued that, in part, the foundations of these decisions were laid down during the six years they had spent in primary school and much depended on how successful they had been in learning what the school had to teach. Those who had been successful would possess the skills to make an easy transition to high school, would be rewarded for their achievements there as they had been in primary school, and would see themselves as capable of handling school learning. In short, they would plan to continue on in an environment in which they were capable, felt capable, were seen as capable, and were rewarded accordingly. On the other hand, we postulated some enduring effects of failing to master basic skills in the primary school. We saw the possibility of this incapability cumulating over the years and the achievement gap widening as the intellectual complexity of the curriculum increases and comes to rely more and more on the exercise of that particular set of abilities we call cognitive. The results, we argued, would take the form of learning difficulties, experienced in high school and brought about by the failure to master basic skills in primary school, a reduced self-conception of one's own capabilities as far as schoolwork is concerned, reduced support from parents, teachers and peers for an extended education and, as a result, something less than enthusiasm for the idea of completing high school and/or further study beyond high school.

We did not, of course, argue that all influences on educational and occupational preferences would be channelled through achievement in school. Thus, allowances were made for the effects of those ascribed characteristics previously summarized as State, School, Family and Sex influences in the analyses of Chapter 4. Thus, the model guiding the current analyses had two main lines of argument: first, that there would be enduring

effects of these ascribed characteristics on most of the variables examined; and second, that within the context of these effects we would see the foundations for successful learning in high school, developing conceptions of students' own capabilities, and perceived psychological support from others, together with educational and occupational preferences, in the extent to which the fundamentals of Literacy and Numeracy were mastered in the primary school.

The Model

These arguments are captured in an extension of the model shown in Chapter 4. This extended model is summarized in Figure 5.1. Thus, we argue that all of the variables outlined in Figure 4.1 affect whether or not a student will experience learning difficulties in the early years of high school. These, in turn, affect the development of his/her self-concept of ability, and the level of psychological support provided by parents, teachers and peers, and all of the variables mentioned so far are potential influences on decisions about when to leave high school and what to do afterwards.

Learning Difficulties Early in High School

In October 1979 we asked these students how often they had had 'serious problems with reading, mathematics or writing' while in high school (see question 3, Appendix A). The distributions of their responses are shown in full in Table 3.4 but in summary these are as follows: 58 per cent said they had never experienced reading problems; 25 per cent reported no problems with mathematics; and 58 per cent reported no trouble with

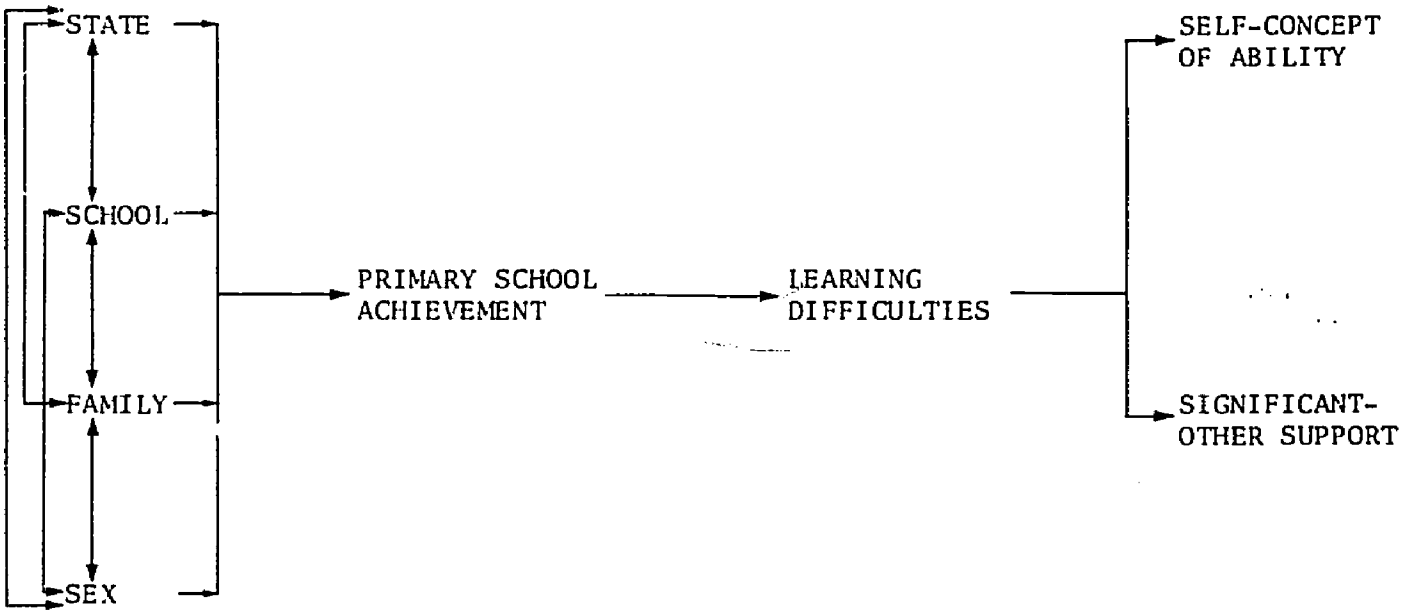

Figure 5.1 Model for the Enduring Effects of Primary School

Table 5.1 Influences on Learning Difficulties in the Early Years of High School

Independent Variables	Dependent Variables: Metric Coefficients			Standardized Coefficients		
	Reading Problems	Maths Problems	Writing Problems	Reading Problems	Maths Problems	Writing Problems
ACT	0.28	*0.02*	*0.12*	0.07	*0.01*	*0.03*
Vic.	*0.02*	-0.08	*-0.02*	*0.02*	-0.08	*-0.01*
Qld	*0.05*	*-0.04*	*0.07*	*0.04*	*-0.04*	*0.05*
SA	*0.01*	*-0.12*	*-0.01*	*0.01*	-0.08	*-0.01*
WA	*-0.06*	*-0.05*	*-0.07*	*-0.03*	*-0.03*	*-0.04*
Tas.	*-0.09*	*-0.13*	*-0.05*	*-0.03*	*-0.05*	*-0.02*
NT	*0.04*	*-0.12*	*0.13*	*0.01*	*0.02*	*0.02*
School Rurality	*0.00*	*0.00*	*0.00*	*0.03*	*0.02*	*0.01*
Catholic School	*0.01*	*0.03*	*0.01*	*0.01*	*0.03*	*0.01*
Independent School	*0.01*	*0.03*	*0.14*	*0.00*	*0.01*	*0.04*
Grade 4	*-0.00*	-0.12	*-0.00*	*-0.00*	-0.12	*-0.00*
Grade 6	*0.06*	*0.11*	*0.03*	*0.03*	0.07	*0.01*
English-Born	*-0.07*	*-0.05*	*0.00*	*-0.04*	*-0.04*	*0.00*
Non-English-Born	*-0.03*	-0.09	*-0.04*	*-0.02*	-0.08	*-0.03*
Family Rurality	*0.00*	*0.00*	*0.00*	*0.00*	*0.03*	*0.06*
Family SES	*0.00*	*-0.00*	*0.00*	*0.03*	*-0.02*	*-0.06*
Family Size	*0.01*	*-0.00*	*0.01*	*0.02*	*-0.01*	*0.02*
Respondent's Sex	-0.15	*0.03*	-0.20	-0.15	*0.03*	-0.20
Word Knowledge	-0.01	-0.01	-0.01	-0.29	-0.14	*-0.14*
Literacy (mastery)	-0.19	*-0.03*	*-0.06*	-0.19	*-0.03*	*-0.06*
Numeracy (mastery)	-0.10	-0.21	-0.11	-0.09	-0.21	-0.10
Proportion of Explained Variance	0.26	0.10	0.13			

Notes

1 Coefficients less than twice their standard error are shown in italics
2 State effects are relative to NSW students
3 Effects for Catholic and Independent schools are relative to Government school students
4 Effects for English-born and non-English-born ethnic groups are relative to Australian-borns
5 Effects of Sex are those of being female relative to being male

writing. In line with our previous arguments we dichotomized these variables into the form 'some problems'/'no problems'. We assume, of course, that those reporting learning difficulties do, in fact, experience these problems. There is little reason to think otherwise, though we have no way of equating the degree of difficulty experienced across all students. In this sense, the reported problems are probably 'relative to others in the class' and are confounded by whatever ability grouping may exist in these schools. In considering what it is that gives rise to these learning problems we estimated three equations, and both metric and standardized coefficients are shown in Table 5.1. Note that list of independent variables now includes the three measures of achievement in the primary school.

Problems with reading. Note too that performances on these three achievement tests are the prime influences on reading problems, along with that of sex. Other things equal, and relative to those failing to achieve mastery of the skills in questions, 19 per cent fewer of those mastering Literacy in primary school report reading problems, while for Numeracy the comparable figure is 10 per cent fewer. The effects of Word Knowledge are demonstrated most graphically in the standardized coefficients shown in the second panel of the table. Achievement in this area turns out to be the most important effect on reading problems (-0.29), followed by mastery of Literacy (-0.19) and mastery of Numeracy (-0.09). In short, those students experiencing problems in learning basic skills in the primary school are much more likely to be reporting reading difficulties in high school, other things equal. Given that we know prior achievement is the best predictor of current achievement this is hardly a revelation. However, these data do illustrate fairly graphically that the four years of schooling intervening between 1975 and 1979 apparently have not always provided the remediation necessary to enable everyone to read adequately. Many of those with problems at Grade 5 still report that they have them in the early years of high school.

Problems with mathematics. Where mathematics learning is in question, we are not surprised to find the largest effect is that of performance on the Numeracy test in 1975 (-0.21), followed by Word Knowledge (-0.14); see panel 2 of Table 5.1. In more concrete terms and with other things equal, of those who achieved mastery on the Numeracy test 21 per cent fewer report problems with mathematics relative to non-masters. Similarly, each point difference in Word Knowledge is linked to a one per cent difference in the number of students experiencing problems in maths. Mathematics learning seems affected by a wider range of influences than either reading or writing. Ethnic group differences favour the non-English-born who, relative to their Australian-born counterparts, report fewer problems with mathematics. The effects of grade advancement or retardation are of particular interest given that, other things equal, 12 per cent fewer 'Grade 4' students (-0.12) and 11 per cent more 'Grade 6'

students (0.11) report problems with maths relative to their 14-year-old age peers who were in in Grade 5 in 1975. This may reflect an increase in the difficulty of the mathematics curriculum across the grades. Alternatively, we may be seeing the effect of school entry regulations that allow children differing by a few months in age to begin school in different calendar years. Thus, what we may be seeing is the effect of being among the youngest in Grade 6 and the oldest in Grade 4. We plan to investigate this question in more detail in analyses to be reported later.

Problems with writing. Girls, and those students who do well on the Word Knowledge and Numeracy tests report fewer problems with writing. Thus, we see again the well-documented but not well-explained advantage of females in subjects involving literacy skills. The effects due to Word Knowledge and Numeracy in the absence of an effect from Literacy have been attributed in other analyses (Williams et al., 1980a:69) to the effect of general intelligence which both tests measure in addition to specific learned skills. However, we introduce a note of caution at this point; we do not really know what the students understood by 'writing' problems. Writing, it seems, could include anything from spelling and neatness to creative writing and we are not sure whether students applied a uniform interpretation to this question. Thus, we choose not to say much more about this variable, except that we should have measured it more precisely and, although we include it in the analyses we do not emphasize the interpretation of its effect.

Learning Difficulties and Remedial Instruction

We also asked these students about the amount of special help they had been given at school in connection with whatever problems in reading, mathematics and writing they may have experienced. The full distributions of responses are shown in Table 3.5. As with the 'problem' variables we dichotomized the 'help' variables into 'none/some' by treating the responses 'all I need', 'quite a lot' and 'some' as a single category, 'some'.

