

AN ANALYSIS OF TIME-USE PATTERNS OF PRIMARY SCHOOL TEACHERS IN TASMANIA

by

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Statement of originality

I certify that this thesis contains no material which has been accepted for award for any other degree or diploma by the University of Tasmania or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of my knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of the dissertation.

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ABSTRACT

The thesis is a study of the time-use patterns of primary school teachers in Tasmania. The time allocation behaviour of primary teachers is described using diary data on teachers' workloads. The diary data describe teachers' daily and weekly time use inside and outside schools. The time allocated to the myriad of tasks undertaken by teachers is described using actual time allocated and the proportion of total available time allocated to each activity or each teaching day. Throughout the thesis, the actual time allocated by teachers is referred to as the time budget, and the proportional allocation of time is referred to as the time share. The use of time budgets is common in time-use research. The use of time shares in the analysis of teachers' time-use that is developed in this thesis is novel, and complements the traditional use of time budgets. A conceptual framework of teachers' time use that uses these time budgets and time shares and describes teacher time allocation behaviour, is developed in this thesis. The conceptual framework has embedded within it a set of activities that teachers perform in the school, after school, outside classrooms, within classrooms, as they allocate time to the complex myriad of activities that they perform. Also embedded in the conceptual framework is a set of structural equations that describe allocation of time to teaching and non-teaching activities, days of the week, and weekend work. These structural equations first, depict the realities of primary teachers' work and the dynamism thereof, and are then estimated using a suite of regression techniques that included ordinary least squares (OLS), seemingly unrelated regressions (SUR), multivariate regressions (MVREG), instrumental variables regressions (IVREG) and error in variables (EIV) regressions. These techniques are estimated using the software (STATA 9.2). The use of this suite of econometric modelling in the analysis of teachers' time allocation behaviour is novel.

The results obtained from these techniques provide evidence on the determinants of: (i) the number of activities undertaken by teachers, (ii) the time budgets and time shares of each type of activity undertaken by teacher, (iii) the time budgets and time shares of each day of the teaching week; and, (iv) the extent to which teachers are overloaded – that is work in excess of mandatory hours. The results reported in this thesis show that time budgets and time shares provide different, but complementary, types of information about the time allocation behaviour of teachers. The results also show that selected teacher characteristics and school characteristics are important determinants of the time use patterns of primary school teachers in Tasmania. Of particular significance is the high level of time allocation to activities undertaken in schools on Tuesdays. Equally significant, although alarming, is the

extent to which primary school teachers in Tasmania are overloaded and work during unsociable hours that include evenings, weekends and, in particular, Sundays. Throughout the thesis it is posited that the main aim of teachers' work is to leave a significant, positive, and indelible imprint on student's learning and other developments. The conceptual framework and the structural equations thereof are thus described as representing the teacher's 'thumbprint'. The use of the metaphor of the teacher's thumbprint highlights the focus of teachers in meeting the various challenges of teachers' ever-changing domains and realities of work.

The thesis provides a conceptual model of teachers' work and time allocation thereof. A set of structural features of teachers' work is captured, within the teachers' thumbprint. The analytical framework is then evaluated for empirical validity using the two concepts: time budgets and time shares. The use of the metaphor of the teacher's thumbprint, the supporting analytical framework, and the use of time shares to complement time budget analysis is novel.

This thesis makes a significant contribution to knowledge, methodology, and policy-making. The findings from this thesis will contribute to informing public policy with regard to schools as workplaces, and lead to an understanding on welfare implications of teachers' work. The findings also contribute to an understanding of time-use data in a way that allows for providing an interpretation of the link between time allocation, teacher emotional states, job satisfaction, and general wellbeing of teachers. The time allocation patterns of teachers also have economic and non-economic incentives that alter teachers' time-use behaviour, the teachers' view of their work, as well as community views of teachers' work.

ACKNOWLEDGEMENTS

This work was conceived in 2005, a year after the Gardner and Williamson (2004) study, when I realized that my then EdD topic on school governance was too broad to have innovative, long-lasting, and tangible benefits, and remain current for a considerable period of time beyond 2010. From 2005 through 2008, working on this project has been quite taxing. When I originally thought of analysing time-use, I had no idea that the concept required such a volume of work. I am humbled by the literature that has ballooned over the time of my writing this thesis – I note, however, without being over-confident that there is a noticeable absence of the style and tact that has been pursued in this thesis.

I am deeply indebted to Professors John Williamson and Margaret Robertson for nurturing me through my Graduate Certificate in Education. The pair made me realise that educational research is so interesting, fascinating and inspiring. Their support through my early research effort looking at middle management in schools, teacher job satisfaction, and student motivation have made it possible for me to look at the study of teachers' time-use, in a broader context. Dr Christine Gardner has been so influential in getting me to understand the intricacies of the world of teachers' work and the use of diary data. Her explanation and earlier coding of the survey on teachers' workloads have made the additional work in STATA considerably easy.

My interest in economics, econometrics and numbers generally, has made the study toward the EdD a moving feat. I have explored concepts in time-use, beyond my original preoccupations, and failed to realise in time that EdD candidature time was not on my side. I thank Professor John Williamson for his superb guidance. I am greatly indebted to Professor John Williamson for mentoring me throughout this journey. I have benefitted considerably from his support. He has inspired me to dig deep within and extract material that really matters to me. John has left his indelible thumbprint on my work. I am honoured to have had that privilege. I am also particularly mindful of the team of experts that create the ideal conditions of my candidature. Their understanding and assistance has been beyond measure. I have certainly benefitted considerably their professional guidance throughout my thesis – I really wish I had a way of putting names and faces to the timely moments of help that I have received, endlessly.

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I am also particularly thankful to my partner, Rosemary Ngwenya, for taking the time to listen to my attempts at interpreting the endless list of ‘tables of results’ I kept producing. Her contribution, as Curriculum Leader and Mathematics-Science teacher of over 15 years, has helped me place in perspective what the results of this thesis mean for teachers’ work. I have also benefitted considerably from observing her from a distance as she grapples with her own time allocation to the various tasks she has undertaken in Australian and Overseas schools.

The editing of the thesis has been an involving task. I would like to thank Rossina-Roberta Ngwenya, Tshepo Ngwenya and Laura Nelson for taking valuable time off their demanding schedules to assist me with editorial work. I do hope you found the experience rewarding, and worth tapping onto in future. To Laura Nelson, your attention to detail is remarkable. Congratulations on being admitted to the Doctorate in Education program. I hope the time you spent reading this thesis has given you a glimpse of the road ahead. I have no doubt, in my mind, that your own doctoral research will be flawless.

To all my friends and the like, who have always wondered why I have pursued this line of study – I would like to say: *“time will tell”*, and encourage them to look at their own workloads and time-use behaviours, and the results thereof. Eventually, ‘time will tell’ how time and other resource tradeoffs, policy, and work and non-work requirements, affect our public and private lives. Time will also tell when the analysis of time-use will be as important as the analysis of households’ expenditures on commodities.

Finally, I would like to thank my mum – Rossina ‘nee Siziba’ for teaching me the virtues of patience, and inspiring me to do my best in everything. This thesis is as much about teachers’ time-use as it is about my dad’s work as a teacher. Dad served the community at many levels, and left his time-use thumbprint on all of us. Mum, thank you for detailing the mast moments of my dad’s life. I do hope time is on my side to accomplish the work ahead – that both of us know has to be done. Mum, I love you very much. Thanks for the wonderful childhood years. I really wish I could spend my adult years with you. Time will tell. Kiaboka.

DEDICATION

This thesis is dedicated to my dad — July Zakafushiwa Ngwenya (1931-2002).

*“Dad you are my greatest teacher, and I will always have fond memories of the time we spent together. You shared your thoughts about life in general, the values of hard-work, and most important, the value of **primary education** (which you have always said was not necessarily monetary). Thank you for asking the numerous Grades 1 to 2 teachers to look after me in their primary classrooms, in the early 70s. I now realise that I was too young to stay at home with mum minding our small herd of cattle, the family shop, and tilling the land in our sun-dried tribal trust land of the then Southern Rhodesia. After four years of sleeping in the corners of various early grade classes, and passing University of Cambridge examinations that determined progression to the next grade, I finally joined you in the Grade 3 and 4 class of 1973. I enjoyed the cookies and the tea, that mum made for you to have during your break-time. Now that I think about it, you actually had those cookies during class time. Your encouragement through the remaining years of primary schooling was exceptional. Your assistance and guidance helped me considerably through primary schooling, secondary schooling (GCE-Ordinary Level), high schooling (HSC-Advanced Level), and university (Undergraduate and Postgraduate Studies), has been pivotal in my own career efforts in Zimbabwe, Southern Africa and overseas (Australia). You spent a lot of the little money you had on whatever avenues were open for my schooling — all you asked of me was to do well. As I tried putting the final pieces to this doctorate, I realised I was actually reflecting more on what you did as a father, teacher and mentor, as well as what you accomplished as family man, businessman, farmer, community visionary and builder. You juggled the many demands on your time, and had endless projects that were onerous. I now have a rough understanding of what the school inspector of the 70s meant to you, in terms of your workload. You managed to allocate your time among several tasks — always multitasking and telling us that hard work always has a payoff. The account given in this thesis is about how primary teachers allocate their time in Tasmania. I do hope in some way I have touched on, although maybe in a different context, how you managed it all. You will always inspire me, and through your wisdom, I hope I will have time to be the best I can. You have taught me all I know now, and I will try and pass that knowledge on to anyone with time, interest and focus. I hope the impact of that knowledge on others, especially your grandchildren, will be as rewarding as it has been for me. Sadly, I make no apology on how I am going to transit that knowledge. It will be with the similar (but not same) zest, hunger, drive and persistence with which you transmitted that learning to me. I do hope, though, that the modern world and its modern occupants will appreciate the effort. I have fond memories of you telling me that if I do something the hard way, as part of learning, then when reality hits — I would certainly appreciate the early cushioning that I have invested in the exercise. You have left a positive, significant, indelible thumbprint on all your children, family and members of our small village community — most of whom do not know my name — they just call me your son. We reflect on your impact on a regular basis through Facebook and other social electronic networks — and we do that now with greater understanding, of course.*

Thank you for inspiring me to be the person I have become. The apparent faults are definitely mine — I had to do something. You are missed, dearly. I will look after mum (your wife), in the best way that I can. The distance is big — over 10 thousand miles, but then connectivity has been enhanced in line with your vision of the 60s. I get a chance to speak to her online regularly. She now has electricity, internet, BBC, CNN, SKYPE, hotmail, in your shop. For some strange reason she believes that this online stuff is far better than me being around in the village. I do not get it — but will accept it — the lady has spoken! But, I guess in her thinking she sees the positives of online connectivity, and then also notices that she does not get to see the realities of what I grapple with on a daily basis. I guess, what she does not know will not hurt her as much in the short term. Dad, your wife (my mum), must be the most patient and understanding person I have known. I will look after her to the best of my ability, and only time will tell how well that job will be accomplished. Sadly, for some reason I seem to run out of time in everything I try and do.

Your loving son,

Elkana (Kha).

LIST OF ABBREVIATIONS AND VARIABLES

ABS	Australian Bureau of Statistics
active09	status (supervising students) (activity number 9)
active11	status of attending meetings (activity number 11)
active13	status of engaging in extra school activities (activity number 13)
ADM	administrative tasks
af5	assisting factor is: "students assist my work"
af8	assisting factor is professional development (PD)
age	age of teacher
age3	age of teacher (41-50 years old)
ANOVA	Analysis of Variance
assfac	aspects of schools assist work
ATUS	American Time Use Study
BP/CW	Breusch-Pagan/Cook-Weisberg
c18	involvement with Grade 2 classes
c19	involvement in Grade 3 classes
c20	Grade 4 dummy
c20	teaching Grade 4
cf7	professional learning as a change factor
cf8	time teaching or on duty is a change factor
clargt	class arrangement
d_oload	status of being over loaded
dfr	Friday daily time budget
dfr_s	Friday daily time share
dm3	satisfaction with role
dminv	satisfaction with involvement in decision making
dmo	Monday time use (in hours)
dmo_s	Monday daily time share
dms	Monday-to-Sunday daily time budget
dsa	Saturday daily time budget
dsa_s	Saturday daily time share
dss	Saturday-to-Sunday daily time budget
dss_s	Saturday-to-Sunday daily time share
dsu	Sunday daily time budget
dsu_s	Sunday daily time share
dth	Thursday time use (in hours)
dth_s	Thursday daily time share
dtu	total hours worked on Tuesdays
dtu_s	Tuesday daily time share
DWC	discussion with colleagues

LIST OF ABBREVIATIONS AND VARIABLES (Continued)

dwe	Wednesday daily time budget
dwe_s	Wednesday daily time share
EIV	Errors in Variables
EIVREG	Errors in Variables Regression
empst	employment status
ESDS	Economic and Social Data Service
ESE	extra school expectations
exastr	teaching experience
FC	information communication
FTE	fulltime equivalent
fulltime	full-time employment status
hf10	hindrance factor is: (non-core requirements (administrivia))
hf8	hindrance factor is: (computers IT support and computer problems)
hinfac	aspects of school hinder work
hr_week	hours per week
IVREG	Instrumental Variables Regression
kindergarten	Teaching kindergarten only
ln_t07s	logarithm of time share communicating with parents
ln_t09s	logarithm of time share supervising students
locatn1	location of school
log_ttt	logarithm of total time expended by teachers
mt11	main task is performing operational planning
mybreak	weekly uninterrupted break time
n_active	number of activities undertaken by teacher
noschs	number of schools taught at
nsts	number of students at school
num_dm	number of decisions make
num_mts	number of meetings attended
num_sug	number of suggestions made
OLS	Ordinary Least Squares
ooa	teaching out of area of expertise
over40s	teachers aged over 40 years
overload	extent of teacher overload (in hours and minutes)
P	Primary teaching only
PDL	professional development and learning
PLPs	Professional Life Phases
PNP	planning and preparation
poshld	position held