In looking at the relationship between the experience of learning problems and obtaining help with these problems we made the reasonable assumption that 'problems' caused 'help', in the sense that those experiencing problems were those most likely to receive help. At the simplest level the relationship between problems and help in each of the three areas is shown in Table 5.2.

The data show quite clearly where most problems occur in the early years of high school - 75 per cent of the students report problems with mathematics whereas only 42 per cent report problems with reading and writing. About three-quarters of those experiencing problems in reading receive some form of help, 84 per cent of those with problems in mathematics receive assistance, but only 64 per cent of those with problems in writing report that they have had help with these problems. While these are

Table 5.2 Distribution of Reported Remedial Instruction Among Students Reporting Problems with Reading, Mathematics and Writing

Remedial Help	Respondents Reporting Problems in Each Area		
	Reading %	Mathematics %	Writing %
No Help	24	16	36
Help	76	84	64
Total % Reporting Problems	42	75	42
Total N	881	916	869

moderately interesting statistics what we would really like to know is why some students receive help and not others.

Who Gets Help?: A Simple Model

To answer this question we estimated three simple models to predict help in reading, mathematics and writing respectively. These models attempted to explain 'help' in terms of the variables summarized as State, School, Family, Sex, Achievement, and Problems in Figure 5.1. Thus, we were making the fairly obvious argument that, within the context of the variety of ascribed and achieved influences considered already, those experiencing problems were most likely to be those receiving help. The results of estimating these models are shown in Table 5.3. In the interests of parsimony we have shown only those coefficients reaching statistical significance, the largest effects.

We have shown the standardized coefficients within the tables because we are interested in the relative importance of the influences that lead to remedial instruction in each of these areas. Not surprisingly, having problems with the subject is the most important influence on exposure to remedial instruction. The other effects of importance are more difficult to interpret. Other things equal, girls are less likely to receive help with reading problems (-0.09), possibly because teachers see them as 'better' students able to overcome these problems themselves and, as a result, teachers allocate their scarce remedial instruction time slightly in favour of boys. Similarly, the more able students - those doing well on the Word Knowledge test - receive less help, probably for the same reason. The one remaining effect is that due to family rurality on help with mathematics and writing, an effect which suggests that the more rural the student the more help he/she gets, regardless of the degree of the problem experienced.

While none of these findings occasion much excitement at first glance, especially the fact that the most important cause of getting remedial help is needing it, it is informative to consider the metric form of these coefficients. For example, the metric effects of 'problems' on 'help' in each of the three areas are, respectively, 0.46, 0.52 and

Table 5.3 Coefficients for Equations Predicting Help with Reading, Mathematics and Writing

Independent Variables	Dependent Variables: Metric Coefficients			Standardized Coefficients		
	Help with Reading	Help with Mathematics	Help with Writing	Help with Reading	Help with Mathematics	Help with Writing
ACT	*	*	*	*	*	*
Vic.	*	*	*	*	*	*
Qld	*	*	*	*	*	*
SA	*	*	*	*	*	*
WA	*	*	*	*	*	*
Tas.	*	*	*	*	*	*
NT	*	*	*	*	*	*
School Ruality	*	*	*	*	*	*
Catholic School	*	*	*	*	*	*
Independent School	*	*	*	*	*	*
Grade 4	*	*	*	*	*	*
Grade 6	*	*	*	*	*	*
English-Born	*	*	*	*	*	*
Non-English-Born	*	*	*	*	*	*
Family Rurality	*	0.01	0.01	*	0.09	0.11
Family SES	*	*	*	*	*	*
Family Size	*	*	*	*	*	*
Respondent's Sex	-0.09	*	*	-0.09	*	*
Word Knowledge	-0.04+	-0.04	*	-0.08	-0.08	*
Literacy (Mastery)	*	*	*	*	*	*
Numeracy (Mastery)	*	*	*	*	*	*
Reading Problems	0.46	*	0.08	0.45	*	0.08
Mathematic Problems	*	0.52	*	*	0.49	*
Writing Problems	*	*	0.39	*	*	0.40
Proportion of Explained Variance	0.34	0.31	0.25			

1 * indicates coefficients less than twice its standard error
2 + indicates coefficient multiplied by 10
3 State effects are relative to NSW students
4 Effects for Catholic and Independent schools are relative to Government school students
5 Effects for English-born and non-English-born ethnic groups are relative to Australian-borns
6 Effects of sex are those of being female relative to being males

0.39. Thus, ceteris paribus, only 40 to 50 per cent of students reported learning problems in these basic skills report receiving help during the early years of high school. That is, on the average, students have roughly 50:50 chance of getting help if they see themselves as having a problem in these subject areas. Their chances are less if they are girls and/or are among the brighter students, and are greater if they come from rural families, though these effects vary across the three subject areas. In short, what these data seem to be saying is that while teachers do provide remedial help to students with problems they can only provide it for about half of these. Whether this is a matter of not being able to allocate sufficient time for remedial instruction or a failure to identify all those in need of help, we cannot tell. Most likely it is a little of both. Teachers also provide help, or withhold it, for reasons unrelated to learning difficulties. None of this is a reflection on teachers for whom remedial education time must be a scarce resource but, if the simple identification of those with problems is also implicated in this phenomenon it does suggest that the use of diagnostic instruments as a regular part of classroom procedures might prove helpful in identifying those students whose problems with the three R's are less obvious.

Group Differences in Remedial Instruction?

On the basis of these findings we considered a more complicated question, namely: 'Do some kinds of students get more help with their problems than do others, for reasons unrelated to learning difficulties?'. For example: 'Do girls with the same degree of problem get less help than boys?'; 'Do students in rural schools receive less help than their urban counterparts because they do not have access to remedial teaching?'; 'Do teachers attempt to compensate for the presumed disadvantages of socioeconomic and/or ethnic background by providing more help to those from less well-off families and/or from migrant backgrounds?'. Do students at Catholic and Independent schools receive more help with their learning difficulties than students at Government high schools? That is, we considered the question of whether, other things equal, the relationship between problems and help was different in different subpopulation groups – groups defined, in terms of sex, school system attended, degree of rurality, socioeconomic background and ethnicity. In statistical terms we are asking whether there is a statistical interaction between subpopulation group membership and the effect of problems on help.

We undertook these analyses for two reasons: first, it seemed possible that there were subpopulation group differences in the delivery of these services to students; and second, we were concerned about our assumption of additivity in these models and wished to go some way toward testing the validity of this assumption.

Statistical comparisons of group effects. Group differences in access to remedial instruction can take one or both of two forms. In the first, other things equal, some groups simply get more than others for reasons unrelated to the amount of difficulties experienced. Such a situation could arise, for example, if a decision was made to give all migrant children extra instruction in English irrespective of the language problems they may or may not be facing. In the second, some groups may get more help per 'unit of problems' than do others such that, for example, a given level of reading difficulty in a rural student generates less help than for his/her urban analogue simply because there is no remedial help available.

Statistical models are available that allow the simultaneous estimation of both kinds of effects. They involve the use of dummy variables to represent group membership and the first type of effect noted above - the additive effect of group membership. The second kind of effect - the interaction effect - is captured with product terms formed by multiplying together each dummy variable with the independent variables in the equation. If the coefficients for the dummy variables achieve significance, according to whatever criterion is used, then there are additive effects. If the coefficients for the product terms achieve significance then there are interaction effects. These effects may be present singly, or in combination. For a more detailed discussion in another (Australian) context and appropriate sources see Broom et al. (1980:41).

For reasons of parsimony we did not attempt a blanket test of all possible interactions within the model. To do so would have increased the number of variables in the equation by a factor of two or three depending on the number of subpopulation groups being examined. In the first instance we restricted our examination to the effect of 'problems on help', taking a basic 'delivery of services' argument. All other effects were assumed additive. Thus, we estimated equations similar to these shown in Table 5.3 but with additional product terms included. For example, to examine the possibility of sex interactions in the effect of reading problems on help with reading we estimated an equation similar to that shown in the first column of Table 5.3 but with one extra term, the product of the dummy variable for sex and the 'reading problems' variable (in its original four-point metric).

We found some evidence in support of sex, ethnic, socioeconomic and urban-rural interations, but not for school system. However, the interpretation of these was complicated by the fact of very high correlations, in some cases, between the product terms and its components; the correlation between the dummy variable for sex and the sex-by-reading problems product term was 0.97, for example. The resulting collinearity problems left us more than a little uncertain about the interpretation of the statistics we derived. Thus, we decided to follow the interpretatively more complicated exercise of estimating the model separately for each subpopulation group and comparing the effects

across the groups. We did this for the equations to Word Knowledge, Literacy and Numeracy, as well as those predicting 'problems' and 'help'. By so doing we were able to look at potential interactions across all variables not just the effect of problems on help.

Again the results were somewhat inconclusive. While we could observe differences in effects between groups we could find no consistent pattern that would support an argument for major between-group differences in social processes. However, the lack of consistent between-group differences in the size of effects leads us to argue that we will not be very wrong in assuming additive effects in subsequent analyses but we will certainly be a great deal more parsimonious in our explanation. We assume additivity of effects from this point on.

Psychological Support: Self and Others

In keeping with the general line of our argument, the next stage in the model linked achievement and learning difficulties, along with ascribed characteristics, to the development of conceptions of one's capability to handle school learning. We considered both self-conceptions and those developed by significant others, parents and teachers in this case. The influence of peers was considered as well though the meaning assigned is somewhat different from that of parents and teachers as we will explain. In these analyses we are setting the stage for the following chapter in which we examine influences on the students' decisions about their educational and occupational futures. Conceptions of ability developed by both self and others are seen as outcomes of the social processes discussed to this point and influences on the educational and occupational decisions students make.

We argue that those who do not learn what the school has to teach in the way the school chooses to teach it, do poorly on achievement tests, have problems in learning the three R's, get fewer of the rewards that schools offer, and develop conceptions of their own incapabilities, conceptions probably more generalized than they should be. Thus, when we ask students 'How good are you at school work compared to other students in your class?' we suggest that their replies tell us something about the way in which they view their capacity for coping with school, and reflect the cumulation of past school successes or failures. We have called the variable 'Self-Concept of Ability' along the lines proposed by Brookover at various times (for example, Brookover and Thomas, 1964), a measure having to do with ability-achievment statements about self. Our measure can hardly be thought of as psychometrically elegant but we suggest that it is as reasonable a single item measure as one might get. As noted earlier, our measures are always a compromise between what we would like to do and what one can realistically ask of students, teachers and schools. The variable is dichotomized into the following categories: 'above average'; and 'average and below average'.

We argue as well, along established lines (cf. Spenner and Featherman, 1978), that parents and teachers develop conceptions of the student's academic capabilities based on his/her demonstrated achievement in school. The argument for peers is somewhat different in that we are not saying that the student's peers develop these conceptions of the student's ability, though this is probably true, but rather that students gradually come to associate with peers who have had the same kinds of success at school. In other words, there is progressive segregation of students explicity or implicitly, into ability-homogeneous class and/or friendship groups on the basis of success in school. In this sense, parents and teachers act as normative reference groups for the student, and peers as a comparative reference group (see, for example, Kemper, 1968).

The variables in question are measures of the number of times the student has dicussed his/her educational and occupational plans with parents, teachers and peers. Thus, what we are really arguing is that the better a student does in school the more likely are parents and teachers to discuss the student's educational future with him/her, and the more likely are peers to discuss these things among themselves. Taken together these create a source of psychological support for the continuation of schooling. Those not doing well, we argue, do not devote a lot of time to discussions of failure and, hence, lack the support of significant others.

The results of estimating the four appropriate equations are shown in Table 5.4 and Table 5.5 which report the metric and standardized coefficients respectively. In the interests of simplicity we have shown only these standardized coefficients which reach statistical significance. Note that we have included only the 'problems' variables in the equation, omitting those to do with the amount of help received. In analyses not reported here we introduced a series of variables capturing the various combinations of problems and help - 'problems/help', 'problems/no help', etc. - but found that knowledge of how much help the student had received added nothing to the explanation. Having problems in learning basic skills or not was all that mattered. Apparently, getting help with problems is seen by students as just another indication of their inability to handle school work.

Self-concept of ability. Self-concept of ability seems closely tied to the degree of success that students experience in school. Difficulties in reading and mathematics depress one's self-concept of ability. The coefficients in Table 5.4 suggest that, other things equal, and relative to those reporting no difficulty with the three R's, 24 per cent fewer of those with reading problems and 37 per cent fewer of those with mathematics problems see themselves as above average in their school work. On the other hand, superior verbal ability, mastery of Literacy and mastery of Numeracy demonstrated in the primary school add to one's feeling of capability as the statistically significant positive effects show. In short, conceptions of one's own capabilities seems to grow out of a cumulation throughout schooling of success or failure to learn what schools teach.

Table 5.4 Influences on Self-Concept of Ability and Significant-Other Support: Metric Coefficients

Independent Variables	Dependent Variables: Self-Concept of Ability	Parent Support	Teacher Support	Peer Support
ACT	*-0.27*	*0.35*	*-0.32*	*-0.02*
Vic.	*-0.01*	*-0.10*	*0.19*	*-0.02*
Qld	*-0.02*	*-0.03*	*0.00*	*-0.21*
SA	*0.09*	*0.01*	*0.18*	*-0.21*
WA	*-0.07*	*0.10*	*0.12*	*-0.24*
Tas.	*0.04*	*-0.36*	*0.42*	*-0.52*
NT	*0.12*	*-0.11*	*-0.05*	*0.26*
School Rurality	*-0.00*	*0.01*	*0.00*	*0.00*
Catholic School	0.19	*0.13*	*0.09*	*0.06*
Independent School	*-0.02*	*0.13*	*0.34*	*0.55*
Grade 4	*0.06*	*-0.17*	*-0.16*	*-0.19*
Grade 6	*0.19*	*-0.10*	*0.15*	*-0.05*
English-Born	*-0.06*	*0.01*	*-0.03*	*-0.01*
Non-English-Born	0.15	*-0.10*	*0.19*	*-0.24*
Family Rurality	*-0.00*	*0.00*	*0.01*	*0.00*
Family SES	*-0.00*	0.02	*0.00*	*0.00*
Family Size	*-0.02*	-0.10	*0.00*	*0.04*
Respondent's Sex	*-0.01*	*0.11*	*0.08*	0.59
Word Knowledge	0.01	*0.01*	*0.00*	*0.01*
Literacy (Mastery)	0.12	*-0.05*	*0.07*	*-0.01*
Numeracy (Mastery)	0.15	*0.06*	*0.04*	*0.13*
Reading Problems	-0.24	-0.37	*0.15*	*-0.11*
Math Problems	-0.37	*0.01*	*-0.10*	-0.27
Writing Problems	*0.03*	*0.14*	*0.02*	*0.18*
Proportion of Explained Variance	0.23	0.09	0.04	0.08

Notes

1 Coefficients less than twice their standard error are shown in italics
2 State effects are relative to NSW students
3 Effects for Catholic and Independent schools are relative to Government school students
4 Effects for English-born and non-English-born ethnic groups are relative to Australian-borns
5 Effects of Sex are those of being female relative to being male

In addition, the point made earlier about the possible 'frog-pond' effects of being in Grade 4 or Grade 6 gains some support from these data, though the coefficients do not reach statistical significance. For convenience we identify the students as being in Grade 4, 5 or 6, their grade in 1975, although obviously they were not in those grades in 1979. They were, however, in parallel year levels in high school, Years 8, 9 and 10. Relative to 'Grade 5' students and with other things equal, including achievement, some six per cent more 'Grade 4' students see themselves above average in their schoolwork (0.06) simply as a result of being in 'Grade 4'. Moreover, other things equal, some 19 per cent fewer 'Grade 6' students see themselves above average in schoolwork, relative to their age peers in 'Grade 5', simply as a function of being in 'Grade 6'. Thus, the data offer some support for the notion that, other things equal, being among the oldest in any year makes school work easier to handle and contributes through this to feelings of capability. On the other hand, being among the youngest in the class makes school work

Table 5.5 Standardized Coefficients for Equations to Self Concept of Ability and Significant-Others Support

Independent Variables	Dependent Variables			
	Self-Concept of Ability	Parent Support	Teacher Support	Peer Support
ACT	*	*	*	*
Vic.	*	*	0.08	*
Qld	*	*	*	*
SA	*	*	*	*
WA	*	*	*	*
Tas.	*	*	0.07	*
NT	*	*	*	*
School Rurality	*	*	*	*
Catholic School	0.09	*	*	*
Independent School	*	*	*	*
Grade 4	*	*	*	*
Grade 6	0.07	*	*	*
English-Born	*	*	*	*
Non-English-Born	0.07	*	*	*
Family Rurality	*	*	*	*
Family SES	*	0.10	*	*
Family Size	*	-0.12	*	*
Respondent's Sex	*	*	*	0.20
Word Knowledge	0.16	*	*	*
Literacy (Mastery)	0.08	*	*	*
Numeracy (Mastery)	0.09	*	*	*
Reading Problems	-0.16	-0.13	*	*
Math Problems	-0.21	*	*	-0.08
Writing Problems	*	*	*	*
Proportion of Explained Variance	0.23	0.09	0.04	0.08

Notes

1 * indicates coefficients less than twice their standard error

2 State effects are relative to NSW students

3 Effects for Catholic and Independent schools are relative to Government school students

4 Effects for English-born and non-English-born ethnic groups are relative to Australian-borns

5 Effects of sex are those of being female relative to being male

more difficult to handle, on the average, and contributes to feelings of incapability. In short, those regulations that govern age of starting school may be unwittingly providing an advantage for some students, those who become the oldest in their class, and a handicap for others, those starting at the youngest age.

Perhaps none of this is too surprising and may not even be problematic if restricted to this narrow definition of ability. However, to the extent that self-conceptions of the inability to cope with school learning are generalized to other areas of endeavour, failure to do well in school has more serious consequences.

Significant other support. In this model these variables are considered more because they have consequences for educational and occupational decisions than because they are important outcomes of the social processes examined to this point. Thus, we do not provide more than a literal interpretation of the coefficients shown in Table 5.4. Other things equal: the higher the socioeconomic background of students the more they discuss their educational and occupational future with their parents (0.10); those from large families talk with their parents less often (-0.12); and those experiencing reading problems talk over these same issues less often (-0.13). The significant effects on teacher support are confined to two State effects with no obvious interpretation. Girls, it seems, talk to their peers more often than boys (0.20), other things equal, and students experiencing problems in mathematics are less likely to talk about these same issues with their peers (-0.08).

The Cumulation of Educational Deficit

Our main concern in this chapter has been to question whether, and how, learning or failing to learn basic Literacy and Numeracy skills in primary school affects learning following the transition to high school. We considered as well the consequences for the student's evaluation of his/her own capabilities and for the amount of psychological support received from significant others. All of this was by way of explaining how a learning deficit apparent in the primary school might endure in a variety of forms to affect the educational and occupational plans that students have as they approach the legal minimum school leaving age.

The answer seems to be that learning difficulties encountered in primary school do endure and are reflected in the experience of problems with at least reading, mathematics and writing in the early years of high school. We noted as a side issue that, other things equal, only about half of the students reporting problems in these subject areas received remedial help. It seemed possible that many students with learning difficulties do not report them and that they may not be obvious to teachers attempting to help those with serious problems in the limited time they have available.

We saw two other consequences of this cumulation of success or failure. Achievement problems in primary school tended to mean achievement problems in high school and both lead to a devaluation of the student's conception of his/her own academic capabilities. Moreover, we found that being a grade ahead of most of the age group led to a devaluation on one's own capabilities among students otherwise equal, and that being a grade behind one's age peers contributed to feelings of capability. We attributed this to, respectively, the learning difficulties experienced by the youngest students in the class, and the advantages for the oldest students of coping with school work pitched for a class of students somewhat younger on the average.

In short, failure in primary school endured in the early years of high school in the form of learning problems in basic skills, a reduced evaluation of one's own capabilities, and a reduced involvement of significant others in the consideration of what one's educational future should be. The way in which this cumulative deficit influences the educational and occupational plans of students is the subject of the following chapter.

CHAPTER 6

EDUCATIONAL AND OCCUPATIONAL FUTURES

We ask two basic questions in this chapter. What kinds of educational and occupational futures do 14 year-old students see for themselves? And, why do students choose these different futures? More specifically we ask: who plans to leave school at the minimum legal age; who plans to complete high school; who plans to do further study after high school; who plans to enter full-time tertiary studies; and who expects to enter a white-collar occupation?

Educational and Occupational Ambitions

The study of the educational and the occupational aspirations, expectations, plans and preferences of adolescents was a growth industry during the '60s and '70s, especially among sociologists interested in the processes of status attainment. Much of this grew out of work on social mobility, especially that in the Blau and Duncan (1967) tradition which looked at the transition of status across generations. The motivating concern seemed to be that of establishing the role of educational and occupational ambitions in this inheritance process; in other words, to answer the question - Does the observed correlation between parent and child educational and occupational attainments come about (in part) because the status attainments of one generation condition the aspirations and expectations of the next? Questions about the 'wastage of talent', whether schools offered equality of opportunity or reinforced existing social class, ethnic and sex differences, about the influence of the 'adolescent society', and about the relative influence of parents, teachers and peers, and achievement in school on the development of these ambitions were all linked to this general concern. In this area the work by Sewell and associates on a sample of Wisconsin youth laid the foundations for much of what we know (cf. Sewell and Hauser, 1975). Spenner and Featherman (1978) provide a comprehensive review of research on achievement ambitions.

Studies of the ambitions of Australian adolescents have followed in the same basic tradition and report analogous findings to those studies undertaken in the US, Canada and the UK. We see little need to detail them here but cite the following as examples: Musgrave (1974); Connell et al., (1975); Taft(1975); McGaw et al., (1977); Punch and Sheridan (1978); Poole (1978); and Williams et al., (1980a).