LIST OF ABBREVIATIONS AND VARIABLES (Continued)

primary	Teaching primary school classes only
promps	promotion and position
R	coefficient of correlation
sgmp1	suggestion to improve working life
sgmp10	appropriateness of curriculum
sgmp5	suggested changes in class sizes and teaching
sgmp7	balancing time and needs
sgmp9	better support by the Department of Education (Tasmania)
sgmpl1	suggested allocating time for official expectations
skoolsiz	size of the school (number of enrolment)
stsc1	students in class
SUREG	Seemingly Unrelated Regressions
TA	teaching alone
TAFE	Technical And Further Education
TOD	time on duty
tot_af	number of factors that assist work
tot_dm	number of satisfied decision making
tot_hf	number of factors that hinder work
tot_sg	suggestions for improving work lives
tt01_s	time share of time teaching alone (tt1)
tt03_s	time share for planning and preparation (tt3)
tt05_s	time share for professional discussion with colleagues (tt05)
tt07_s	time share for informal communication with parents and students (tt07)
tt08_s	time share for staff supervision (tt8)
tt09_s	time share for student supervision (tt9)
tt1	time teaching alone
tt10	time performing administrative tasks
tt10_s	time share for performing administrative tasks (tt10)
tt11	weekly time spent on meetings
tt11_s	time share for attending staff meetings (tt11)
tt3	time planning and preparation
tt5	weekly time spent with colleagues
tt7	time in informal communication with parents and students
tt8	time in formal communication with parents and students
tt9	weekly time spent on student supervision
tweek	total hours expended Monday-to-Friday.
TWO	teaching with others
UBT	Uninterrupted Break Time
UK	United Kingdom
US	United States of America
xcertsc	experience in current school

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Teachers' time-use has implications for teachers' workloads. Similarly, the teachers' workload dictates the teachers' time-use. The teachers' workloads and patterns of time-use have considerable implications on how teachers undertake their roles and responsibilities within the school community and outside the school community. How teachers perform these roles and responsibilities with the time available has significant implications on outcomes of schooling, teaching, and teachers' work lives. The effects of teachers' time-use patterns on teachers' work lives depends on the use of time as a resource and constraint by teachers and education policy makers, and the education policy framework that teachers work under. An analysis of time-use patterns of teachers is, therefore, essential, and requires an in-depth understanding of how time is used, viewed, interpreted, defined, and most importantly, experienced by teachers.

Time is an under-researched issue in consumer research (Gershuny, 1987; Keating & Murgolo-Poore, 2001), social psychology (Neulinger, 1974; Robinson, 1977), anthropology, economics (Shackle, 1958; DeSherpa, 1971; Brown & Saks, 1987; Beesley, 1965; Blaylock & Smallwood, 1987; Wolburg, 2001), geography (Anderson, 1971; Brail & Chapin, 1973; Chapin, 1974; Chapin, 1976; May & Thrift, 2001; Probyn, 2001), social sciences in general (Connelly & Clandinin, 1990; Zuzanek & Veal, 1999), and in education (Bloom, 1974; Rosenshine, 1978; Rosenshine & Berliner, 1978; Gettinger & White, 1979; Smyth, 1980; Anderson, 1984; Burns, 1984; Smyth, 1984; Smyth, 1985; Brown & Saks, 1987; Demfer, 1987; Millot, 1995; Millot & Lane, 2002), among other disciplines (Kranz, 1970; Parker,

1980; Jacoby, Szybilb & Berning, 1976; Mueller, 1984; McFarlane, 1990; Kitamura, Fujii & Pas, 1997; Miller & Mulvey, 2000; Joesch & Spiess, 2002). Time is an important variable that is intertwined with every aspect of human behaviour (Meier, 1959; Becker, 1965; Brail & Chapin, 1973; Cullen & Godson, 1975; Chapin, 1976; Jacoby, Szybillo & Berning, 1976; O'Driscoll, Rizzo & Garrison, 1985; Kitamura et al., 1992; Hessing, 1994; Hughes & Trautmann, 1995; Keating & Murgolo-Poore, 2001; Cinamon & Rich, 2005). Time is generally viewed as linear, measurable as clock time, chronological time, irreversible, abstract and divisible (segmentable), unidirectional, objective, separate from distance and space (Graham, 1981; Bluedorn, Kaufman & Lane, 1992; Bluedorn & Denhardt, 1998; Benabou, 1999; Keating & Murgolo-Poore, 2001; Wolburg, 2001) and having a beginning and an ending (Benabou, 1999; Stinson, 1999). In industrialised societies time is always considered as a resource that can be saved, managed efficiently, allocated appropriately to yield a profitable output (Romer, 1987; Betchtold et al., 1994; Benabou, 1999; Dababneh, Swanson & Shell, 2001). Time functions as one of the major dimensions of social organisations (Hornberger, 1987; Benabou, 1999; Floro & Miles, 2003; Yamagata-Lynch, 2003; Bittman, 2005). Like in other spatial-temporal work on time allocation, time itself is not the subject of investigation (Strzeminska, 1972; Carlstain, Parkes & Thrift, 1978) but is the agent by which other subjects are studied (Scheuch, 1972; Cottle, 1976; As, 1978; Arndt, Gronmo & Hawes, 1981; Hornik, 1984; Szebo & Cebotarev, 1990; Campbell & Mathews, 1998; Game, 2001; Stein, 2001; Beaujot & Liu, 2005).

Time is used, therefore, to explain behaviour (Strzeminska, 1972; Chapin, 1976), and, behaviour (viewed through the allocation of time) is also used to explain time allocation (Hill, 1985; Apps, 2002; Day, Sammons & Gu, 2008). Research interest on how and why individuals allocate their time resources is extensive (Becker, 1965; Szalai, 1972; Gronau, 1977; Lakoff & Johnson, 1985; Juster & Stafford, 1985; McGraw & Kelly, 1986; Gershuny,

1987; Juster et al., 1988; Kaufman, Lane & Lindquist, 1991; Niemi, 1993; Bluedorn & Denhardt, 1998; Bhat & Koppelman, 1999; Cranic & Florian, 2008; Kan & Pudney, 2008; Krantz-Kent, 2008; Krantz-Kent, 2009). How individuals allocate their time in the workplace has an effect on how other individuals within the workplace allocate their time to the myriad of tasks presented (Holder & McKinney, 1992; Kaufman-Scarborough & Lindquist, 1999; Waller, Giambatista & Zellmer-Bruhn, 1999; Johnson, 2001; Keating & Murgolo-Poore, 2001; Floro & Miles, 2003; Cinamon & Rich, 2005).

In this thesis the allocation of time by teachers is the subject being studied. In the study of time allocation by teachers, time is used to represent (i) teachers' workloads, (ii) the tradeoffs in time allocation across activities, (iii) the use of time during and after school time; and, (iv) the use of time during different days of the teaching week. In all these representations, among many others, time is used as a measuring device to give insight into the various processes that comprise the activities pursued (Cottle, 1976; Davies, 1994; Caul, 1995; Goddard, 2000; Floro & Miles, 2001; Miles, 2003; Krantz-Kent, 2008). The allocation of time to the activities performed by teachers has implications for workloads of teachers. The allocation of time to the teacher's various activities is influenced by the school environment (Rick, 2000; Miles, 2003) and how teachers constantly interact with other teachers and non-teachers (administrators, for example, see Kutcy & Schulz, 2006). The teacher's view of schools as a place of work (Johnson, 1990; Rick, 2000) influences the teacher's construction of how time is used in the school (Dreeben, 1970; Blasé & Pajak, 1986; Apple, 1989; Casey & Acker, 1989; Acker, 1992; Huberman, 1993; Biddle, Good & Goodson, 1997; Huberman, Thompson & Weiland, 1997; Adler, 2002; Cinamon & Rich, 2005).

The allocation, control and management of time have always been a major preoccupation of organisations (Chapin, 1976; Walker & Woods, 1976; Kitamura, Fujii & Pas, 1997; Benabou, 1999; Klevmarken, 1999; Klepsis et al., 2001; Cranic & Florian, 2008). The allocation of

time is affected by income levels (Mueller, 1984), age (Cochrane & Logan, 1975; Krantz-Kent, 2005; Krantz-Kent, 2008), gender (Acker, 1989; Acker, 1992; Cinamon & Rich, 2005), regional differences (Chapin, 1976; Cochrane & Logan, 1975; Joyce & Stewart, 1999; Floro & Miles, 2003), employment status (Probert, 2003), other demographic variables (Stark, Lowther & Austin, 1985; Floro & Miles, 2003; Krantz-Kent, 2005), and school characteristics (Chebat & Zuccaro, 1995; Williams & Gersch, 2004; Ingvarson, Meiers & Beavis, 2005; Painter, Haladyna & Hurwitz, 2007). Schools are contextual institutions and as such are heavily influenced by the varied cultures of professional and non-professional communities in which they reside (Edwards, 1996; Joyce & Stewart, 1999; Rick, 2000; Goddard, 2002; Frazis & Stewart, 2004).

The effects of external change on the management and administration of schools are considerable (Smith & Scott, 1990; Hargreaves, 1994; Adelman & Pringle, 1995; Galton, Hargreaves & Pell, 1996; Hargreaves & Fullan, 1998; Galton et al., 1999; MacBeath et al., 2000; Clement & Vandenberghe, 2001; Fullan, 2001; Galton et al., 2002; Ingvarson, Meiers & Beavis, 2005; Kutcy & Schulz, 2006; Reeves, Emerick & Hirsch, 2006; Kirkgoz, 2008, Ballet & Kelchtermans, 2009; Mulford & Edmunds, 2009; Mulford & Edmunds, 2010). Teachers find themselves not having sufficient time to teach or plan with their colleagues (McGarvey et al., 1996; Williams & Cole, 2007; Kirkgoz, 2008). Teachers are increasingly becoming unable to manage their time, address students' needs and also undertake their own profession development (Ingvarson, Meiers & Beavis, 2005; Kutcy & Schulz, 2006; Lohman, 2006; Eldridge & Pabilonia, 2007; Krantz-Kent, 2008; Williamson & Myhill, 2008). In shaping learning and assessing productivity in organisations it is important to understand how time is allocated to activities (Tomlison et al., 1973; Smyth, 1985; Demfer, 1987; Burns, 1984; Anderson, 1984). The allocation of time to activities can be such that time is allocated to one activity at a time (this is called monochronic time-use) or time is allocated to several

activities within a given time period (this is polychronic time-use). The monochronic time (M-time) and polychronic time (P-time) orientations of individuals (Floro & Miles, 2003) in any organisation, and how the individuals differentiate themselves with respect to their organisational time dimensions (Bluedorn, Kaufman & Lane, 1992; Benabou, 1999) are also important elements in understanding time-use.

1.2 Motivation to Study Teachers' Time-Use

Teaching is an art of persuasion and persuasion requires a lot of time. Time is viewed as a resource, a constraint and also a mediator of human action (Carlstain, Parkes & Thrift, 1978; Dinham & Scott, 2000; Roth, Lawless & Tobin, 2000). Time is generally used to analyse and “draw inferences about a multidimensional problem” (Yamagata-Lynch, 2003, p.591) and/or conduct multidimensional analyses of multiple, complex and often conflicting multiple objectives (Hargreaves, 1994; Liebermann & Miller, 1999). Teaching is also a multidimensional problem with multidimensional effects (Carlstain, Parkes & Thrift, 1978; Hargreaves, 1994; Liebermann & Miller, 1999; Yamagata-Lynch, 2003; Cinamon & Rich, 2005; Rice, 2005). The nature of teaching is such that “teachers have difficulty defining or quantifying their impact on students, and the nature of the learning is such that the best efforts of teachers are not always rewarded with matching results” (Rice, 2005, p. 187), and students “also learn [more] from the invisible curriculum ... than from the visible curriculum” (Raju & Srivastava, 1994, p. 7). It is also assumed that the time teachers allocate to learning and teaching translates directly to student engagement time - which is the amount of time students actually spend focused on the learning tasks presented to them (Rosenshine & Berliner, 1978; Berliner, 1990; Reeves, Emerick & Hirsch, 2006). The literature stresses the notion that time is a constraint and a scarce commodity or resource that can be managed towards productive desired school and non-school outcomes (Lortie, 1975; Centra & Porter, 1980; Marjoribanks, 1995; Frazis & Stewart, 1999; Stigler & Hiebert, 2004).