The Model

In order to look at influences on the development of these educational and occupational preferences we extended the model shown in Figure 5.1 to include these measures as the

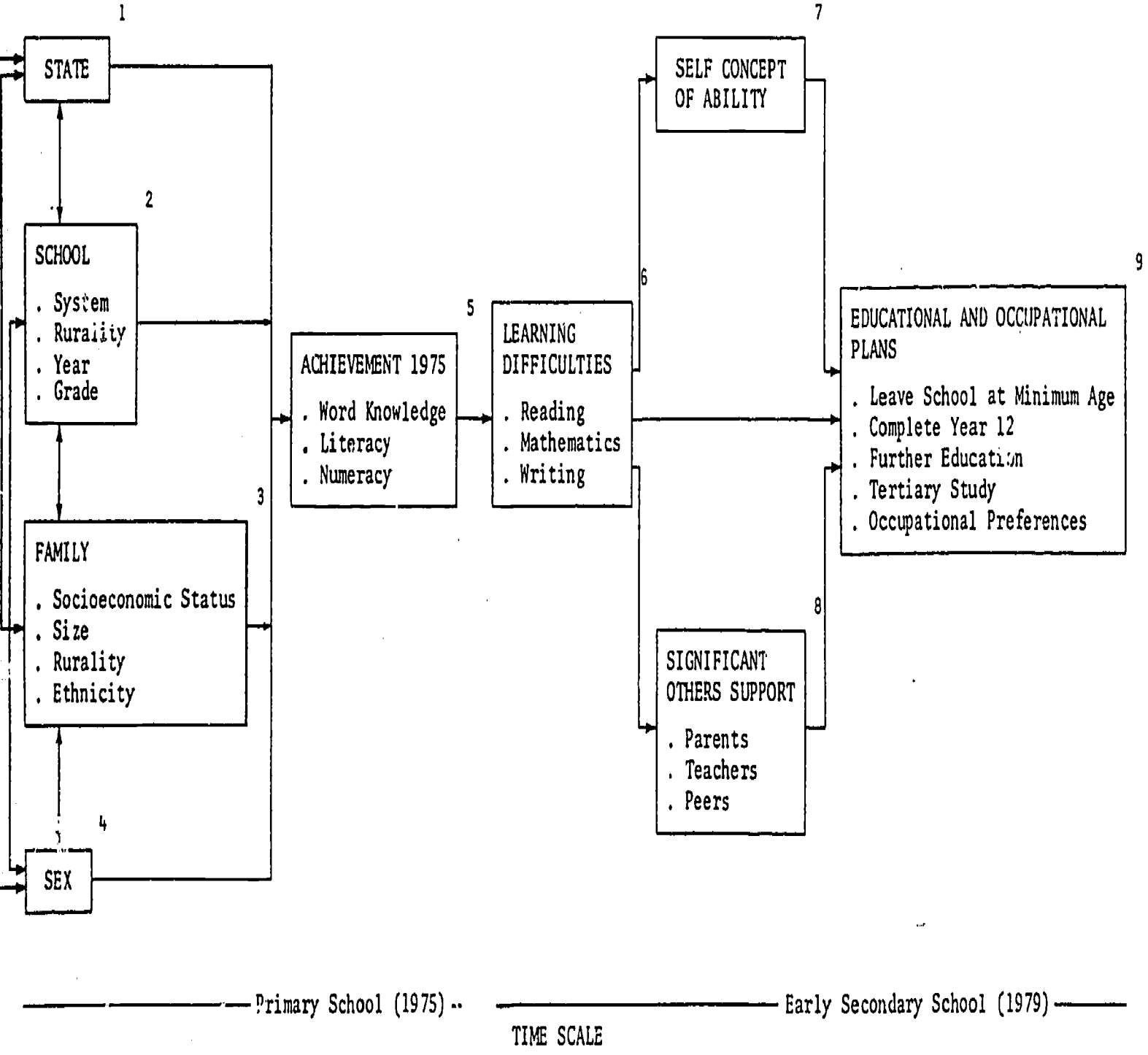

Figure 6.1 Model for Educational and Occupational Preferences

final outcomes of social processes represented in the models developed and estimated in previous chapters. Thus, we saw individual differences in these outcomes beginning in ascribed differences among students as a function of where they live, the family they were born into, the school they attended and their sex. These, we argued, led to between-student differences in basic skill learning in the primary school years, differences which cumulated over time and became manifest in the early years of high school as differences in academic capabilities and evaluations of these capabilities. The result, we will show, is parallel differences in educational and occupational plans and preferences. These arguments are captured in the relationships summarized in Figure 6.1, the complete model pictured earlier as Figure 2.1.

The Measures

We considered five measures of educational and occupational plans, each derived from responses to either question 5 or question 6 in the questionnaire (see Appendix A). The full distribution of responses is shown in Table 3. The first of these was designed to answer the question 'Who plans to leave school at the minimum legal age?'. To do this we dichotomized the responses to question 5 into those answering 'The year I reach school-leaving age', and others; 21 per cent of the sample planned to leave at the minimum age. The second variable was constructed to describe those who planned to complete high school. Thus, we dichotomized the same set of responses but this time considered the group answering 'At the end of Year 12' versus the remainder; 53 per cent of these 14-year-olds planned to complete high school.

The treatments of the 'further study' variables were similar. Responses to question 6 were dichotomized into a category containing those indicating no further study and those planning on some, either full-time or part-time. Thirty-six per cent indicated that they would undertake no more formal education after leaving high school. We considered as well the question of who planned to enter full-time tertiary education immediately after high school. To create a measure we grouped those indicating some form of full-time study, versus those who did not; 31 per cent had plans for full-time tertiary level study after high school.

Only one measure of occupational plans was available and this was provided by the students' responses to question 10 in the questionnaire. The reported occupations were coded to a 16-point occupational prestige scale and the distribution can be seen in Table 3.1. This way of coding occupations has no concrete interpretation of the kind we would like to provide as it has no 'natural' metric. Thus, as before, we took some liberties with the distributional assumptions of regression and dichotomized the occupational variable. We adopted the traditional white-collar/blue-collar distinction grouping occupations in categories 1 to 8 and calling them white-collar occupations while considering those ranging between 'craftsman' and 'unskilled' as blue-collar. Forty-four per cent of the sample aspired to white-collar occupations.

Table 6.1 Influences on Educational and Occupational Plans: Metric Coefficients

Independent Variables	Dependent Variables: Leave at Minimum Age	Complete Year 12	Further Study Plans	Full-time Study Plans	Occupational Plans
ACT	*-0.05*	0.33	*-0.05*	*0.06*	*-0.07*
Vic.	*-0.02*	*-0.00*	*-0.08*	*0.07*	*0.03*
Qld	0.12	*0.03*	*-0.10*	*-0.03*	*0.05*
SA	*0.03*	*-0.05*	*-0.13*	*-0.07*	*-0.05*
WA	0.19	*-0.09*	*0.06*	0.20	*0.10*
Tas.	0.22	*-0.06*	*-0.10*	*0.01*	*-0.02*
NT	*0.01*	*0.18*	*-0.01*	*0.06*	*0.14*
School Rurality	*0.00*	*0.00*	*0.00*	0.01	*0.00*
Catholic School	*-0.03*	*0.02*	*0.09*	*-0.01*	*0.00*
Independent School	*-0.01*	*0.06*	*0.16*	*0.18*	*0.13*
Grade 4	*0.04*	*0.02*	*0.02*	*-0.01*	*0.07*
Grade 6	*0.07*	*-0.09*	-0.17	*-0.07*	-0.14
English-Born	*0.05*	*0.04*	*-0.05*	*-0.07*	*0.01*
Non-English-Born	-0.11	0.16	0.14	0.15	0.14
Family Rurality	*-0.00*	*0.00*	*0.00*	0.01	*0.00*
Family SES	-0.01	0.01	0.01	0.01	0.01
Family Size	*-0.00*	*-0.02*	*0.01*	*-0.00*	-0.02
Respondent's Sex	*-0.04*	0.12	*0.02*	0.12	0.11
Word Knowledge	*-0.00*	*-0.00*	*0.00*	*0.00*	*0.00*
Literacy (mastery)	*-0.04*	0.12	*0.03*	*0.04*	*0.07*
Numeracy (mastery)	*-0.07*	0.11	*0.04*	*0.07*	*0.05*
Reading Problems	*0.04*	*-0.06*	*-0.06*	-0.09	*-0.02*
Math Problems	*0.04*	*-0.06*	*-0.04*	*-0.03*	*0.00*
Writing Problems	*0.01*	*-0.02*	*-0.03*	*0.01*	*-0.02*
Self-Concept of Ability	-0.06	0.17	0.10	0.20	0.16
Parent Support	*-0.01*	*0.02*	*0.01*	0.02	*-0.01*
Teacher Support	*-0.01*	0.04	0.04	*-0.00*	0.05
Peer Support	*-0.00*	*-0.01*	*-0.01*	*-0.01*	*0.01*
Proportion of Explained Variance	0.13	0.22	0.15	0.24	0.18

Notes

1 Coefficients less than twice their standard error are shown in italics
2 State effects are relative to NSW students
3 Effects for Catholic and Independent schools are relative to Government school students
4 Effects for English-born and non-English-born ethnic groups are relative to Australian-borns
5 Effects of Sex are those of being female relative to being male

Table 6.2 Standardized Coefficients for Equations to Educational and Occupational Plans

Independent Variables	Dependent Variables				
	Leave at Minimum age	Leave before Year 12	Further Study Plans	Full-time Study Plans	Occupational Plans
ACT	*	-0.08	*	*	*
Vic.	*	*	*	*	*
Qld	0.10	*	*	*	*
SA	*	*	*	*	*
WA	0.13	*	*	0.12	*
Tas.	0.10	*	*	*	*
NT	*	*	*	*	*
School Rurality	*	*	*	0.12	*
Catholic School	*	*	*	*	*
Independent School	*	*	*	*	*
Grade 4	*	*	*	*	*
Grade 6	*	*	-0.10	*	-0.08
English-Born	*	*	*	*	*
Non-English-Born	-0.10	-0 12	0.10	0.12	0.10
Family Rurality	*	*	*	0.11	*
Family SES	-0.11	-0.13	0.19	0.17	0.15
Family Size	*	*	*	*	-0.08
Respondent's Sex	*	-0.12	*	0.12	0.11
Word Knowledge	*	*	*	*	*
Literacy (Mastery)	*	-0.12	*	*	*
Numeracy (Mastery)	*	-0.09	*	*	*
Reading Problems	*	*	*	-0.10	*
Math Problems	*	*	*	*	*
Writing Problems	*	*	*	*	*
Self-Concept of Ability	-0.07	-0.16	0.10	0.20	0.16
Parent Support	*	*	*	0.07	*
Teacher Support	*	-0.09	0.09	*	0.11
Peer Support	*	*	*	*	*

Notes

1 * indicates coefficients less than twice their standard error
2 State effects are relative to NSW students
3 Effects for Catholic and Independent schools are relative to Government school students
4 Effects for English-born and non-English-born ethnic groups are relative to Australian-borns
5 Effects of sex are those of being female relative to being male

Estimating the Model

To answer the questions posed we estimated five equations, one for each of the variables noted above. The metric coefficients from each are shown in Table 6.1 and the standardized forms of those reaching statistical significance are displayed in Table 6.2.

Influences on Educational and Occupational Plans

As before we do not offer an interpretation of every coefficient but focus on the largest effects and patterns of effects or, at times, non-effects where effects might have been expected. In addition, these interpretations follow the two lines of argument developed in Chapter 5, namely: the effects of contextual variables, largely ascribed characteristics; and the effects of what seems to be a cumulation of capabilities, actual and perceived, throughout the school years.

Leaving School at the Legal Minimum Age

In our earlier analyses (cf. Williams et al., 1980a:58) we noted differences between ethnic groups in what appears to be commitment to schooling. We find parallel differences in this sample; relative to Austalian-borns like them in other respects, 11 per cent fewer students from non-English-speaking backgrounds and 6 per cent more of the English-born students plan to leave school at the minimum age. We speculate about the non-English born group now as we did then: (some) 'migrant groups tend to see education as the path to social mobility upward from the lower social strata to which they were assigned on arrival' (Williams et al., 1980a:66). Similarly, we noted again the influence of the student's social origins on this decision and how, other things equal, those from more advantaged backgrounds planned to get more schooling.

The patterns of effects for the achievement-related variables support our notions of a cumulative deficit. Those likely to leave school at the earliest opportunity are, other things equal, those whose achievement in primary school was poor, who are experiencing learning difficulties in high school, and those who see their own academic capabilities as only average or worse. On this basis, it is an eminently reasonable decision. Whether this basis need develop is another question, and one that we take up later.

Completing High School

In this case, as in the preceeding analysis, characteristics of the primary school attended seem not to matter much. By contrast, characteristics of the student's family continue to affect his/her decisions and, as before, those from non-English-born backgrounds and socioeconomically advantaged backgrounds are more likely to intend to complete high school. So are girls, other things equal, 12 per cent more in fact, relative to their male counterparts.

The cumulation of academic advantage is seen here as well and the effects are more pronounced. Other things equal, 11 to 12 per cent more of those mastering Literacy and Numeracy in primary school plan to complete Year 12 of high school. Moreover, experiencing learning difficulties in high school reduces one's probability of planning to stay to Year 12 by about 6 per cent. Self-evaluation of academic capabilities has an even larger effect, the largest of all in fact. Other things equal, if you rate yourself as above average in school work the probability of planning to go on to Year 12 increases by 17 per cent. In short, learning what the school has to teach and learning this without undue difficulty, coupled with positive notions of one's own academic capabilities, all contribute to the desire for more schooling; if you can cope you stay, and if you can't, you leave. We offered a similar interpretation of similar findings for the older sample: 'Since much of the business of schools is the teaching of these skills we suspect that those who learn them well are rewarded accordingly. As a result they find schooling a reasonably fulfilling way of life that promises an even better future, so they stay. Those less capable earn fewer rewards and see little point to a continued schooling that will offer them even fewer rewards in the future, so they leave'. (Williams et al., 1980a:66).

Plans for Further Study

Recall that the measure of this expectation discriminated only between those who planned to do no more study after leaving high school, and those who planned to do some, no matter what it might be. The patterns of effects are similar to the preceding analysis. Other things equal, there are school system effects suggesting that more Catholic and Independent school students become commited to further study than do their Government school student counterparts. Both kinds of effects may be due to a differential attractiveness of educational practice and provision between the school systems, but we have no real way of knowing at present.

We take up again the effect of being a grade ahead or a grade behind one's age peers; that is, being in Grade 6 in 1975 rather than in Grade 5 where the bulk of the 10-year-olds were. These analyses suggest that, other things equal and relative to age peers one grade behind, 17 per cent fewer of the grade-advanced students plan to undertake more study of any kind. Looking back across Table 6.1 we see that they are also less likely to consider staying in school until Year 12 (-0.09) and more likely to leave at minimum age (0.07). And, as we will see, they are less likely to plan on a tertiary level education (-0.07) and less likely to aspire to a white-collar occupation (-0.14). Although these effects are not particularly large, except in two instances, they are consistent across the various educational and occupational expectation measures, and consistent with our argument about a 'frog-pond' effect. We take up this point and its meaning in the following chapter where the overall patterns of effects of each influence are considered.

The remaining effects parallel those reported in the analyses described above. Those from non-English-born backgrounds and from socioeconomically advantaged families who achieve well in primary school, who experience few learning problems in high school and who evaluate their capabilities as above average plan to continue their education beyond high school.

Plans for Full-Time Tertiary Study

The patterns of effects for this variable are essentially the same as those noted in the other equations with a couple of exceptions. Students from rural backgrounds are more likely to plan on a tertiary education and, relative to males like them in other respects, 12 per cent more girls plan to take a degree, diploma or certificate at a tertiary institution. And, as before, non-English-borns and those from socioeconomically advantaged backgrounds are more likely to plan on a tertiary education. The largest effect, that of self-concept of ability, says that, other things equal, 20 per cent more of those who rate their ability above average are likely to plan on attending a tertiary institution.

Seen overall, the measures of educational aspirations/expectations discussed so far reflect the same basic processes. Within the context of influences from the State, School and Family variables, principally the latter, success, or the lack thereof, in primary school cumulates throughout school life to affect one's success with and commitment to educational institutions and the learning they provide. The end result is that those who have done well early have always done well, know it, and plan to continue with their education. Those with learning difficulties in primary school are still likely to have these difficulties in high school, know it, do not plan to prolong their agony, and have little inclination to subject themselves to more of the same after leaving high school.

Occupational Plans

Recall that the measure of intended occupation was transformed into a crude white-collar/blue-collar dichotomy in the interest of providing more concrete interpretations of the magnitude of the coefficients representing influences on the development of these plans. Those students we have called grade-advanced appear to have lower aspirations simply as a function of being grade-advanced. Relative to their age peers one grade behind in school, 14 per cent fewer expect to enter white-collar occupations. Family SES and family size exert the kinds of influence we have come to expect, as does sex. Other things equal, 11 per cent more girls than boys expect to be in white-collar occupations. We noted a similar phenomenon in our earlier analyses of the occupations of early school leavers and attributed this phenomenon to sex differences in the availability of blue-collar occupations, these being predominantly male.

Doing well in school and seeing oneself as above average in this respect both

contribute to the probability of aspiring to a white-collar occupation. Ceteris paribus, seven to eight per cent more of those mastering Literacy and Numeracy in 1975, and 16 per cent more of those who see themselves above average in their academic capabilities, aspire to white-collar occupations, other things equal. Talking about one's future with teachers has an effect for the better here as it did in connection with completing high school and planning on further study.

If we discount the effect of sex as a function of the labour market rather than the processes of ascription and achievement that identify each student in high school, then the two largest effects on occupational aspirations are those from family SES and self-concept of ability. We tend to explain the first in terms of the occupational models and encouragements available within families. The second of these effects suggests that adolescents understand well the connection between educational attainment and the labour market. Those who see themselves above average in the capability to handle school-work aspire to more education and the higher status occupations that become available as a result.

Family, School and Future

While we will attempt to place a broader interpretation on these findings in the next chapter, we consider now the kinds of social processes that seem to be at work affecting the development of educational and occupational plans among 14-year-olds across Australia. Where one lives in Australia makes a difference, though the differences are inconsistent across the several kinds of aspirations which are considered. The effects of the school itself -- its degree of rurality, whether it was Government, Catholic or Independent, and whether it had placed the student in Grade 4, 5 or 6 in 1975 - were minor with respect to the students' immediate educational plans. The effects were more pronounced on the plans and aspirations concerned with what would happen after leaving high school. We saw the apparent disadvantage of starting school early and being among the youngest in the grade, and attributed this to the effect of being a small 'frog', developmentally speaking, in a large 'pond'. Most likely learning was more difficult, and success harder to obtain, with the result that commitment to education suffered.

The aspects of family background captured in family SES and the non-English-born category of ethnicity exert a consistent positive effect across the educational and occupational aspirations measured. No matter where the student lives, the kind of school he/she attends or how well he/she is doing there, those from socially and economically advantaged families and/or those from migrant families not of English-speaking origin are more strongly commited to completing high school, continuing their education in a tertiary institution and entering a white-collar occupation. The effects of SES we attribute to parallel differences between families in

the educational and occupational models and encouragements they offer. The ethnicity effect was observed in our earlier analyses and we speculated about its meaning thus: 'This is consistent with the often documented fact that migrant groups tend to see education as the path to social mobility upward from the lower social strata to which they are assigned on arrival' (Williams et al., 1980a:66).

We talked about the cumulation of an educational deficit in Chapter 5 and we observed its outcomes in the present chapter. Those failing to learn basic Literacy and Numeracy skills in primary school tend to become those experiencing learning problems in high school and those who see their academic capabilities as average at best. While all three sets of influences reduce directly the probability that these students will complete high school, undertake further education and enter a white-collar job, the first two affect these aspirations indirectly through their effect on the student's evaluation of his own abilities. In short, if you don't do well in primary school the chances are increased that, other things equal, you won't do well in high school, that you'll plan to leave before Year 12, that you won't plan to undertake more education and that you expect to end up in a blue-collar occupation. We suggest that this pattern of effects pictures for some a gradual cumulation of incapabilities beginning in the primary school, incapabilities that are realized and accepted as part of the student's self-image. The result is an adolescent commited to leaving the one institution set up to provide the basic skills needed to function effectively in the society at large, and to a post-school life that does not involve education. We question whether this need be so in the following chapter.

CHAPTER 7

ASCRIPTION, ACHIEVEMENT AND PREFERENCES

This is a summary chapter and for some readers may be the only chapter read. It is designed to serve three main purposes. First, it provides a summary of the findings reported in Chapters 4 to 6 for those who are less interested in the detail presented there, and for this reason may appear repetitious in parts. Second, it attempts to knit together these detailed findings into a more general statement of the influences that govern achievement in primary school, the transition from primary to secondary school, and the ways in which 14-year-olds see their educational and occupational futures. Third, it presents recommendations for research and practice that we see as logical implications of the findings, albeit through extrapolation at times.

Three Questions

In the design of this investigation, in the development of the theoretical models which guide it, and in the interpretation of the statistics which describe the 969 14-year-olds in our sample we have asked about the relative influence of ascription and achievement in the development of the knowledge, skills and preferences that underpin the futures of these adolescents.

More concretely, we have asked the following kinds of questions:

1 What influences the learning of basic skills in the primary school, and by how much: does it matter where you live; does it matter what school you go to; how important is it to be born into the 'right' family; do the children of migrant families start off on an equal footing; are country children better or worse off; does it make a difference whether you are male or female?

2 Do the successes and failures of primary school - the learning and the failure to learn fundamental skills at this time - carry through to high school: do students with learning difficulties in primary school have problems learning the three R's in high school; who gets help with their learning difficulties; how do these problems, or the lack of them, affect what students think of themselves; achievement aside, does it still matter where you live, what school you go to, what family you come from, and whether you are male or female?

3 How are students' educational and occupational preferences formed: who leaves school as soon as they can, and why; who stays on to finish Year 12; who will look for more education after high school; who will go to a University or College of Advanced Education; what kind of jobs do these 14-year-olds aspire to; how does success and failure in learning the three R's in primary and/or high school bear on these decisions?

We answer these questions within the framework of a theoretical model that specifies explicitly our arguments about what affects what. We argue for patterns of cause and effect which embody the questions noted above and which link achievement, its causes and its consequences in a system of cause and effect. Figure 2.1 illustrates the model guiding the present investigation. Questions of 'who', 'how', and 'how much' are answered with statistics which offer the interpretation 'other things equal, the effects of "x" on "y" amounts to "z"'. That is, we postulate multiple causes of each phenomenon then set about to isolate the effect of each while holding constant the others by statistical means. This allows us to say, for example, that 'other things equal...13 per cent more females achieve mastery of Literacy, on the average, relative to males like them in other respects' as we did in Chapter 4. In other words, even when we take a variety of other differences among students into account - compare students alike in all other (measured) respects except sex - females still do better than males on Literacy. At the other extreme, these statistics provide the verification or not of hypotheses based on simple relationships. If we were to observe, for example, that the proportions of students mastering Literacy differed between Government, Catholic and Independent schools we might argue one of two hypotheses: either some schools are better than others; or, some school systems are more selective and the differences we see are due to average differences among student populations not among the schools themselves. By controlling statistically for differences among students and thus examining, ceteris paribus, the effects of school system on Literacy unconfounded by these student differences we are able to say something about the schools themselves, though not unequivocally. What we said in Chapter 4 was 'School system seems not to exert a strong influence on achievement in the primary school'.

Learning Basic Skills in Primary School

Fifty-three per cent of the 10-year-olds reached the mastery level in Literacy and 75 per cent demonstrated mastery of the numerical skills tested. We set about finding out why students differed in these capabilities and argued that at least the following factors were potentially important influences on learning: the State in which the student lived, because educational practice and provision may differ between the States; the location of family and school relative to urban areas on the supposition that rural families may view education differently and rural schools are limited in what they can provide; school system attended, because it remains a possibility that there are differences between the Government and non-Government systems in what they do and provide; grade in school, on the basis of different degrees of opportunity to learn these skills; ethnic origin, for at least the reason that language, migrant status and cultural differences in what is seen as important are likely to affect learning; family socioeconomic status, because we have

ample evidence that the attainments of the fathers are visited on their sons (and daughters); family size, because it always makes a difference though we have no clear understanding of why it does; and sex, because of the belief that girls are naturally, or unnaturally, better at words and worse at numbers than are boys.