The notion of time as a constraint and resource influences the thinking of school reformers, administrators, and teachers (Lortie, 1975; Brown & Saks, 1987; Huberman, 1993; Hargreaves, 1994; Weiner, 1999; Huntly, 2008; Ballet & Kelchtermans, 2009). However, teachers, administrators and school reformers do construct time in schools somewhat differently given their differing perceptions and philosophies on school needs, teachers' work and preferences (Day, Sammons & Gu, 2008). The allocation and use of time is a subjective experience (Huberman, 1993; Hargreaves, 1994; Liebermann & Miller, 1999; Yamagata-Lynch, 2003; Huntly, 2008) – that experience is a phenomenon and hence the phenomenology of teaching and teachers' work lives and the assessment of the workloads of teachers (Gardner & Williamson, 2004; Williamson & Myhill, 2008) as perceived by social actors (Clandinin, 1986; Broadfoot et al., 1993; Smyth, 1997; Gooddard, 2000; Aspin, Chapman & Klenowski, 2001; Vogt, 2002; Bartlett, 2004; Rice, 2005;).

The teacher allocates time to school work and executes school tasks during what is defined as public time. However, time allocated at work (defined as public time) has implication for time for private life - defined as private time (Apples & Tietelbaum, 1989; Johnson, 1990; Yamagata-Lynch, 2003; Churchill & Williamson, 2004; Collett, Menlo & Rosenblatt, 2004). A complete analysis of teachers' workloads and work lives should therefore involve both private and public time (Frazis & Stewart, 2004; Williamson & Myhill, 2008). Teachers bring home school work, and student time (through on-line work, for example) erodes teachers' private time (Drago et al., 1999; Perlow, 1999; Swain & Swain, 1991; Giltin, 2001; Galton et al., 2002; Gardner & Williamson, 2002; Blekesame, 2005; Gardner & Williamson, 2006; Wotherspoon, 2008; Ballet & Kelchtermans, 2009). In addition, community time as part of teacher professional identity also eats into private time (Eldgridge & Pablonia, 2007; Krantz-Kent, 2008). Often school time does not allow for informal learning (Lohman, 2006). As a result, teachers tend to share resources, research, prepare for classes, scan through

professional readings and reflect on their teaching outside school time and during private time (Bullough, 1989; Hargreaves, 1992; Billet, 2001; Boud & Middleton, 2003). Shifting informal learning to private time occurs because of the absence of an unencumbered time for informal learning at school (Lohman, 2006). The absence of free time that can be used in teachers' discretion is a common problem in schools and learning (Hargreaves, 1992; Huberman, 1993; Hargreaves, 1994; Liebermann & Miller, 1999; Billet, 2001; Boud & Middleton, 2003; Yamagata-Lynch, 2003; Frazis & Stewart, 2004; Lohman, 2006; Eldgridge & Pablonia, 2007; Huntly, 2008; Krantz-Kent, 2008; Williamson & Myhill, 2008).

The activity of teaching requires a careful and balanced tradeoff between public time and private time. The tasks performed during private or public time are done individually (sequentially) or jointly (simultaneously). Where the teacher performs tasks sequentially and/or individually, the allocation is generally termed monochronic behaviour (Floro & Miles, 2003). In contrast, where tasks are done simultaneously, the allocations are referred to as polychronic (Miles, 2003). Cottee (1998) suggests that time passes at an agreed rate for society, and yet is seen to pass at a different rate for individuals in that society. The experience and perception of time is subjective and is defined by the person experiencing the time – a personal experience (Stinson, 1999; Miles, 2003). The individual's unique perception of time influences decision-making and the resultant behaviour. Each teacher has their own behavioural style which is captured in the monochronic-polychronic continuum (Cottee, 1998; Persing, 1999; Floro & Miles, 2003).

Parents, the school environment and school reforms also place pressure on teachers' time allocation (Dondero, 1997). Parents represent a critical heterogeneous category of outsiders who importantly influence the content and process of teaching in schools (Rick, 2000; Kutcy & Schulz, 2006). Parents often perceive teachers' time under the manufactured illusion of teachers' work as being simple, punctuated with very short working hours and extremely long

holidays, and being less demanding (Fullan, 1998; Goddard, 2000; Rick, 2000; Kutcy & Schulz, 2006). The school sector has witnessed financial cutbacks in public schools, restructuring of education departments, privatisation of functions, and the promotion of free market enterprise goals in public education (Fullan, 2001; Ballet & Kelchtermans, 2009). School reforms have involved restructuring, changes in school governance and introduction of new curriculum (Galton et al., 1999; Clement & Vandenberghe, 2001; Fullan, 2001; Galton & MacBeath, 2002; Churchill & Williamson, 2004; Gardner & Williamson, 2004; MacBeath & Galton, 2004; Williamson & Myhill, 2008; Ballet & Kelchtermans, 2009). All these factors have individually or jointly led to increased workloads of teachers (Galton et al., 2002; Gardner & Williamson, 2004), lowered levels of teachers' job satisfaction (Day, Sammons & Gu, 2008), and above all, heightened teachers' stress and anxiety levels (Rick, 2000; Floro & Miles, 2003; Miles, 2003). It is generally lamented that: "it is a pity that so much money spent on enforcing reforms could not have been spent on making schools tolerable workplaces for professionals, not to mention comfortable places for children to spend many hours each day" (Rick, 2000, p.2). In addition, evidence also points to an obsession with schools as 'a place for children' and a complete disregard that schools are 'workplaces for adults' (Johnson, 1990; Hargreaves, 1994; Rick, 2000; Kutcy & Schulz, 2006). Teachers are frustrated by lack of funds to support teachers in teaching (Roblyer & Erlanger, 1999; Giacomino & Gose, 2002; Hargreaves, 2003; MacBeath et al., 2005), administrators' lack of understanding of the nature of teachers' work (Bascia, 1996); failure to clearly identify the boundaries of the teacher's professional life; and, the teachers difficulty in balancing personal and professional lives (Biddle, Good & Goodson, 1997; Kutcy & Schulz, 2006). Teachers' work is real work (Williamson & Poppleton, 2004), and also is emotional work (Aspin, Chapman & Klenowski, 2001; Kelchtermans, 2005; Bullough, Bullough & Mayes, 2006), and the nature of teachers' emotional work is related to each

individual teacher's professional motivation (Chen & Addi, 1992; Chen & Sun, 1994; Song & Wei, 2007), each teacher's professional identity (Day, 1998; Jones, 2008), and each teacher's ability and willingness to change or adapt in the context of numerous and often ill-timed educational reforms (Ball & Goodson, 1985; Goodson, 1992; Hubermann et al., 1993; Bascia, 1996; Goodson, 1997; Hargreaves et al., 2001). Teachers also understand and experience their work differently, and may attempt to elucidate on the nature of their work through metaphors. To understand the context of the metaphors in teachers' work life, is also thus, a motivation for the study of teacher time-use.

The centrality of time as a concept in teaching activities raises key problems such as: how time is defined, how teaching and non-teaching activities are classified, how time is allocated across activities and days of the week, the nature of the evidence on time-use, why teachers need more time, how teachers experience time, how teacher activity time can be modelled, and the policy implications of teacher time-use. To answer these questions and similar related questions, it is imperative that the definition of time and the classification of activities yield meaningful categories (Avery et al., 1996; Shelly, 2005) that have significant and practical policy recommendations (Abramson, 1991; Hessing, 1994; Dondero, 1997; Drago et al., 2001). These policy recommendations rely heavily on accurate assessment of the time taken to complete set tasks.

The time taken to complete tasks is usually recorded using time diaries. However, in the measurement of activity time, using time diaries, is often difficult to get an accurate assessment of time devoted to primary, secondary and tertiary tasks. The allocation of time to primary, secondary and tertiary tasks depends on individuals' assessments of the role, responsibilities or domains of their work. In the case of teaching, for example, teachers generally view teaching students as a primary task. Maintaining positive behaviour in school could be considered secondary and communication to parents on how school reform

influence teaching and other areas of classroom practice would indeed be considered a tertiary activity (Churchill & Williamson, 2004). The difficulty in delineating primary, secondary, and tertiary tasks; and, the performance of activities in monochronic time or polychronic time, is often compounded by the lack of separability between physical activity and mental activity. In the case, for example, where teachers are involved in decision-making and school-planning, most work will comprise mental activity and then translate (later) to physical activities or even further managerial activity. Avery et al. (1996) argued that the simultaneous occurrence of mental and physical activity makes it difficult to obtain an accurate assessment of the allocation of time.

Nonetheless, time diaries have remained the main instrument in the measurement of activity times (As, 1978; Robinson, 1985; Juster & Stafford, 1991; Drago et al., 1999; Apps, 2002; Schwartz, Herz, & Frazis, 2002; Roth, Brooks-Gunn & Linver, 2003; Lindquist & Kaufman-Scarborough, 2007; Krantz-Kent, 2008; Wotherspoon, 2008). In using time diaries to collect teachers' activity data it is generally assumed that what teachers report in time-use diaries is reliable and useful in defining time, classifying activity categories and also profiling teachers' patterned activity behaviour over time (Roth et al., 2003; Krantz-Kent, 2008).

It has to be presumed that teachers have the same concept of time and categories of work activities such as those suggested in theoretical studies. As a result, the analysis of time-use patterns of Tasmanian teachers carried out in this thesis, using time diaries, should adequately reflect the phenomenon of time-use, the interpretation (definition) of time and the experience of time-use. The empirical techniques employed in this thesis are novel in that they focus on teachers' activities as well as daily time allocation and the extent to which teachers are overworked. Most significant is the fact that the technical analyses consider tradeoffs in time-use across days of the teaching week, as well as, weekend time. It is also presumed, therefore, that the benefits of analysing time-use in ways proposed in this thesis outweigh the cost of the

lack of “standard definitions and classifications of time categories that generally hamper generalisations across empirical studies and other comparisons across different cultures and time” (Avery et al., 1996, p. 412). More-so, in cases where the classifications are done by a qualified teacher with experience in the research field, then the definitions and classifications that emerge are informed strongly by professional practice. In that regard, the displayed patterned behaviours of teachers, with respect to time allocation, are more likely to be credible in the absence of a standardised instrument with which to collect data on teachers’ time-use. The classifications, provided in the dataset used in this thesis, were done by a qualified or trained researcher (Gardner & Williamson, 2004).

This thesis is motivated by the noticeable absence of a theoretical and empirical model of time-use across teachers’ activities in the literature, in general. In particular, given the dearth of evidence of how teachers allocate time across a myriad of competing activities, it is motivating to establish a conceptual, analytical and empirical framework that allows or enables one to: (i) identify the key determinants of time-use by teachers, and (ii) draw implications of that time-use for the workloads of teaching. Equally motivating is the desire to set up the analytical framework in such a way that allows the use of mixed research methods where required. This motivation is significant given the noticeable absence of mixed research methods in efforts aimed at understanding teachers’ roles, time-use and the impacts of time allocation decisions on teachers’ work lives (Johnson, 1990; Lieberman & Miller, 1999; Day et al., 2008; Huntly, 2008; Williamson & Myhill, 2008).

1.3 Research Problem, Questions and Objectives

Teachers are forever working to control and/or manage an already overwhelming variety of complex, interrelated tasks (Perlow, 1999; Goddard, 2000; Williams & Gersch, 2004; Kutcy & Schulz, 2006; Melnick & Meister, 2008). Each of these tasks has its own time requirement,

and each [time requirement] meshes with the time requirements of other tasks with varying degrees of ease and complexity (Lakoff & Johnson, 1985; Stark, Lowther & Austin, 1985; Hargreaves, 1990; Davies, 1994). The total time available for a teacher's activities at school, and the configuration (sequencing) of the activities creates a system of time-use that must interrelate to the time clock used by the school administration or school management (Adler, 2002; Weiss & Brown, 2003). The administrator's time clock is in turn connected to the school time clock (Cuban, 1995). However, schools do not exist outside and without communities – hence the school time is also intricately linked to community time (however defined). Community time is linked to political time.

It is clear from this brief and over-simplified analysis that time allocation by a teacher represents a fragment (although the most important fragment) of a complex system of allocating labour resources (as an input to) organised production in order to produce tangible or intangible output (Raju & Srivastava, 1994) from schooling. How the teacher uses their time to convert inputs to outputs is a fairly complex research problem. This complexity of teachers' time-use is often illuminated in the literature through the use of a metaphor of time as an old-fashioned clock (Hargreaves, 1990; Cambone, 1994; Cuban, 1995; Giacomino & Gose, 2002; Stoll, Fink & Earl, 2003; Weiss & Brown, 2003; Krantz-Kent, 2008). In this metaphor the teacher's time is represented by the small gears that mesh to form subsystems which in turn interlock to form increasingly larger systems (Graham, 1981; Lakoff & Johnson, 1985; Stark, Lowther & Austin, 1985; Hargreaves, 1990; Kaufman, Lane & Lindquist, 1991; Bluedorn, Kaufman & Lane, 1992; Cambone, 1994; Bluedorn & Denhardt, 1998; Collinson & Cook, 2001). Time for teachers is represented as a group of interconnected gears and that the system of gears is connected to the time for administrators. Administrators' time then forms the next set of larger gears that create another system of interconnected gears which interweaves with the systems of gears that control or leverage school time and political

time. The list of connections is quite extensive (Kaufman-Scarborough & Lindquist, 1999; Stoll, Fink & Earl, 2003; Lindquist & Kaufman-Scarborough, 2007). A schematic diagram illustrating these gears and clocks is provided in Figure 1.1. From this illustration one can draw some simple implications of school reform on teachers' time allocation, workloads and work lives. For example, it follows that successful school reform will require consistent reconstruction of time as understood by the community, administrators and teachers, and other stakeholders (Cambone, 1994). These stakeholders must make informed time allocation choices and become increasingly creative at using the ever-shrinking time for school-based learning (Stark, Lowther & Austin, 1985; Bluedorn & Denhart, 1988; Lafleur, 2001, cited in Stoll, Fink & Earl, 2003, p.41; Weiss & Brown, 2002; Krantz-Kent, 2008).

The complexity of teachers' work and teachers' time-use captured using the metaphors of interconnected gears of a clock, also synchronises with other metaphors for describing teachers' work and how teachers experience time in and outside school. As much as these metaphors help illuminate a complex problem of teachers' time-use, and impacts of educational reforms, there is an observable absence of a theoretical and empirical model that ties together, as neatly as possible, all or most of the metaphors of teachers' time use. The construction of such a theoretical and empirical model is thus attempted in this thesis.

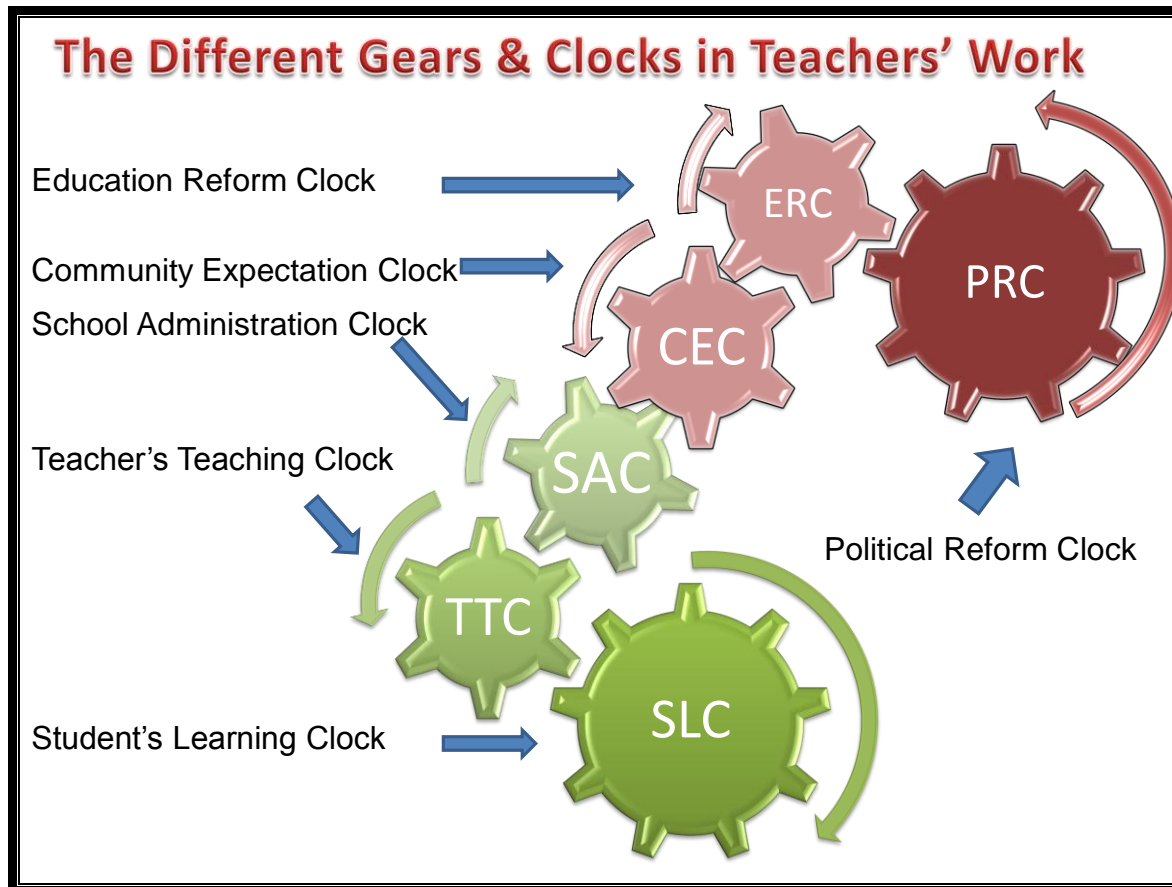


Figure 1.1 The Gears and Reform Clocks that Affect Teachers' Work

In constructing such a theoretical and empirical model it is important to recognise that the problem of time allocation [or time-use] is not a new concept and/or problem in education (Denham & Lieberman, 1980; Stark, Lowther & Austin, 1985; Brown & Saks, 1987; Drago et al., 1999; Acker, 1992; Huberman 1993; Nelms, 1993; Campbell & Neill, 1994a; Campbell & Neill, 1994b; Livingstone, 1994; Huberman, Thompson & Weiland, 1997; Acker, 1999; Collinson & Cook, 2001; Yamagata-Lynch, 2003; Williams & Gersch, 2004; Gardner & Williamson, 2004; Cinamon & Rich, 2008; Huntly, 2008; Krantz-Kent, 2008; Williamson & Myhill, 2008; Ballet & Kelchtermans, 2009). However, what particularly complicates the theoretical and empirical model is that the speed of school reforms and the relatively rigid structures of schools place the time allocation problem at the centre of decision-making for

teachers, administrators, communities and schools (Gordon, 1955; Dinham, 1985; Dinham & Scott, 1997; Churchill, Kelly & Mulford, 1999; Stoll, Fink & Earl, 2003; Gardner & Williamson, 2004; Rice, 2005; Williamson & Myhill, 2008). The use and management of time for all stakeholders thus comes to the forefront of research.

The practical implication of understanding school time, political time and the teacher's time allocation problem are becoming increasingly evident as seen in how an increasing number of teachers, administrators and education policy makers have begun searching for ways to find time for teachers to do important work of restructuring while they continue to teach (Churchill, Williamson & Grady, 1997; Dinham & Scott, 1997; Dinham & Scott, 1998; Smyth, 2001; Stoll, Fink & Earl, 2003; Churchill & Williamson, 2004; Rice, 2005). Involvement in a series of professional development courses has, thus been seen as one way of getting teachers involved in school and curriculum restructuring. These extra non-teaching roles have created an additional time pressure for teachers, as they try to cope with reforms, focus on professional development for the short-lived curriculum changes, and still find time for face-to-face teaching in the classrooms. The reforms and new domains of teachers' work have significant implications on teachers' workloads (Churchill, Williamson & Grady, 1997; Galton & MacBeath, 2002; Gardner & Williamson, 2004; Williamson & Myhill, 2008). The reforms have an impact on teachers' time-use inside and outside school, and also erode the productivity gains from any break time available to teachers – particularly uninterrupted break-time (UBT).

It is important therefore in this thesis to put the research problem of teacher time-use (and its supporting theoretical model) in context, support the research problem with relevant research questions, identify research objectives that can be accomplished within the confines of the structure and data used in this thesis, showcase the novel ways of conceptualising the research problem; and, evaluate the research problem empirically.

1.3.1 Research problem

Time is largely an agreed convention that allows most individuals to structure their lives temporally and spatially. The activity patterns that individuals pursue define how their lives are structured temporally and occur in a spatial context. Time allocation over space then becomes the phenomenon with which individuals structure their way of thinking and action. The individual attaches meaning to the time used and, as such, time then becomes a collective subjectivity (Smith & Scott, 1990; Clement & Vanderberghe, 2000; Michelson & Harvey, 2000; Kaff, 2004; Yamagata-Lynch & Haudenschild, 2009). It is important, therefore, to look at how teachers allocate time to various tasks and also attach meaning to time. Developing and evaluating a model that captures teachers' allocation of time to a myriad of activities inside and outside the school is, therefore, the research problem that is explored in this thesis.

The literature suggests that teachers view time through three theoretical lenses: (i) the personal and social construction of time (Gaskins, 1988), (ii) time as a variable (input) in teaching and learning (Denham & Lieberman, 1980; Stark, Lowther & Austin, 1985; Demfer, 1987; Raju & Srivastava, 1994; Millot, 1995; Collinson & Cook, 2001; Reeves, Emerick & Hirsch, 2006; Rivkin, Hanushek & Kain, 2005; Day, Sammons & Gu, 2008), and (iii) time as a political variable (Mortimore & Mortimore, 1998; Kutcy & Schulz, 2006). These three constructions of time are dependent on each other and therefore must coexist. These three lenses generally provide a good starting point for the discourse on the time dilemmas of teachers (Robinson, 1990; Romeo, 1993; Pollock, 1994; Millot, 1995; Hochschild, 1997; Cinamon & Rich, 2005; Jones, 2008).

Most of the discussion on how teachers manage their time centres on (i) how educational change affects teachers' work lives (Sparks, 1988; Churchill, Williamson & Grady, 1999; Collet, Menlo & Rosenblatt, 2004; Williamson & Myhill, 2008), and (ii) how teachers respond to educational change to their work ethic and/or environment (Easthope & Easthope,

2000; Churchill & Williamson, 2004; Hurley, 2004; Gardner & Williamson, 2004; Poppleton & Williamson, 2004). To understand how teachers view change, in the context of time, three general constructions of time are required. These are: (i) technical-rational time, (ii) phenomenological time, and (iii) cyclical time (Swain & Swain, 1999; Black, 2001; Gardner & Williamson, 2004; Jones, 2008). It is important to understand teachers' time-use in the context of current school reforms that sweep across the education system (landscape).

The research problem is set, therefore, in the context of the problem of allocating time across a range of activities that teachers perform. Negotiating uses of time is certainly not an easy task in modern workplaces (Johnson, 1990; Holder & McKinney, 1992; Leonard, 1999; Krantz-Kent, 2008), especially given the pace of reform (Churchill, Williamson & Grady, 1999; Churchill, Williamson & Grady, 1999; Moran, Dallat & Abbott, 1999; Hargreaves & Goodson, 2006), increased demands for accountability (Galton & MacBeath, 2002; Williamson & Myhill, 2008), the teachers' own learning (Yamagata-Lynch, 2003; Lohman, 2006; Yamagata-Lynch & Haudenschild, 2009), and the multiple roles that teachers must accomplish, in addition to their teaching responsibility (Williamson & Cowley, 1995).

1.3.2 Research Questions

How teachers' working time is used raises important questions about getting value for money, the 'kind of school management' that does or does not work (Rosenshine & Berliner, 1978; Gettinger & White, 1979; Rutter et al., 1979; Heath & Clifford, 1980; Hatton, 1987; Johnson, 1990; Goddard, 2000; Williams & Gersch, 2004; Kutcy & Schulz, 2006; Painter, Haladyna & Hurwitz, 2007), and outcomes from schooling and how these outcomes relate to teachers' time-use (Rivkin, Hanushek & Kain, 2005; Day, Sammons & Gu, 2008; Ingvarson, Meiers & Beavis, 2005). It is key to understand, for example, what proportion of a teacher's time is spent on 'low-level tasks that do not require skills of relatively well-paid graduates' (Campbell & Neill, 1994a; Campbell & Neill, 1994b), or what proportion of a teacher's work

is done during weekends (Collinson & Cook, 2001; Gardner & Williamson, 2002; Krantz-Kent, 2008; Ngwenya, 2009a; Ngwenya, Williamson & Gardner, 2010a). Equally important is identifying key factors that influence teachers' time-use. The empirical techniques used to extract these key factors must be robust and reliable. It is important to use, therefore, complementary empirical techniques to describe the pattern of teachers' time-use.

In the context of how teachers allocate time, the research questions addressed in this thesis are:

1. What is the profile of time-use by Tasmanian teachers during a typical week?
2. What types of main tasks or activities are performed by Tasmanian teachers, and how many of these tasks (activities) are performed in a typical week?
3. What factors determine the number of activities undertaken by Tasmanian teachers during a typical week?
4. What are the determinants of time allocation by Tasmanian teachers?
5. What complementary models can be used to describe and analyse the pattern of time use by Tasmanian teachers?
6. To what extent are primary school teachers in Tasmania working overload?
7. What are the key determinants of the overload status of Tasmanian primary school teachers?
8. How can the complexities of teaching be described and encapsulated in a model, using research questions (1) through (7)?
9. What policy setting can be considered in order to improve teachers-well-being or work lives, through time allocation decision-making?

So, how are these particular research questions and similar derived questions to be answered? In short, these questions are answered by analysing daily diary data on workloads of Government school teachers and allied educators in Tasmania (Gardner & Williamson, 2004). The data from the Gardner and Williamson (2004) study are suitable for this thesis because the data: (i) are captured using a questionnaire (structured interviews) to extract detail on a range of teacher and school characteristics; (ii) include daily diaries of teachers' activities over a typical week; (iii) are the most current data on workloads of Tasmanian teachers; (iv) were collected, coded and verified by a qualified, experienced teacher, who holds a Doctorate in Education and has researched, extensively, Tasmanian teacher's work-lives, roles and educational change. In addition, the Gardner and Williamson (2004) study is the first independent study of workloads of Government school teachers and allied educators in Tasmania, and is the most recent study of teachers' workloads in Australia. An extract of an Executive Summary of Gardner and Williamson (2004), and the research instrument used are presented in Appendix A through Appendix C.