State Effects

Although we estimated State effects we argued against their interpretation in this instance. The State contributions to our sample were proportional to State populations with the result that States other than NSW, Vic. and Qld were represented by less than 100 students from less than 10 schools. In the case of the ACT we had only 14 students from a single school in the sample. As a group these State 'samples' allowed satisfactory Australia-wide generalizations but taken individually the sampling was too unreliable to talk about State effects with any degree of certainty.

School Effects

School rurality. Students attending primary schools in rural areas seem disadvantaged as far as achievement in basic skills is concerned. Other things equal, the more rural the school the lower the achievement of 10-year-old students in the basic skill areas measured by the Literacy and Numeracy tests. We cannot be completely certain that the substantial influence shown is due to what happens, or does not happen, in rural primary schools. However our findings are consistent with the conventional wisdom that attributes this disadvantage to isolation, reduced access to extra-school learning facilities, a high proportion of inexperienced teachers, rapid teacher turnover, and the reduced range of facilities that small schools can offer. It is worth noting that we were unable to find these disadvantaging effects at the high school level (cf. Williams et al., 1980a:60) which suggests to us that rural disadvantage has its most marked effects on learning in the early years of school. It also suggests where programs of compensation might be most profitably targeted.

School system. Again, contrary to our earlier analyses which examined achievement in high school at age 14, we find that, other things equal, it matters little for basic skill learning whether one attends a Government, Catholic or Independent primary school. Thus, where we suggested that the practice and provision of education might vary between Government and non-Government secondary schools (Williams et al., 1980a:109) we find no evidence of this at the primary level. These findings are consistent with the belief that an independent school education only matters during the high school years.

Grade. We considered the effect of the student's grade level in 1975 because we were dealing with an age sample spread across grades 4, 5 and 6, and because grade

represents a measure of the degree of exposure students have had to the material being tested. The effects of grade are consistent and in the expected direction. Other things equal, those in Grade 4 do worse and those in Grade 6 do better than the bulk of the students, those in Grade 5. In short, ceteris paribus, the more time you spend learning the basic skills tested, the more you learn and the better you do on the test. While this might seem to be something of a truism, time spent learning has not always been given an explicit treatment in educational research. It has become an issue of current interest and is a basic construct in one popular model of school learning, that of Carroll (1963).

Family Effects

Ethnicity. We considered the influence of ethnicity on achievement for at least the reason that the constellation of cultural, language and status differences that distinguish migrant groups within Australia are likely to affect the kind of education students get and their commitment to it. Ethnicity was treated in a fairly coarse fashion such that we distinguished only three groups of students: those whose fathers were born in Australia; those whose fathers were born in an English-speaking nation not Australia; and those whose fathers were born in a non-English-speaking nation. Seeing that this latter group contains a variety of language and cultural groups we suspect that grouping students in this way conceals a good deal of variation between specific ethnic groups. Other things equal, the effects of ethnicity are minor, though they indicate some disadvantage for the two migrant groups; 8 per cent fewer, for example, achieve mastery of Literacy in each case, relative to Australian-borns like them in all other respects. There is little evidence of any language disadvantage and perhaps this is not surprising given that 90 per cent of the students were born in Australia.

Family rurality. Other things equal, the rurality of one's family seems to matter only for the learning of numerical skills and, then for the better. Students whose families differ by one standard deviation in rurality differ by 10 per cent in the proportion mastering Numeracy in favour of the more rural students. We have no way of knowing why this effect occurs though we did speculate that the practical day-to-day mathematics of farm management may be more a part of rural life than the mathematics of urban living - measuring the chicken food and counting the eggs, so to speak.

Family size. Family size effects are consistent, favour students from smaller families, and are fairly substantial, but remain unexplained as always. Other things equal, each additional sibling decreases by 3 or 4 per cent the chance of achieving mastery in the basic skills tested. Most likely the effect is not due to size alone, being confounded by birth order and child-spacing effects, but it seems clear that for reasons we have yet to understand properly, ceteris paribus, children from large families are

worse off when it comes to learning what the schools have to teach. Research aimed at the explanation of these effects is sorely needed.

Family SES. Whatever the nature of the differences in life-styles of families differing in their social and economic attainments, and in the life-styles and life-chances they confer on their children, other things equal, they matter for the learning of basic skills. Among students otherwise equal, those from families who are one standard deviation apart in socioeconomic status differ by 7 to 8 per cent in the proportion mastering Literacy and Numeracy. Our understanding of the mechanisms involved is imperfect but traditionally these effects are explained in terms of what parents do, provide and believe in connection with their children. As we noted earlier, it is difficult to 'escape' from the influence of one's social origins, the more so the closer one is to these origins.

Sex differences. Other things equal, being a girl is good for one's achievement in primary school. Girls demonstrate their traditional mastery of words in that 13 per cent more achieve mastery of Literacy, an advantage that reduces to 3 per cent for Numeracy. Explanations in terms of sex differences in socialization are the most common (cf. Maccoby and Jacklin, 1974).

Home and School

Our emphases on the concrete interpretation of effects led us into basing most interpretations on metric coefficients. However, we made passing note of the standardized coefficients and the interpretations of comparative influences that these allow. It seems worthwhile to take up the question of the relative importance of influences at this point because our data contain a variety of family and school measures. These relative effects are particularly interesting for what they have to say about the perennial educational research question - the relative influence of home and school. It seems that we have been able to demonstrate at least parity, and perhaps the ascendancy in some cases, of school influences over those of the family, at least those measured in this investigation. Where the mastery of basic Literacy skills is concerned the relative influence of family and school is of much the same order of magnitude, showing the disadvantages of a rural education, the advantages of having had a chance to learn the material being tested, the intangible advantages of having the right parents, and the disadvantages of too many siblings (see Table 4.1). The school effects are even more marked for mastery of Numeracy. The largest effect of all stems from our measures of the opportunity the student has had to learn the mathematics tested and, again, other things equal, attending to a rural primary school appears to depress the learning of these skills. However, this is offset in part by the fact that most students in rural schools come from rural families who appear to facilitate the learning of basic

mathematical skills. Family SES and family size effects are consistent with those for Literacy.

We seem to have demonstrated that at least two aspects of primary schools make a difference and, in some instances, more of a difference than the traditional measures of family background. Our data on the grade variable are consistent with a growing body of findings that says, other things equal, the amount of learning that takes place is a function of the amount of time spent learning. We seem to have demonstrated as well what the Schools Commission and rural school principals have always asserted, namely, that the isolation, teacher turnover, and reduced facilities of rural schools affect the learning of the children who attend them. While we were unable to offer much support for this argument in the case of high schools, it seems that we can for primary schools. Despite what we might like to believe about the 'little red schoolhouse', beginning one's education there turns out to be a bit of a handicap as far as learning basic skills in concerned. Compensatory funding may be the answer, but we do not know.

The Enduring Effects of Primary School

By October 1979, four years after these students had demonstrated their Literacy and Numeracy achievements in 50 primary schools selected in our sample, the members of our sample were located in 243 high schools across Australia and were now aged between 14 and 15 years. They were approaching a major decision in their lives, namely, whether or not to leave school at the minimum legal age and, we guessed, had given some thought to their educational and occupational futures. Moreover, we argued that, in part, the foundations of these decisions were laid down during the six years they had spent in primary school and much depended on how successful they had been in learning what the school had to teach. Those who had been successful would possess the skills to make an easy transition to high school, would be rewarded for their achievements there as they had been in primary school, and would see themselves as capable of handling school learning. In short, they would plan to continue on in an environment in which they were capable, felt capable, were seen as capable, and were rewarded accordingly. On the other hand, we postulated some enduring effects of failing to master basic skills in the primary school. We saw the possibility of this incapability cumulating over the years, and the achievement gap widening as the intellectual complexity of the curriculum increased, engendering a growing reliance on the exercise of that particular set of abilities we call cognitive. The results, we argued, took the form of learning difficulties experienced in high school and brought about by the failure to master basic skills in primary school, a reduced self-conception of one's own capabilities as far as schoolwork is concerned, reduced support from parents, teachers and peers for an extended education, and, as a result, something less than enthusiasm for the idea of completing high school and/or further study beyond high school.

Table 7.1 The Enduring Effects of Mastery of Literacy and Numeracy

Outcome Variables	Percentage of Masters and non-Masters in Categories of Outcome Variables			
	Literacy		Numeracy	
	Master	non-Master	Master	non-Master
Reading Problems Reported	24	63	34	69
Math. Problems Reported	69	83	69	94
Writing Problems Reported	32	54	37	60
Plan to Leave School Min. Age	15	28	17	33
Plan to Complete Year 12	66	38	60	32
Plan Further Study	70	56	67	53
Plan Tertiary Study	42	20	37	15
Report being Above Average at School-work	45	24	41	19
Plan on White-Collar Job	54	31	49	26

In Table 7.1 we show the enduring effects of achievement in primary school as unadjusted simple percentages. Achievement is limited to performance on the Literacy and Numeracy tests in 1975 and is expressed in the mastery/non-mastery mode. These categories define the columns of the table. The rows are defined by the variables in our model which, we argue, are likely to show the enduring effects of this achievement: learning difficulties with the three R's in high school; plans to leave at the minimum legal age; plans to complete Year 12; plans for further education; plans for tertiary education; self-concept of ability; and occupational plans.

The differences are consistent and clear cut. Those who have mastered Literacy: experience fewer learning difficulties; are more likely to stay at school longer and plan on further education; tend to think of themselves are more capable; and, are more likely to aspire to white-collar occupations. In the case of Numeracy, the differences between those who mastered these basic skills at age 10, and those who failed to, parallel those for Literacy but are more pronounced.

We did not, of course, argue that all influences on educational and occupational preferences would be channelled through achievement in school. Thus, allowances were made for the effects of those ascribed characteristics previously summarized as State, School, Family and Sex influences in the analyses of Chapter 4. Thus, the model guiding this particular set of analyses had two main lines of argument: first, that there would be enduring effects of these ascribed characteristics on most of the variables examined; and second, that within the context of these effects we would see the foundations for successful learning in high school, developing conceptions of one's own capabilities, and perceived support from others, together with educational and occupational preferences, in the extent to which the fundamentals of Literacy and Numeracy were mastered in the primary school.

To measure learning difficulties we asked these students, now in the early years of high school, to report the extent to which they had experienced problems with reading, mathematics and writing. While we found effects due to School, Family and Sex, the context of achievement noted above, it was achievement in the primary school that exerted the dominant influence on learning difficulties, or the absence of them, in high school four years later. Other things equal, and relative to the students who had mastered the Literacy skills tested in 1975, 19 per cent more of those students who failed to meet this standard in 1975 reported having problems with reading in 1979. In fact, the three measures of primary school achievement turned out to be the dominant forces affecting reading in high school. Similarly, other than the effects of grade, the major influences on difficulties with mathematics were Numeracy achievement in primary school and Word Knowledge. Other things equal, mastering Numeracy in primary school decreased by 21 per cent the chance of having mathematics problems in high school. In short, we found convincing evidence of the enduring effects of success and failure in primary school; other things equal, the foundations for success or failure in learning what high schools teach is mastery of the basic skills that primary schools teach. While this is hardly a revelation - we always knew that the best predictor of achievement was prior achievement - it is documentation of an important social fact. The four years of schooling intervening between 1975 and 1979 had not provided the remediation necessary to enable everyone to read adequately. Many of those with problems in Grade 5 still have them four years later in high school. Apparently, failure to learn what schools teach begins early and influences the course of an individual's school life such that success or failure cumulates as the student progresses through school with consequences for the basic capabilities needed for effective participation in the society at large.