What specific methods are used to answer the research questions? To be specific, what is done to produce the results used to answer the research questions? What are the answers to the research questions? An empirical work is proposed to support both the conceptual and analytical frameworks. This empirical work uses existing data to address the research problem – the time-use of primary school teachers in Tasmania. The empirical examination of the Tasmanian data on teachers' time-use is quantitative (descriptive and inferential), and has significant policy implications.

1.3.3 Research Objectives

In order to provide answers to these research questions, the research objectives are stated. Empirical evidence is amassed from the broad primary literature. The studies covered in the broad primary literature provide a basis for developing the conceptual and analytical framework for evaluating time allocation by teachers in Tasmanian schools. The objectives of this thesis are as follows:

1. to review the literature on time use in general, and time-use by teachers in particular;
2. to provide a conceptual framework of teachers' time-use,
3. to construct a metaphor that captures the complexities and realities of teachers' work lives.
4. to provide an empirical framework of teachers' time-use,
5. to re-examine time-use data in an earlier study (Gardner & Williamson, 2004),
6. to re-analyse the profile of time-use in Tasmanian schools in the context of an established analytical framework, and constructed model, using available data,
7. to evaluate, empirically, a model of teachers' time-use by incorporating qualitative and quantitative variables, and,
8. To draw simple effective policy recommendations with regard to teacher time allocation behaviour.

In the thesis, the central focus is on looking at teachers' input in terms of the time allocated to the various activities that teachers perform. This allocation of time also represents the workloads of teachers. The differences in the time allocated to various activities within schools and between schools are also explored. The only original / raw data available are those from the Gardner and Williamson (2004) study. Availability of such original data enables:

1. extending the earlier work by Gardner and Williamson (2004) in this thesis;
2. identifying any new policy implications that arise from the new analyses of the data;
3. showing competing and complementary ways of analysing teachers' time-use data,
4. analysing the growing problem of teacher work overload,
5. identifying additional variables that may need considering, in the event of a further study on Tasmanian teachers' work lives; and,
6. developing a novel metaphor that is supportable by a theoretical as well as an empirical model.

Given the research questions and research objectives outlined earlier, and the general literature on time-use, it is important to describe in general terms how teachers allocate time to the myriad of activities that they perform. A conceptual model of teachers' work must, therefore, look at the type and number of activities that teachers perform, and the amount of time allocated to these activities over a defined space and time. There is a strong presumption that is maintained here; that is, the variation in types of activities performed by teachers indicates the variation in the roles teachers play in schools, and outside schools. It is worth reflecting how these roles are accomplished – are the roles performed in a polychronic or monochronic way? Whether or not the roles are polychronic or monochronic it is imperative

that teachers' time allocation behaviour be cast in a manner that showcases how time is both a resource and a constraint. Most important is also indicating that teachers' activities are also location-specific, and different schools and classes will have their unique demand on time, in the form of either a resource, constraint or both.

Certainly, teachers' time allocation behaviour will also depend on teachers' socio-demographic characteristics, school characteristics, and non-school factors. Data on these factors and characteristics must be collected using instruments of known validity and reliability. Time diaries have been identified as suitable instruments for collecting data on teacher time allocation behaviour. The use of questionnaires in collecting data on teachers' work is an old tradition (Flickinger, 1932).

Data are collected for both quantitative and qualitative variables. The conceptual framework of teacher time allocation supports a mixed-methods type of analysis, where required. The conceptual model is then cast in a way that allows analytical representation of variables and the empirical estimation of factors that influence time-use by Tasmanian primary school teachers. Key pitfalls in using time diary data are noted and avoided in the conceptual model and the accompanying empirical analyses.

1.4 Conceptual, Analytical and Empirical Frameworks

1.4.1 The Conceptual Framework

The conceptual model developed in this thesis is focussed on the activities of individual teachers and considers what the teacher does during school and out of school hours. To make the activities easy to track, the issue of the teacher's role is presented using a set of simple dichotomies that accord the flexibility to place a teacher in only one of several spatial units (for example, in the school or out of the school; or, in the classroom or out of the classroom). In the framework it is assumed that the teacher is rewarded financially through involvement

in teaching as work. In addition, the teacher is rewarded in personal ways through his or her perception of the net non-financial rewards of teaching. The combination of financial and non-financial rewards of teaching make the teacher allocate time in any optimum way conceivable in order to attempt to undertake a core task – increasing engagement time with the learners. A list of activities undertaken in the school, classroom and ultimately at the core of the teacher's engagement is generated. The classroom, in its 'cathected form' (Lortie, 1975) remains the "most meaningful locus of action for both teachers and pupils ..."

(Huberman, 1993, p.18). The classroom is often construed as not only the "main source of self-esteem and fulfilment but also vulnerability" (Osborn et al., 2000, p.50), frustration and a source of significant role conflict (Rice, 2005) and emotional labour (Shalem, 1992; Hargreaves, 1997; Doherty & Mayer, 2003; Sutton, 2005; Trevaskis, 2006; Ayako, 2008; Sammons et al., 2007; Jones, 2008). It is this emotional labour, role conflict and vulnerability that also puts teachers' work under pressure – under 'constant bombardment' (Williamson & Myhill, 2008) from the thumbprint of educational reform.

A skeletal shell of the conceptual model is shown in Figure 1.2. It is maintained in this thesis that dichotomising teachers' work and placement produces a skeletal shell that looks like a thumbprint. The venue of the application of the centre of pressure of the teachers' thumbprint is the classroom. The metaphor of a teacher's thumbprint is then used, therefore, to show all the strong points in the design of the conceptual framework. A detailed description of the structure of the conceptual framework is presented in Chapter 3.

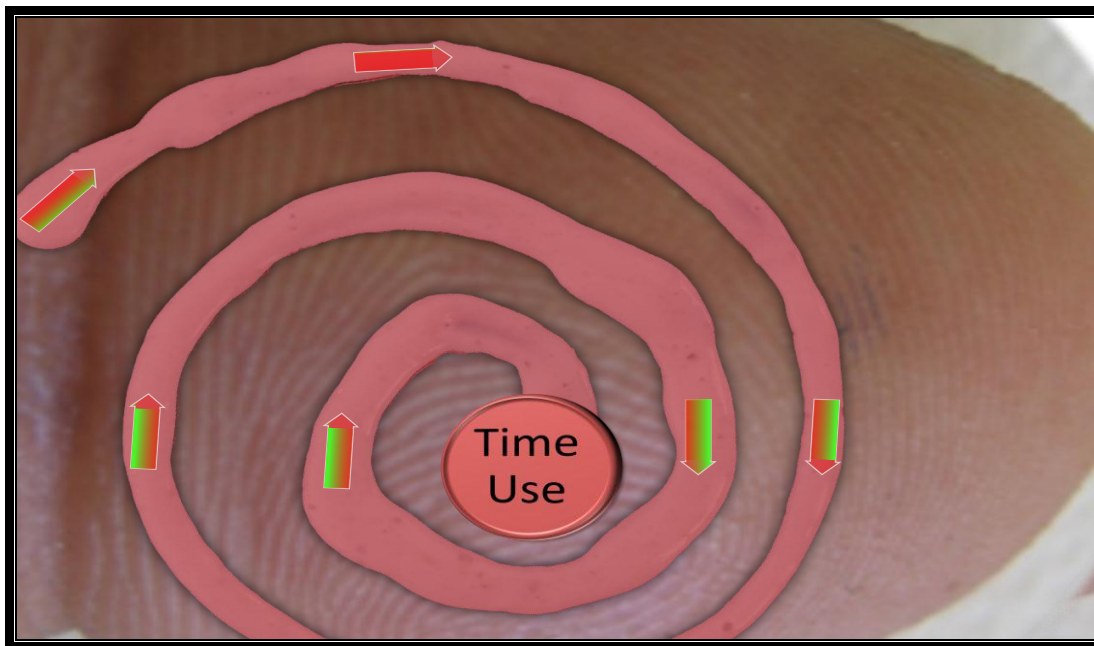


Figure 1.2 Conceptual Framework for the Analyses of Teachers' Time-Use

The skeletal shell shown in Figure 1.2 is used to: (i) develop an analytical framework for computing the total time expended on each of the activities, (ii) describe the time allocated to each of the activities, as well as the time allocated to a typical day or week of teaching, (iii) highlight the significant efforts teachers make in order to create conditions conducive to learning and subsequent achievement in schools (through engagement time), and (iv) create an appreciation of the realities of teachers' work. The skeletal shell is at the core of the focus of the thesis – describing the time use of primary school teachers in Tasmania. For example, in Figure 1.3, teachers work with the school and the community, pursuing their own professional development, teaching alone or teaching with others in a classroom environment with the aim of generating as much engagement time as possible (Mulford & Edmunds, 2009; Mulford & Edmunds, 2010). So, in Figure 1.3 the clockwise spiral takes engagement time away from the core, and teachers and the system in these hard to staff schools have to make every endeavour to public learning (Good, Clark & Clark, 1997; Ingersoll, 2001; LaGrange et

al., 2001; Ingersoll, 2004; MacBeath et al., 2006. The arrows shown, in Figure 1.3, represent therefore the desired net – result of teachers' efforts.

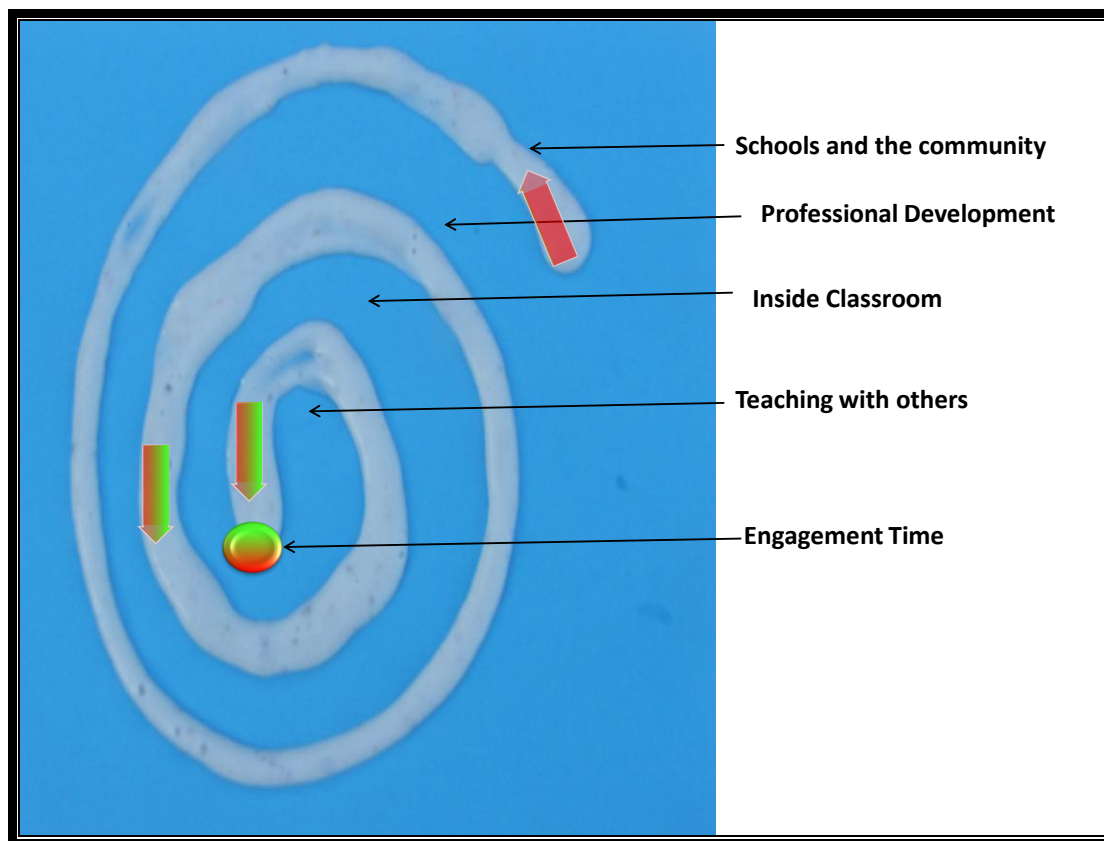


Figure 1.3 Locus of Teachers' Activities Inside and Outside Hard to Staff Schools

However, the scenario captured in Figure 1.3 is for teaching in hard to staff schools, similar to those described in Woofter (1917), Steffy and Wolfe (2001), Woodward & Munns (2002); Lashway (2003), Munns (2007) and Kirkgoz (2008). In order to conjure an image of teacher struggle (similar to the struggles observed in other disciplines, (see Parker, 1980; MacFarlane, 1990)), the spiral in Figure 1.3 runs anticlockwise. The arrows, representing teachers' endless effort are also in an anticlockwise direction. In order to maintain the connection between time and gears – consolidate an image of time-use in clocks, a clockwise direction of rotation of the clock is presented. The core is where the crux of learning is assumed to occur. The model of anticlockwise directionality is a heuristic designed to capture

the various difficulties encountered in achieving an endowment of academic learning time, through purposeful time-on-task and engagement time in the hard to staff schools.

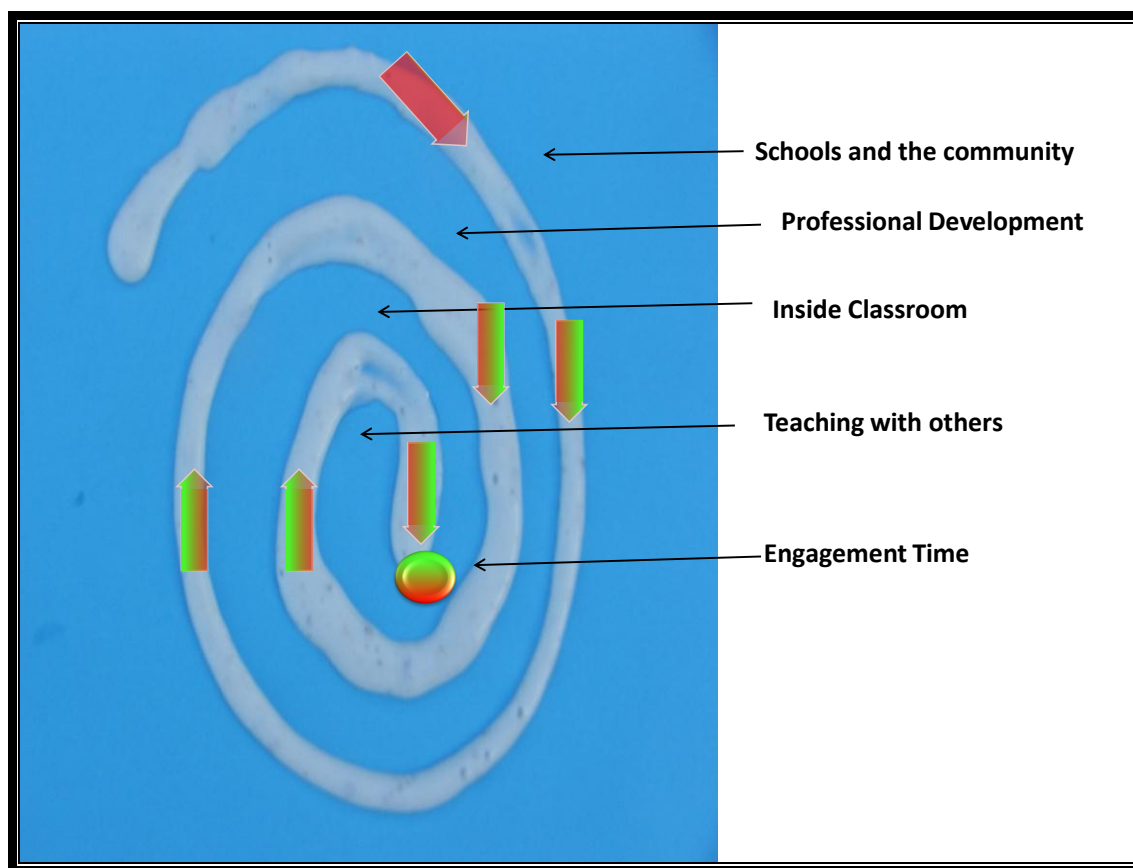


Figure 1.4 Locus of Teachers' Activities Inside and Outside Good Schools

In Figure 1.4, the whorls still spin clockwise, and thus generate a current that carries the also clockwise net rewards of teaching in such a way that provides the attainment of academic learning time (effective engagement time and /or time-on-task (Woodward & Munns, 2003)). Figure 1.4, as a heuristic represents, therefore, a skeletal shell of the eventual or desirable locus of teachers, time-use in the not so-hard-to-staff schools (Good, Clark & Clark, 1997; Smith, 2000; Ingersoll, 2004; MacBeath et al., 2006; Rocha, 2007).

Additional, examples of the imagery of the teachers' thumbprint are presented in Chapter 3. These images extend the application of the teachers' thumbprint model to explain time allocation behaviour of part-time teachers, relief teachers, and paths towards teaching

competencies (to name a few, (see Perrachione, Rosser & Petersen, 2008)). Engagement time and time on task are at the centre of the teachers' thumbprint, as required in the theoretical premise by Johns et al., (2008) and Masci (2008) where teachers battle as they struggle to help 'remedy lost time-on-task' (ASCD, 1982; Smith, 2000; Masci, 2008).

The model of the teacher's thumbprint can also be viewed in the context of the six professional life phases (PLPs), as developed by Sammons et al., (2007). These PLPs include "commitment (support and challenge), ..., identity and efficacy in classroom, ..., managing change in role and identity, ..., work life tensions, ... [and] ..., declining motivation and ability to cope with change ..." (Apple & Jungek, 1990; Reynolds, 1992; Shalem, 1992; Graham, 1993; Talbert, 1993; Clandinin et al., 1995; Sumara & Luce-Kapler, 1996; Collinson & Cook, 2000; Lynn, 2002; Vogt, 2002; Webb et al., 2004; Sammons et al., 2007, p.686; Basol & Bardakci, 2008; Jephcote & Salisbury, 2009; Webb et al., 2009). Teachers go through development stages that are "associated with increased effectiveness – from being a novice through to advanced beginner, competent, proficient and expert" (Baldwin, 1934; Chapel, Leask & Turner, 1997; Johnston, McKeown & McEwen, 1999; Duggleby & Badali, 2001; Ejieh, 2003; Sammons et al., 2007, p.686). Day, Sammons and Gu (2008, p.337) found "a relatively greater decline in commitment among late-career teachers ... [and that] ... teachers in their early years were, in relative terms, no more or less committed than teachers in their middle years" (Lynn, 2002; Day, Sammons & Gu, 2008, p.337). It is important, therefore, to examine time allocation behaviours of teachers using socio-demographic and school variables as much as they can be supported by theory and data.

1.4.2 The Analytical Framework

In order to examine the conceptual framework, there is need to develop an analytical framework. The analytical framework houses the variables that operationalise the concepts in the conceptual framework. Once the concepts are presented in the form of variables capable

of being measured and/or observed, then data are gathered for these variables. In order to provide a clear linkage between the conceptual and the analytical frameworks the following key variables are used in the framework. First, activity times are calculated – these are called *activity budgets*. Second, the command of time resources imposed by each of these activities is calculated. This time-command or time-thirstiness of activities is referred to as *the activity share*, and simply shows each teacher's relative time expenditure on each activity. The time-share of each activity is a fraction of total time available that is spent on that activity. Third, the number of activities undertaken by a teacher is also calculated. Fourth, in addition, the activities of teachers have a daily time requirement which is expressed as a daily *time budget*. Fifth, these daily time budgets are then transformed to daily *time shares*. The daily time shares highlight the relative use of teacher's time across the days when school-related tasks are performed. Sixth, the cumulative time budget for a typical week is calculated. This cumulative time budget presents the teachers' *weekly budget*, and any amount of time in excess of the time required by the Department of Education (the education system) represents the extent of overload. Data for each of the above variables, and other variables chosen on the basis of evidence from primary literature, are then collated and used to give empirical support to the conceptual model.

1.4.3 The Empirical Framework

In this section a brief overview of the empirical (econometric) framework that is used to (i) address the research problem, (ii) provide answers for the research questions, and (iii) address the research objectives, is presented. In analysing the time-space allocation behaviour of teachers it is important therefore to integrate teaching activities, space and time in one single modelling framework. A detailed account of the empirical framework that captures teachers' time-use in one single modelling framework is presented in Chapter 4 of the thesis.

The econometric methodology used to analyse the use of teachers' time, and time allocation involves calculating time budgets and time shares, and activity budgets and activity shares of the various activities that teachers perform. The activity time budgets capture the expenditure of total time that is diverted to a nominated activity. Activity time shares of each activity represent the fraction of total available time that is spent on that activity. The time budgets and time shares are then modelled as determined by teachers' personal, demographic characteristics, the school setting and a host of other variables. In the estimation, it is recognised that time shares are interdependent. Each time share equation is estimated separately, initially, using ordinary least squares (OLS) and errors-in-variables (EIVREG) regressions. The set of time shares is then estimated simultaneously using instrumental variables (IVREG) regressions, seemingly unrelated regressions (SUR) and multivariate regressions (MVREG). Given the problem of simultaneity in activities and joint allocation of time across activities, the estimation of time shares over a variety of activities is then considered – so the use SUR, IVREG and MVREG methods becomes important (Madalla, 1983; Dougherty, 1992; Greene, 1993; Griffiths, Hill & Judge, 1993; StatCorp, 2005; StatCorp, 2006; StaCorp, 2010).

In order to empirically evaluate the conceptual framework using daily diary data there is need to:

- Identify all the separate segments of time-use recorded for each teacher.
- Add the separate segments to obtain the total amount of time spent on a defined work activity or over a defined time period.
- Identify factors that potentially influence teachers' activity patterns.

- Calculate the relative effects of each factor on total time spent, on each activity, or during the given time period (Joyce & Stewart, 1999).
- Isolate the core factors that significantly affect work patterns (Walker & Woods, 1976),
- Show that the framework used for describing time allocation behaviours highlights, clearly where the tradeoffs in time-use are; and,
- Clarify the significance of the results from the point of view of the metaphor developed and the model it represents.

These are crucial steps in undertaking time-use modelling, and have been stressed considerably in the literature (Evans, 1972; Juster & Stafford, 1991; Joyce & Stewart, 1999; Stinson, 1999; Frazis & Stewart, 1999; Schwartz, Herz & Frazis, 2002; Floro & Miles, 2003; Kan, 2008).

The empirical work conducted in this thesis, thus looks at the key determinants of time spent on an activity by regressing time shares on selected regressors (note the use of the term regressors instead of independent variables). This distinction is important because some regressors could also be used as dependent variables where a system of equations is developed. Other regressors that can be used to explain time allocation by teachers include decision-making, roles undertaken during private time - outside schools (Chapin, 1976; Stark, Lowther & Austin, 1985; Brown & Saks, 1987; Apps, 2002; Gardner & Williamson, 2004; Floro & Miles, 2003; Cinnamon & Rich, 2005), gender of time allocators (Apple, 1986; Acker & Oatley, 1993; Beatty, 1996; Joyce & Stewart, 1999; Armenti, 2004; Frazis & Stewart, 2004; Krantz-Kent, 2005), multiplicity of roles (Easthope & Easthope, 2000; Goddard, 2000; Clement & Vandenberghe, 2001; Galton et al., 2002; Miles, 2003; Gardner &

Williamson, 2004; Williamson & Myhill, 2008), and stage in life cycle (Chapin, 1976; Crown, Levine & Nager, 1990; Clement & Vandenberghe, 2001; Krantz-Kent, 2005; Day, Sammons & Gu, 2008; Ballet & Kelchtermans, 2009).

1.5 Significant Contribution of Thesis

To the knowledge of the researcher no study has so far been attentive to:

- the conceptual framework for teachers' time-use inside and outside schools,
- the analytical framework for teacher time allocation behaviour,
- the empirical estimation of the problem of teachers' time budgets in the teaching profession,
- the empirical estimation of the problem of teachers' time shares in the teaching profession,
- conducting econometric estimation of time allocation in terms of the budget and time shares,
- identifying the key determinants of teachers' workloads using different definitions of work time,
- using various definitions of overload status to profile teachers' time-use,
- incorporating characteristics of teachers in different full time equivalent employment status in examining the determinants of the extent to which teachers are overloaded,
- identifying key factors that influence teachers' time-use, and,
- representing teachers' work in a metaphor of the teacher's thumbprint.

To the knowledge of the researcher no study has so far been attentive to combining the conceptual, analytical and empirical estimation of the problem of teachers' time allocation behaviour in the teaching profession. The thesis makes a significant contribution in these ten areas and also in other areas that include: contribution to knowledge; contribution to methodology; contribution to practice (making teachers and administrators aware of the determinants of time-use); and, contribution to policy (making policy makers aware of the link between time-use and workloads and the general ambience of teachers' work lives).

Time-use becomes a good proxy of workload. The thesis therefore adds more theoretical and empirical rigour to earlier studies on workloads of teachers. It is imperative that full cognisance be given to the fact that: teachers' productive activities change over time. Moreover, teachers come from households, and as their household characteristics change so does the teacher's contribution to the household (adjustments in space and time are required) and to the school. It is important to note that in studies on why people become teachers – the household model, although not explicitly studied, features predominantly. So, it should be a natural extension that a household model be applied to the way teachers allocate their effort to their work or tasks. The (principal) advantages of time as a measure of production are that: (i) time varies principally with the amount of work, (ii) time is a measure of work completed/done (but not the results of work accomplished); (iii) time is expressible in different units (which allows for time compression or time expansion), and (iv) time-use patterns can be extracted from data that are easy to collect (Chapin, 1976; Walker & Woods, 1976; As, 1978; Niemi, 1993; Lindquist & Kaufman-Scarborough, 2007), particularly using time diaries (Robinson, 1985; Juster & Stafford, 1991; Robinson & Bostrom, 1994; Drago et al., 1999; Joyce & Stewart, 1999; Herz & Frazis, 2002; Williamson & Gardner, 2004; Krantz-Kent, 2008; Wotherspoon, 2008).

Although time-use studies can be developed from data that are easily collectable, a descriptive analysis of time-use data is fairly limiting. Even though simple descriptive analysis contributes significantly to methodology, practice and policy, such analysis could be enhanced considerably by use of inferential analysis. It is in that regard that time-use data from Gardner and Williamson (2004) is further analysed in order to showcase the significant inferential aspects of teachers' time-use patterns. In order to use data that allow for confidence in the use of teachers' time budgets and time shares, a subset of data from Gardner and Williamson (2004) study is used. The subset of data focuses on primary school teachers. The focus on primary school teachers only is dictated by the number of degrees of freedom accorded by the data for the purpose of empirical evaluation, in the context of the empirical techniques employed. It is prudent to mention that results similar to those reported for primary school teachers also were produced for secondary school teachers, principals, TAFE teachers, technicians and teaching assistants. These results are not reported in the thesis, and for the sake of containing this thesis within reasonable length, the focus in this thesis is purely on primary teachers.