The effect of grade was of particular interest because of our earlier speculations about the effects of school entry regulations which allow some students to start school a year earlier than others born in the same year. We argued that those in Grade 6 in 1975 would be among the youngest in their grade and at something of a disadvantage when it came to learning Grade 6 work pitched at the level of older grade peers. We suggested that this was likely to affect the ease of learning and degree of success experienced, relative to others in the same grade. On the other hand, we argued the reverse case for students in Grade 4 in 1975 as these would be among the oldest in their grade at a time when developmental differences among students are most important. These students, we argued, would find Grade 4 work, and work in subsequent years, easier and experience greater success at it relative to their grade peers, other things equal. The data on reported learning difficulties support this view. Other things equal, and relative to students in 'Grade 5', fewer of those in 'Grade 4' report learning difficulties and more

students in 'Grade 6' report difficulties with the three R's. For example, ceteris paribus and relative to 'Grade 5' students, 12 per cent fewer of the 'Grade 4' students report problems with mathematics while 11 per cent more of the 'Grade 6' students report these learning difficulties. Obviously, in 1979 these students were no longer in Grades 4, 5 and 6 but they were in parallel high school grades. In this sense we use 'Grade 4' to indicate those one year behind the bulk of their age peers, and 'Grade 6' to indicate those who began school a year before most other students of their age.

Help with Learning Problems

We considered as well the question of the delivery of remedial teaching and were not too surprised to find that the most important cause of getting remedial help was needing it. However, our data indicated that, other things equal, those in need had only a 50:50 chance of getting help; teachers provide remedial help to students in need but seem able to cater for only about half of these. We suspect that this half contains those with the most serious problems and hence, those to which teachers should allocate the greater part of their scarce remedial teaching time. Nevertheless, if our argument about the cumulation of educational deficits holds water, then the failure to deal with even minor problems is likely to have consequences for subsequent learning. We suggested that some of these students might be difficult to identify and that the use of diagnostic instruments on a regular basis might help those students whose problems with the three R's were less obvious, though no less important.

Self-Conceptions of Ability

We considered in addition how the cumulation of success and failure in primary school and in high school might affect a student's notions about his/her own capabilities. That is, we saw the possibility of a two-fold outcome of this cumulative process which began in primary school: a gradual accumulation of success or failure in learning the basic skills schools teach in the way that they teach them; and, the gradual development of a self-image of capability or incapability as a direct result. Our data seem to support this view. Other things equal, it is those who learned the basic skills taught in primary school, and those with the least learning difficulties in high school, that see themselves above average in their ability to handle the learning demands that high schools make on their students.

Again, none of this seems particularly surprising. Schools reward students, in the main, for exhibiting behaviours that indicate that the school is fulfilling its primary function - teaching knowledge and its application, together with appropriate attitudes, to the next generation. Those who fail to learn receive few of these rewards and are made aware of this failure in a variety of ways. Paradoxically, among the more visible of these are the procedures adopted by schools in an attempt to compensate for this failure

- such as special groupings, remedial help, counselling, special assignments - procedures which identify the student to himself and to teachers, parents and peers as a failure.

Being in the high school year counterparts of 'Grade 4' or 'Grade 6' relative to 'Grade 5', affected self conceptions of ability much as we predicted. Because these conceptions are developed relative to students within the same grade, the grade advanced students saw themselves as less capable, on the average, and the grade retarded students saw themselves as more capable, relative to the Grade 5 (in 1975) students. In short, having to learn and 'compete' with older grade peers was damaging to students' feelings of capability while, on the other hand, being older than most of the students in the grade contributed to the student's image of his or her own capabilities presumably because, other things equal, differences in maturity affect ease of learning and though this, access to the rewards schools provide for successful learning.

The Cumulation of Educational Deficit

We considered the notion that surpluses or deficits in basic skills accumulated over a student's school life, and were reflected in self-evaluations of capabilities, because it seemed eminently reasonable that students would decide on their educational and occupational futures on this basis, at least in good part. We look at this question in the following section. For now it seems clear that we can say that learning problems in primary school do not go away; rather, they tend to lead to similar difficulties in high school and to a devaluation of the student's conception of his/her own academic capabilities. The consequences for the educational and occupational plans of these students are discussed next.

Educational and Occupational Futures

We asked two basic questions: what kinds of educational and occupational futures do 14-year-old students see for themselves; and, why do students choose these different futures? More specifically we asked: who plans to leave school at the legal minimum age; who plans to stay on to Year 12; who plans to do further study after high school; who plans to continue with education at a University or College of Advanced Education; and who expects to enter white-collar occupations?

Leaving at the Legal Minimum Age

We asked this question because it seemed likely that those planning to leave school as soon as they could were those who saw schools as having little to offer them. On the whole this is true; other things equal, the students most likely to leave are those who did poorly in primary school, who are experiencing learning difficulties in high school and who see their capability to handle schoolwork as average at best. We noted here as in our

earlier analyses the apparent commitment of non-English-born students to an extended education, and the increased likelihood that those from socioeconomically advantaged backgrounds will stay on in school.

Completing High School

While the characteristics of the primary school attended four years previously seem to count for little in this decision, as before, ethnicity and socioeconomic background do. Relative to Australian-borns like them in other respects, some 16 per cent more non-English-born students plan to complete high school, a fact which we interpreted as others have - as a higher commitment to education on the part of those from migrant families whose mother-tongue is not English. Sex effects are evident as well, other things equal, 12 per cent more girls than boys plan to stay on to Year 12, a reflection, but not an explanation, of the increasing retention of girls within schools.

The cumulation of academic advantage is seen here as well and the effects are more pronounced. Other things equal, 11 to 12 per cent more of those mastering Literacy and Numeracy in primary school plan to complete Year 12 of high school. Moreover, experiencing learning difficulties in high school reduces one's probability of planning to stay to Year 12 by about 6 per cent. Self-evaluation of academic capabilities has an even larger effect, the largest of all in fact. Other things equal, if you rate yourself as above average in school work the probability of planning to go on to Year 12 increases by 17 per cent. In short, learning what the school has to teach and learning this without undue difficulty, coupled with positive notions of one's own academic capabilities, all contribute to the desire for more schooling; if you can cope you stay, and if you can't, you leave. We offered a similar interpretation of similar findings for the older sample: 'Since much of the business of schools is the teaching of these skills we suspect that those who learn them well are rewarded accordingly. As a result they find schooling a reasonably fulfilling way of life that promises an even better future, so they stay. Those less capable earn fewer rewards and see little point to a continued schooling that will offer them even fewer rewards in the future, so they leave'. (Williams et al., 1980a:66).

Plans for Further Study

The measure of this expectation discriminated only between those who planned to do no more study after leaving high school, and those who planned to do some, no matter what it might be. The patterns of effects are similar to the preceding analysis. There are 'grade' effects which suggest in this case that, other things equal, those 10-year-olds in Grade 6 in 1975 are much less likely to plan on further study after leaving high school. We attribute this to the difficulties arising from being the youngest in grade and suggest that grade advancement itself affects commitment to education for the worse because it makes schooling and life in school more difficult for the students in question.

The remaining effects parallel those reported in the analyses described above. Those from non-English-born backgrounds and from socioeconomically advantaged families, who achieve well in primary school, who experience few learning problems in high school, and who evaluate their capabilities as above average, plan to continue their education beyond high school.

Plans for Full-Time Tertiary Study

The patterns of effects for this variable are essentially the same as those noted in the other equations with a couple of exceptions. As before, non-English-born students and those from socioeconomically advantaged backgrounds are more likely to plan on a tertiary education. The largest effect, that of self-concept of ability, says that, other things equal, 20 per cent more of those who rate their ability above average are likely to plan on attending a tertiary institution. Seen overall the measures of educational aspirations/expectations discussed so far reflect the same basic processes. Within the context of several and variable influences from the State, School and Family, principally the latter, success or the lack thereof in primary school cumulates throughout school life to affect one's success with and commitment to educational institutions and the learning they provide. The end result is that those who have done well early have always done well, know it, and plan to continue with their education. Those with learning difficulties in primary school are still likely to have these difficulties in high school, know it, do not plan to prolong their agony, and have little inclination to subject themselves to more of the same after leaving high school.

Occupational Plans

The measure of intended occupation was transformed into a crude white-collar/blue-collar dichotomy in the interest of providing more concrete interpretations of the magnitude of the coefficients representing influences on the development of these plans. Those students we have called grade-advanced appear to have lower aspirations simply as a function of being grade-advanced. Other things equal and relative to their Grade 7 peers, 14 per cent fewer expect to enter white-collar occupations. Family SES and family size exert the kinds of influence we have come to expect, as does sex. Other things equal, 11 per cent more girls than boys expect to be in white-collar occupations. We noted a similar phenomenon in our earlier analyses concerned with early school leavers and attributed this phenomenon to sex differences in the availability of blue-collar occupations, these being predominantly male. Females tend to concentrate in the white-collar clerical occupations (see Williams, et al., 1980a:77).

Doing well in school and seeing oneself as above average in this respect both contribute to the probability of aspiring to a white-collar occupation. Seven to eight per cent more of those mastering Literacy and Numeracy in 1975, and 16 per cent more of those who see themselves above average in their academic capabilities, aspire to white-collar occupations, other things equal. Talking about one's future with teachers has an effect for the better here as it did in connection with completing high school and planning on further study.

If we discount the effect of sex as a function of the labour market rather than the processes of ascription and achievement that identify each student in high school, then the two largest effects on occupational aspirations are those from family SES and self-concept of ability. We tend to explain the first in terms of the occupational models and encouragement provided within families. The second of these effects suggests that adolescents understand well the connection between educational attainment and the labour market. Those who see themselves above average in the capability to handle school-work aspire to more education and the higher status occupations that become available as a result.

School and Work in Prospect

In all of this we find persuasive evidence that, within a context of State, School and Family influences that persist in varying degrees to affect all aspects of this process, there is a phenomenon which we have called 'the cumulation of educational deficit'. We find, other things equal, that many of the 10-year-olds having trouble with the three R's in primary school are still having trouble with reading, writing and arithmetic as 14-year-olds in high school. Some of these are getting remedial help but it does not seem to matter, at least matter for the way in which the student views his/her own capabilities. Those not doing well in primary school are not doing well in high school, other things equal, and know it. Moreover, we find that students who are the youngest in their class as a result of the regulations that govern age at starting school, experience more difficulties in learning relative to others of a similar age and similar in the other respects we have measured, but one grade behind in school. We suggest that this is another strand contributing to the cumulation of educational deficit and one that may be the result of an administrative procedure.

If, as we suspect, schools offer a disproportionate share of rewards to those who learn well what schools teach, then schools are probably not very congenial places for those who have trouble learning. They ask you to do difficult tasks in an environment in which your difficulty is apparent and measured against others either directly or indirectly; as Dreeben (1968:19) notes, 'A classroom has certain characteristics of a public place ... activities are carried on out loud and in front of everybody ... and pupils

are required to engage in public performance, often judged openly by the teacher and other members of the class'. It is not too surprising then that students who have learning difficulties develop the notion that they are not very good at learning, and if all this has been going on since primary school, then one would expect that these students will plan to leave school early and not return. They do. They also seem to appreciate the connection between education and the labour market because they aspire to, essentially, semi-skilled and unskilled work. And they do not aspire to further education, apparently because they believe that they are not capable of learning and/or because schools were not very congenial places in the past. In short, they leave, without the basic skills needed for adequate participation in society, the one societal institution charged with providing these skills.