This thesis is focused on the meaningful classifications of activities of primary teachers in Tasmania, and the data thereof. It is significant to reiterate that these classifications were done by an experienced teacher and researcher. Given that teachers' time-use does not only occur in schools, it is thus important to look at time expenditure during working and non-working days. Data collected for each type of time period are important, therefore, in providing a better, general picture of the teachers' time allocation behaviour.

The thesis is significant in that it:

- presents a framework or model that links or interweaves the qualitative and quantitative approaches used in earlier studies on time allocation of teachers,

- investigates/analyses the workloads of teachers, quantitatively and qualitatively,
- examines how teachers make use of their time;
- identifies the factors or determinants of time-use by teachers,
- presents a model of time-use by Tasmania teachers using a framework that is general enough to be extended to areas in education and outside of education,
- shows the extent of teachers' overload in the context of fully-developed conceptual, analytical and empirical framework; and,
- builds a metaphor of the teacher's thumbprint, that is rich especially in the way in which the metaphor embeds other metaphors on teaching, learning, schools and educational reforms.

1.6 What Makes this Thesis Unique?

The major thrust of the thesis is: (1) constructing a framework for measuring total time used in the various activities that teachers perform (the teacher's thumbprint), (2) identifying the key variables that drive the allocation of time to the activities that teachers perform, (3) testing the framework empirically, using time shares of activities (using past qualitative and quantitative data), (4) recoding qualitative data (output) for mixed methods modelling, (5) analysing the time-use model for various Tasmanian primary and kindergarten teachers, and in particular checking how any specific variables affect the allocation of time by the various Tasmanian Education workers; (6) focusing on specific variables in relation to time-use, and then examining the significance of these variables, and the policy implications of these variables in terms of workloads or overloads in teachers' work; and, (7) constructing an empirical model that encapsulates a key metaphor of teachers' work. The differences in time allocated to various activities within the school also give additional meaning to time-use data.

1.7 Structure of Thesis

Following Chapter 1, a review of the literature is presented in Chapter 2. The literature reviews time-use and activity patterns, details teachers' experience of time in schools, looks at ways of modelling time allocation (time-use), and presents a summary of key findings from international and Australian time-use studies. In Chapter 3 a conceptual framework for teachers' time-use is presented. The framework shows key concepts that must be considered in time-use modelling and the use of mixed-methods research techniques in identifying determinants of teachers' time-use. The concepts presented in Chapter 3 are translated into variables in Chapter 4. A structural equation system for the analysis of time-use by teachers also is presented in Chapter 4. Techniques for analysing time-use data are highlighted. The data and variables required are also suggested. The results from the analyses of data are reported in Chapter 5. Empirical findings and selected detailed econometric diagnostics are discussed in Chapter 6. Concluding remarks are drawn in Chapter 7. A list of references is presented.

1.8 Conclusion

Time constraints are evident in most human activities, thus forcing individuals to make informed choices about time-use. Time in schools forces teachers to make choices subject to time being a resource and a constraint. It is therefore important to study how time is allocated across a range of activities performed by teachers. Teachers' time-use has implications for students' achievements, and teacher job satisfaction, among other factors. Teaching provides a source of income, and therefore teachers' supply of labour is part of a larger economic model of household decision-making and household allocation of time. In addition, teaching provides other non-financial rewards to teachers (Moran, Dallat & Abbot, 1999; Kutcy & Schulz, 2006; Painter, Haladyna & Hurwitz, 2007).

The use of time by teachers is a complex research problem that requires an understanding of the kind of activities undertaken by teachers (Collinson & Cook, 2001; Weiss & Brown, 2003). It is important, therefore, to identify the key determinants of time spent on teaching activities using stylised (common) facts from the literature on teacher time-use and evidence from previous studies on household time allocation. In this regard, an interdisciplinary and multi-method approach to time allocation by teachers is required. In this thesis a conceptual framework of teacher time-use is suggested (constructed). The framework is tested using data from the Gardner and Williamson (2004) study on workloads of Tasmanian education workers. The conceptual framework is translated into an analytical framework (with estimable models and structural equations). The estimation of the equations yields results that have implications for the workloads management of Tasmanian teachers. The analysis is unique in that it allows for the estimation of time-use equations in such a way that embeds the teachers' time allocation behaviour within a monochronic-polychronic continuum.

In this thesis time-use and the activities of teachers are described, and then explained using a suite of suitable regression techniques. In the explanation, one is looking for factors that tend to regulate the activity patterns of teachers' work. From a policy point of view it is important to investigate the likely impacts of the implementation of school reform on teachers' time-use, and the workload implications of that time-use. As noted in Ballet and Kelchtermans (2009, p.1), "education policy is increasingly driven by an economic logic in which efficiency and effectiveness are becoming important parameters". The relentless pressure to comply with requirements of economic rationality is not necessarily a good bureaucratic or administrators' thumbprint. The framework presented shows how teachers reconcile competing pressures from an unrelenting bureaucracy (Jephcote & Salisbury, 2009), and different reforms (Fullan & Miles, 1992; Good, Clark & Good, 1997; Hargreaves, 1997; Churchill, Williamson & Grady, 1999; Hargreaves, McCallum & Gipps, 2000; Skwarchuk,

2004; Ballet, Kelchtermans & Loughran, 2006; Ballet & Kelchtermans, 2009). The framework also provides a likely explanation for teachers' workload or work overload status (Bartlett, 2004), time-on-task requirements to improve student achievement (Smyth, 1981; MacBeath & Galton, 2004; Masci, 2008; Fischer, 2009), and also reconciles the notions or reflections obtainable from other metaphors of teacher's work (Cuban, 1983; Clandinin, 1985; Brause, 1987; Yearley, 1985; Smyth, 1992; Sztajn, 1992; Moore, 1993; Bullough & Stakes, 1994; Lorschach, 1994; Parks, 1996; Dooley, 1998; Goddard, 2000; Osborn et al., 2000; Hutchinson, 2002; Bowman, 2004; Goddard, O'Brien & Goddard, 2006; Kutcy & Schulz, 2006; Wolsey, 2006). In addition, the framework and econometric (empirical estimation, thereof) shows that the teachers' time-allocation behaviour can be altered by a policy that allocates sufficient useful and uninterrupted break-time (UBT). In that regard, the thesis links teachers' time-use to the literature on work productivity (Cochrane & Logan, 1975; Rosenshine & Berliner, 1978; Romer, 1987; Carlin, 1997; Dababneh, Swanson & Shell, 2001; Roth, Brooks-Gunn & Linver, 2003; Betchtold, Janaro & Sumners, 2004), and the literature on teacher effectiveness (Ferner, 1980; Benke & Roof, 1990; Talbert, 1993; Biddle, 1997; Stigler & Hiebert, 2004).

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, a synthesis of the empirical literature on time-use is presented. Focus is placed on the allocation of time to a range of activities at the workplace. The interest in this allocation, and its implications for workloads, is purely policy driven. An attempt is made to describe time allocation patterns through examining time-use by individuals in order to inform policy. An understanding of findings of past research on time-use will contribute to improving the development of a framework for examining the determinants of time-use over a range of activities. Livelihoods in all industrialised countries are scheduled on the basis of clock-time since clock-time serves as a basis of organisation in industry, schools, and business (Walker & Woods, 1976; Bluedorn & Denhardt, 1988; Garhammer, 1995). Transportation to and from these places, and the scheduling of social functions are examples of time-space-dependent processes. Time is of major significance in the cultural setting of industrialised society (Bluedorn & Denhardt, 1988). Individuals in industrialised societies are highly conscious of clock-time, and recognise the value of time as a resource as well as a constraint, and hence view time as money.

The concept of linear time offers a means for analysing the pattern or structure of human activity as observed in the present, and time-use patterns likely in the future. Time is used to record when an activity occurred, the duration of the activity, and the sequencing of the activity in relation to other different activities. Time is instrumental therefore to defining the signature of patterned activities of individuals as well as studying the structured life-ways of entire segments of a population (Ferge, 1972; Chapin, 1974; Chapin, 1976; Jacoby, Szybillo & Berning, 1976; Blaylock & Smallwood, 1987).

In addition, time measurements have been expected to give better measures of market work, improve understanding of labour supply (Klevmarken, 1999) and facilitate the planning of processes for activities and facilities required for time-uses. For example, transport planning has traditionally relied on time-use studies to model travel demand (Kitamura, Fujii & Pas, 1997; Crainic & Florian, 2008). Kitamura, Fujii and Pas (1997) use time-use data for transport planning policy – an activity based approach to travel demand modelling in Japan. Health promotion policy has also used this activity-based approach to encourage good health practices and healthy behaviours. For example, a time-use survey was used in assessing the impact of exposure to environmental factors on health as a result of different patterns of time-use (Klepsis et al., 2001). Time-use data have been collected extensively in various countries (Converse, 1972; Robinson, Converse & Szalai, 1972). These countries have included: Australia through the Australian Bureau of Statistics (ABS), the United States of America - the American Time Use Study (ATUS), and the Scottish Government through the Economic and Social Data Service (ESDS).

As noted in Chapin (1974), Chapin (1976), Davies (2001), and Probyn (2001), a critical dimension in describing activity involves observing things that people do in time and space. The spatial and temporal allocation of activity and how long the activity lasts have been a source of research interest for a considerable period of time (Blaylock & Smallwood, 1987; Bluedorn & Denhardt, 1988). Various social surveys on time allocation have been conducted and the results of these surveys have been instrumental in system-wide social planning. The empirical dynamics of time allocation and the constraints faced in time allocation have not received considerable empirical attention in the literature (Becker, 1965; Chapin, 1974; Neulinger, 1974; Chapin, 1976; Robinson, 1977; Juster & Stafford, 1985; Lakoff & Johnson, 1985; Connelly & Clandinin, 1990; Davies, 1994; Bluedorn & Denhardt, 1998; Goddard, 2000; Crainic & Florian, 2008; Krantz-Kent, 2008; Bittman, 2000). The complexity of human

effort has meant that the use of time allocation as a basis of monitoring human effort still has considerable limitations (Klevmarken, 1999). Particularly noted is that it is highly unlikely that time-use research will capture all considerations of consequences in studying interactions between individuals within any defined activity system (Chapin, 1974; Chapin, 1976). Certainly time has a bearing on scheduling of the activities and the coordination of relations between entities. However, time on its own does not give a measure of the substantive nature of the interactions observed but can be used as a medium for defining interactions among subsystems of activity systems (Chapin, 1976; Jacoby, Szybillo & Berning, 1976; Collinson & Cook, 2001). All activities involved in the interaction can be expressed in clock-time and/or calendar-time (Graham, 1981; Sharp, 1981; Bluedorn, Kaufman & Lane, 1992). Clock-time and calendar-time thus present a meaningful base measure (Chapin, 1976, Lakoff & Johnson, 1985; Adler, 2002); and, where feasible, clock-time and calendar-time can be used to compute rates and intensities of interactions (Jacoby, Szybillo & Berning, 1976; Collinson & Cook, 2001; Weiss & Brown, 2003).

Research also suggests that in Western societies or cultures or democracies, individuals have been trained to focus on undertaking one task at a time – and thus processing and using time monochronically (Bluedorn et al., 1999; Adler, 2002; Floro & Miles, 2003; Miles, 2003; Rose, Evaristo & Straub, 2003). Social norms dictate that men work monochronically and that women work polychronically – organising their time in nonlinear and non-separable manner (Brouwers, 1972; Manrai & Manrai, 1995; Frei, Racicot & Travagline, 1999; Persing, 1999; Waller, Giambatista & Zellmer-Bruhn, 1999; Floro & Miles, 2001). For example, women have generally been “acculturated into, compelled to, and/or have consciously developed the ability to perform multiple activities simultaneously” (Floro & Miles, 2003, p.10), and therefore have become adept at finding more time for a lot of things by tapping into their time reserves, through their polychronic use of time (Floro, 1995).

Women are, therefore, more likely to overlap their day-to-day activities than men (Lee & Waite, 2005). In addition, parenthood increases the likelihood to overlap activities, for both men and women.

Following this brief introduction, a brief synopsis of time and activities is given in Section 2.2. The synopsis is followed by an overview of the phenomenon of how teachers experience time, in Section 2.3. The multiple meanings of time to teachers are suggested and the teacher's view of time in the monochronic-polychronic continuum is suggested. Section 2.4 then presents a view of some of the thinking that may be undertaken in order to model teachers' time-use. Policy implications that flow from the literature and form a basis for an understanding of teachers' use of time are given in Section 2.5. A brief summary of the lessons learnt from the international and Australian literature on teachers' time-use is presented in Section 2.6. Concluding remarks are drawn in Section 2.7.