If we make the reasonable assumption that the skills in question are only beyond the capabilities of the mentally handicapped, at the levels we are considering, then we need to ask why some 20 per cent or more of the population fail to reach basic proficiency levels. We don't know, but we suggest as we did previously that school learning may depend overly much on the exercise of cognitive abilities. While we agree with Bereiter (1969) that these abilities will become increasingly valued in Western technological societies, we also agree with Jensen that they should not be 'the sine qua non of being able to learn' (Jensen, 1969:117). There are other abilities. Most people, for example, learn to drive a car quite well without ever understanding the subtleties of compression ratios, carburettors, ring-gear or differentials. We suspect that most students are capable of learning to read, write and calculate at the levels required for full participation in the society at large, and could do so. As we noted previously

> 'Understanding' in an abstract, verbal, cognitive sense need not be a prerequisite for the learning of basic skills. It should be for those that are cognitively capable, but there are other ways for those who are not as capable. In short we are arguing for an instructional pluralism which recognizes that different aptitudes require different treatments to ensure that all individuals develop the competencies needed to function effectively. Along with this schools would need to develop assessment procedures and reward structures that recognized a plurality of instructional methods and the existence of more than one kind of learning. (Williams et al., 1980a:115)

More likely one cannot avoid the fact that the 20 per cent who do not learn these basic skills at present will always be those at most risk of unemployment as machines replace the labour of the least skilled. However, with success in learning basic skills and a reasonable share of the rewards schools can offer for success, two advances are made. Twenty per cent of the population can now participate fully in the routines of daily life, where once they could not, and education is likely to be viewed more positively as a result. This is a matter of some importance when we consider that this 20 per cent are those most likely to need retraining at some time in their post-school life to give them skills that the current generation of machines do not have, and to open up alternatives to work.

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APPENDIX A

QUESTIONNAIRE TO RESPONDENTS

SCHOOL AND WORK

We are interested to know how you feel about your school work and your plans for the future. Please read each item carefully and circle the number next to the answer which best describes you. In questions 10, 19 and 20 please write your answer in the blank space.

If you have trouble in understanding any of the questions, you may ask your teacher to explain them to you.

All the answers you give are confidential.

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1 How good are you at school work compared to other students in your class?

A lot above average	1
A little above average	2
About average	3
A little below average	4
A lot below average	5

2 If you could be remembered at school for *one* of the four things listed below, which one would you want it to be?

Outstanding at school work	1
Outstanding at sport	2
Leader in school clubs and organizations	3
Popular student	4

3 While you have been at secondary school, how often have you had serious problems with reading, mathematics, or writing?

	All the time	Often	Some-times	Never
Reading	1	2	3	4
Mathematics	1	2	3	4
Writing	1	2	3	4

4 How much special help have you been given at school with the problems you have in these areas?

	All I need	Quite a lot	Some	None
Reading	1	2	3	4
Mathematics	1	2	3	4
Writing	1	2	3	4

5 When do you think you will leave school?

The year I reach school-leaving age	1
After that year, but before completing Year 12 (final year of secondary school)	2
At the end of Year 12	3

6 **What do you plan to do right after you leave secondary school?**

Full-time job, no further study 1

Part-time job and part-time study (including apprenticeship) 2

Full-time study to get a diploma or certificate 3

Full-time study to get a degree 4

Other (describe) 5

7 **If you plan to leave school before completing Year 12, how important are the following reasons to you in coming to this decision? (Circle one number for *each* item).**

I plan to complete Year 12 1

	Very important	Fairly important	Slightly important	Not at all important
I want to earn my own money	1	2	3	4
My marks are not good enough	1	2	3	4
I dislike school work	1	2	3	4
My parents do not want me to stay on at school	1	2	3	4
I am not happy at school	1	2	3	4
I will have enough education for what I want to do	1	2	3	4
Most of my friends plan to leave school early	1	2	3	4

8 **Indicate with whom you would *prefer* to discuss each of the following topics. (Circle one number for *each* of the six topics).**

	Parents, family	Careers teacher, counsellor	Other teachers	Friends	No-one
School work	1	2	3	4	5
Choosing school subjects	1	2	3	4	5
Job plans when you finish your education	1	2	3	4	5
Attending university or college	1	2	3	4	5
Leaving high school before finishing	1	2	3	4	5
Personal problems	1	2	3	4	5

9 **Indicate with whom you have *already* discussed each of the following topics. (You may circle *more* than one number for each topic).**

	Parents, family	Careers teacher, counsellor	Other teachers	Friends	No-one
School work	1	2	3	4	5
Choosing school subjects	1	2	3	4	5
Job plans when you finish your education	1	2	3	4	5
Attending university or college	1	2	3	4	5
Leaving high school before finishing	1	2	3	4	5
Personal problems	1	2	3	4	5

10 **In your present thought and plans, what occupation do you intend to go into when you leave school or complete your further education?**

Occupation .....

11 **How certain are you that you will actually go into that occupation?**

Very Certain	Fairly Certain	Not very Certain	Not at all Certain
1	2	3	4

12 **Do you feel you are well enough informed about the different kinds of jobs you could get to make a good choice for your future career?**

Yes, very well	Yes, quite well	No, not too well	No, not at all well
1	2	3	4

13 **Do you feel you know your own interests and abilities well enough to decide about your future career?**

Yes, very well	Yes, quite well	No, not too well	No, not at all well
1	2	3	4

14 **How much have you thought and planned about doing each of the following things? Indicate whether you have**

1 given it no thought and made no plans.

2 given it a little thought, but made no plans.

3 given it some thought, but made no plans.

4 made definite plans, but not sure how to carry them out.

5 made definite plans, and have already done something about them.

	No thought, no plans	A little thought, no plans	Some thought, some plans	Definite plans, don't know how to carry out	Definite plans, already done some-thing
Finding out about educational and job possibilities (from library, talking to people etc).	1	2	3	4	5
Talking about career plans with an adult who knows something about me	1	2	3	4	5
Taking subjects that will help me decide what line of work to go into when I leave school	1	2	3	4	5
Taking subjects that will help me in college or university, in job training, or on the job	1	2	3	4	5
Sorting out problems that might make it hard for me to get the kind of training or work I would like	1	2	3	4	5

15 **How important would the following items be to you in a job? (Circle one number for each item).**

	Very important	Fairly important	Slightly important	Not at all important
The security of steady work	1	2	3	4
The opportunity for rapid promotion	1	2	3	4
The enjoyment of the work itself	1	2	3	4
Friendly people to work with	1	2	3	4
Good pay	1	2	3	4

16 **How much useful information on jobs and careers have you obtained from each of the following sources?**

	A lot	Some	A little	None
Fathers, mothers, uncles, aunts, etc.	1	2	3	4
Brothers, sisters, cousins, friends	1	2	3	4
Careers teachers, school counsellors	1	2	3	4
Other teachers	1	2	3	4
Other adults, outside of school	1	2	3	4
Books, handbooks, pamphlets	1	2	3	4
Audio or visual aids, like tape cassettes, films or computers	1	2	3	4
People in the occupation, or at the university or college I am considering	1	2	3	4

17 **How much do you agree or disagree with the following statements?**

	Strongly Agree	Tend to Agree	Tend to Disagree	Strongly Disagree
I need reassurance that I have made the right choice of occupation	1	2	3	4
I am concerned that my present interests may change over the years	1	2	3	4
If I had to make an occupational choice right now, I am afraid I would make a bad choice	1	2	3	4
I need to find out what kind of career I should follow	1	2	3	4
Making up my mind about a career has been a long and difficult problem for me	1	2	3	4
I am confused about the whole problem of deciding on a career	1	2	3	4
I am not sure that my present occupational choice is right for me	1	2	3	4
I am uncertain about the occupation I would enjoy	1	2	3	4
I can't understand how some people can be so set about what they want to do	1	2	3	4

18 **How much education have your father and mother had?**

	Father	Mother
Primary school only	1	1
Some secondary school	2	2
Finished secondary school	3	3
Further training (not degree or diploma)	4	4
Tertiary (university, college degree or diploma)	5	5
Don't know	6	6

19 **What is the present or last main occupation of your father or guardian? (Name the occupation and describe what he does).**

Occupation .....

What he does .....

20 **What is the present or last main occupation of your mother? (Name the occupation and describe what she does).**

Occupation .....

What she does .....

APPENDIX B

THE EFFECTS OF DICHOTOMIZING DEPENDENT VARIABLES

Table B.1 Illustrative Comparison of Standardized Coefficients in Equations Using Full-Range and Dichotomous Forms of Dependent Variables

	Dependent Variables			
	Literacy (mastery)		Numeracy (Mastery)	
Dependent Variables	Full	Dichot.	Full	Dichot.
ACT	*	*	*	*
Vic.	*	*	*	*
Qld	*	*	*	*
SA	-0.12	-0.15	-0.18	-0.15
WA	*	*	-0.09	-0.07
Tas.	*	*	*	*
NT	*	*	*	*
School Rurality	-0.17	-0.14	-0.15	-0.17
Catholic School	*	*	*	*
Independent School	*	*	*	*
Grade 4	-0.24	-0.17	-0.37	-0.31
Grade 6	0.14	0.14	0.12	0.09
English-Born	*	*	*	*
Non-English-Born	*	*	*	*
Family Rurality	*	*	0.12	0.14
Family SES	0.18	0.13	0.12	0.11
Family Size	-0.18	-0.15	-0.15	-0.11
Respondent's Sex	0.16	0.13	*	*
Proportion of Variance Explained	0.19	0.13	0.21	1.24
Minimum	12.00	0.00	13.00	0.00
Maximum	29.00	1.00	33.00	1.00
Mean	23.08	0.54	27.05	0.76
Standard Deviation	3.80	0.50	4.77	0.43

Notes

1 * indicates coefficients less than twice their standard error

2 State effects are relative to NSW students

3 Effects for Catholic and Independent schools are relative to Government school students

4 Effects for English-born and non-English-born ethnic groups are relative to Australian-borns

5 Effects of sex are those of being female relative to being male

Earlier on we mentioned the matter of problems associated with providing complex statistics in an intuitively interpretable form. We saw the creation of dichotomous dependent variables and the subsequent interpretation of metric partial regression coefficients in percentage terms as one solution, but one that violated a distributional assumption of the statistical technique. At that time we promised to provide examples of the effects of this violation and this digression from the main substantive argument provides these examples.

In Table B.1 we present standardized coefficients obtained in estimating the same equations for both the full range and the dichotomous mastery versions of the Literacy and Numeracy total tests. In the interests of simple comparisons we have shown only those coefficients which equal or exceed twice their standard error; that is, coefficients significantly different from zero at slightly less than the five per cent level of confidence. Also shown are the maximum, minimum, mean and standard deviation of each test.

Comparisons of the coefficients are not entirely straightforward. One cannot compare the metric coefficients across the equations for each form of the dependent variable because the units of measurement differ. Furthermore, although we have shown the standardized coefficients these are not directly comparable either because they are standardized on different variances. What we do, instead, is look at the rough rank order of effects within an equation, compare the two rank orders for Literacy and again for Numeracy, and see if one would arrive at a different conclusion about the pattern of influences on these basic skills depending on the equation used. While there are differences in the second decimal place between coefficients, the average difference in each equation is only 0.03 and one would arrive at essentially the same conclusions no matter which equation in each pair was used. On this basis, while we acknowledge that our treatment of the data is statistically inadvisable in a strict sense, we argue that the benefits for lay interpretability of the statistics far outweigh the disadvantages associated with the use of dichotomous dependent variables and so we continue in this mode.