2.2 Time, Activity, Teaching and Learning and Time in Schools

Time has been a source of speculation for centuries and decades (Bevans, 1913; Shackle, 1958; Meier, 1959; Brause, 1987; Jacobs, 1998; Berliner, 1990; McGrattan & Rogerson, 1998; Drago, 2001; Shelly, 2005; Porterfield & Winkler, 2007); and, time enters into most concepts in natural sciences and social sciences (Kranz, 1970; DeSerpa, 1971; Chapin, 1974; Chapin, 1976; Parker, 1980; McFarlane, 1990; Zuzanek & Veal, 1999; Wolburg, 2001; Bittman, 2005; Krantz-Kent, 2009). The use of time as basis for studying social behaviour is a relatively recent development in social sciences (Chapin, 1976; Mueller, 1983; Anderson, 1984; Campbell & Neill, 1994a; Miller & Mulvey, 2000; Benavot & Gad, 2004). The theoretical significance of studying time centres around the notions of the allocation of time as a resource and also as a constraint (Kan & Fu, 1997; Jacobsen & Kooreman, 2004; Goulias & Henson, 2006). Time has been used as an accounting device for the study of social

behaviour (Meier, 1959; Becker, 1965; Klevmarken, 1999) throughout the history of time use research (Szalai et al., 1972; Gronau, 1977; Carlstain, Parkes & Thrift, 1978; Hornick, 1984; Kitamura, Fujii & Pas, 1997; Jacobs, 1998; Benabou, 1999; Stinson, 1999; Hetherington, 2001; Metcalfe & Ferguson, 2001; Wolburg, 2001; Bonke & McIntosh, 2005; Kitterod & Lyngstad, 2005; Day et al., 2006; Gonzalez-Chapela, 2006; Antilla, Oinas & Natti, 2009; Glorieux & Minner, 2009; Merz & Osberg, 2009; Robinson & Michelson, 2010; Goodin, 2011).

The interest in time allocation probably stems from the link between time allocation and workforce participation, and the link between time allocation and workplace location (Game, 2001; Gren, 2001). This link also ties an individual's wage rate for work done and the allocation of time for household income (Becker, 1965; Sulberg & Wong, 1992; Floro, 1995; Waterreus & Dobbelsteen, 2001). In spite of the early surge of interest in time allocation studies, interest in household time allocation behaviour declined due to the amount of qualitative and quantitative data required to analyse and solve time-use problems (Chapin, 1974; Juster et al., 1988; Juster & Stafford, 1991). The data generated are generally qualitative, and collected through narrative enquiry, content analysis, and conversation analysis, among a range of other qualitative techniques. These qualitative data were often supported by limited quantitative data. Quantitative data have been relatively easy to handle given the well-established routines for analysing quantitative data, as well as the generally acceptable issues regarding validity, reliability, authenticity and reproducibility. Unfortunately, qualitative data has not been easy to analyse. It is noted that no effort has been made in the literature to use qualitative data and the themes thereof, to inform models that rely on quantitative data.

2.2.1 Time and Human Activity

Activities are classifiable acts or behaviours of household or individuals that can be used as units of analysis in studying patterns displayed by individuals within a system (Anderson, 1971; Chapin, 1974; Tomlison et al., 1973). The collection of activities pursued by the individuals constitutes an activity system. An activity system represents the “patterned way in which individuals, households or institutions pursue their day-to-day affairs in a community and interact with one another in time and space” (Chapin, 1974, p.25). The activity system is generally complex but can be studied in terms of its institutional, economic, and human components.

For example, in the case of teachers’ work, teaching time is the actual doing of instruction and comprises the hours teachers spend trying to engage students in learning (Rosenshine, 1978; Rosenshine & Berliner, 1978; Rutter et al., 1979; Heath & Clifford, 1980; Gaskins, 1988; Hargreaves, 1990; O’Donoghue & Chalmers, 2000). Teaching time is supposed to constitute a large proportion of a teacher’s time. Teachers’ school-time is time a teacher spends in schools teaching and performing other teaching-related tasks or school administration tasks (Hargreaves, 1994; Raju & Srivastava, 1994; Yamagata-Lynch & Haudenschield, 2009). There is considerable debate, however, regarding ways in which teaching time is constructed, used, managed and controlled (Centra & Porter, 1980; Heath & Clifford, 1980; Anderson, 1984b; Burns, 1984; Wang, 1984; Johnson, 1990; Robinson, 1990; Marjoribanks, 1995; Michelson & Harvey, 2000; Collinson & Cook, 2001; Reeves, Emerick & Hirsch, 2006). The way teachers perceive time, and experience time is useful for understanding teachers’ workloads in the school system (Campbell & Neill, 1994a; Campbell & Neill, 1994b; Menter, 2000). The school environment is constrained by cyclical time – which represents the sociotemporal cycles that structure the routines and rituals of each individual school (Dreeben, 1970; Ross, 1984; Johnson, 1990; Galton et al., 2002; Weiss &

Brown, 2002; Lohman, 2006; Krantz-Kent, 2008). Basically, the school activities are generally structured around schedules that exhibit a structured periodicity.

2.2.2 Activity Analysis and Time Analysis

Activities require time to execute. The activities generally have a time stamp - a position in time - that is usually designated by the start time, a place in a sequence of events, and a fixed location or path in space, and a terminal point. The activities must also have a purpose or character, which can be used in establishing the taxonomy of activities in the classification system being evaluated (Chapin, 1976). For example, in the case of time-use by teachers, it may be important to establish a set of activities that comprise teachers' generic work (Hargreaves, 1994; Williams & Coles, 2007; Huntly, 2008; Ballet & Kelchtermans, 2009), or a set of activities that promote learning (Anderson, 1984c; Brown & Saks, 1987; Demfer, 1987) and activities that are completed effectively within a managed time period (DECCD, 1996; Dimmock, 2000; Giacomino & Gose, 2002)

2.2.3 Time and Activity Analyses

Teaching is an activity that falls into the general category of obligatory work (Drago et al., 1999; Ballet & Kelchtermans, 2009). The allocation of time to obligatory activities tends to affect the way in which individuals allocate time to a set of activities (Stone, 1972a; Gettinger, 1984; Hatton, 1987; Nelms, 1993; Romeo, 1993; Day & Leitch, 2001; Giltin, 2001; Giacomino & Gose, 2002). In the previous sections, time analysis and activity analysis were discussed, briefly and separately. It is useful, however, to examine time and activity simultaneously or jointly (Stone, 1972b; Floro & Miles, 2003; Rose, Evaristo & Straub, 2003). A useful concept that links time and activity is the time-budget for each activity (Gershuny, 1965) generally collected using time diaries (Boh & Saksida, 1972; Rosenbloom & Whittington, 1993; Robinson & Bostrom, 1994; Frazis & Stewart, 2004). A time budget is a detailed record of how individuals use their time over a defined time period, most typically

ranging from a single day to a week. The time budget contains information on the sequencing, timing and duration of an individual's activities across spaces (Stone, 1972b; Chapin, 1974; Chapin, 1976; Holy, 1978; Gardner & Williamson, 2004).

The analysis of time budgets tends to focus on activities undertaken separately – independent of other activities (Stone, 1972a; Stone, 1972b; Kan, 2008; Kan & Pudney, 2008). This practice, although informative, is nonetheless limiting because time-use in one activity generally represents tradeoffs in time-use in other activities (Gettlinger, 1984). Given the temporal and spatial coordinates of any activity, treated separately (on its own -independent of other activities), it is important therefore to integrate the teacher's various activities, their space and time, into one single modelling framework. This integration is attempted in Chapter 3 of the thesis through the construction of a conceptual model that encapsulates the teacher's objective function and constraints thereof – and is represented by the metaphor of the teacher's thumbprint.

2.2.4 Different Types of Time in Schools

In the analysis of activity over time, it is perceived that each activity has an allocated time. In the school system the allocated time is defined by the time scheduled for the learning activities. This allocated time is created or allocated mainly by the administrators. During the allocated time the teachers attempts to create effective engagement time or engaged time. Engagement or engaged time is the amount of time when a participant actually gives attention to whatever is being presented. Engaged time is a subset of time-on-task (Rosenshine & Berliner, 1978; Gaskins, 1988). Time-on-task is time spent on an activity when the participants are 'engaged in a specific kind of task', and the task must be related directly to the 'outcome or goal' of the learning being pursued (Centra & Porter, 1980; Gettlinger, 1984; Gettlinger, 1985; Demfer, 1987; Marjoribanks, 1995). It is important to note that allocated time is a subset of curriculum time - defined or construed as the time requirement for

creating, delivery and evaluating lessons (Stark, Lowther & Austin, 1985; Berliner, 1990) and thus represents planning, development and instructional time combined. Allocated time also includes intended instructional time - the number of hours during the school year that educational authorities expect schools to allocate for the teaching of all required (and optional) curriculum subjects (Berliner, 1990; Campbell & Neill, 1994a; Campbell & Neill, 1994b; Smith, 2000; Collinson & Cook, 2001; McFadden & Munns, 2002; Woodward & Munns, 2003; Reeves, Emerick & Hirsch, 2006; AERA, 2007; Munns, 2007; Rocha, 2007; Silva, 2007; Krantz-Kent, 2008).

Since teaching tends to be “tied to a traditional school year” (Smith, 2000; Krantz-Kent, 2008, p.52), the intended instructional time has three components: (i) duration of the working school year, (ii) the number of teaching periods, and (iii) the average duration of teaching periods (lessons) (Gettinger, 1984; Gettinger, 1985; Berliner, 1990; Ingersoll, 2003). In addition to the different types of allocated time, there is need to find time for non-instructional activities (Drago et al., 1999; Lohman, 2006), and activities that contribute to a teacher’s “personal and professional growth” (Nelms, 1993, p. 92; Ingvarson, Meiers & Beavis, 2005).

2.2.5 Time, Teaching and Learning and Why Teachers Need Time

Teachers are involved in a production system - they provide the inputs and the outcomes of their teaching (however measured) are the outputs. The input is in the form of facilitating students’ learning. Learning requires effort on the part of the individuals, communities and society. The organisation of learning time in schools is important for facilitating learning or making what is being learnt relevant, meaningful and engaging. As noted in Reeves, Emerick and Hirsch (2006, p.1), “time is the most critical working condition for improving students’ learning ... [and] ... is more important than leadership, empowerment, professional development and ... [other] resources”. Deep learning takes conscious effort, focused

attention and consumes a considerable amount of time (Anderson, 1984a; Stoll, Fink & Earl, 2003; Reeves, Emerick & Hirsch, 2006). It is assumed that the achievement of learners is enhanced if engaged learning time is maximised (Berliner, 1990). Stoll, Fink and Earl (2003) observed that time spent at school by pupils equates to between 900 and 1400 hours of schooling in a year, and that evidence suggests that of these 900 or so hours of schools only 125 hours are normally dedicated to learning.

Teachers need time for planning and organising their work, and integrating lessons learnt from professional development experiences, in order to provide productive, purposeful and effective student learning (Turney et al., 1986; Floro & Miles, 2003; Cinamon & Rich, 2005; Ingvarson, Meiers & Beavis, 2005; Yamagata-Lynch & Haudenschild, 2009). In the literature, greater concern is on the impact of instructional time on pupil learning (Bloom, 1974; Smyth, 1985; Manthei & Solmon, 1988; Anderson, 1994; Millot, 1995; Stoll, Fink & Earl, 2003; Benavot & Amadio, 2004). The view is that when more time is made available to students in classrooms then the desired learning outcomes such as knowledge and skills are easily acquired, and ideals, values and attitudes also are internalized easily (Benavot & Amadio, 2004).

Teachers also need time for their own formal and informal learning (Ingvarson, Meiers & Beavis, 2005; Lohman, 2006). The formal learning takes the form of professional development experiences (Yamagata-Lynch & Haudenschild, 2009). The informal learning is mainly through reflecting on classroom experience, using community knowledge, interacting with other teachers (Hargreaves, 1994; Lieberman & Miller, 1999; Lohman, 2006), and engaging in effective private study in the use of information and educational technologies. Nelms (1993, p.93) argues that teachers need time “for personal and professional development, ownership of own professional destinies, and response from supportive, stimulating colleagues”. Successful learning, for both teachers and students, depends on how

the allocated teaching time is managed within each school (Cinamon & Rich, 2005). Lieberman and Miller (1984) argue that schools are not the same, nor are classrooms. The dynamics in each school define the complexity of the social environment and culture; and, in addition constrains the way in which teachers allocate their time to a myriad of tasks presented to them (Hargreaves, 1994; Lieberman & Miller, 1999; Yamagata-Lynch, 2003). The interface between teaching activity and the school environment, therefore, needs exploring (Cinamon & Rich, 2005) preferably within the context of a theoretical framework or construct. In this thesis, the economic model of using time and collecting other resources for purposeful production is used as a basic framework for explaining the spatial and temporal aspects of teachers' activities. This economic model has its early roots in the work of Mincer (1962), Becker (1965), and Gronau (1977); and has since been extended to a range of studies (Sulberg & Wong, 1992; Wattereus & Dobbelsteen, 2001; Lee & Waite, 2005).

If teachers need time, then the question is what type or kind of time do they need? The literature suggests that allocating time for teacher learning is not as effective when teachers' time is integrated with other forms of time such as: (i) standard cycle of [time in] schools (Connelly & Cladinin, 1990); (ii) teaching time, (iii) student time, and (iv) non-teaching time, to name a few (Collinson & Cook, 2001; Ingersoll, 2003; Collet, Menlo & Rosenblatt, 2004; Ingvarson, Meiers & Beavis, 2005). Although the integration creates ineffective teacher learning, the various forms of time must, nonetheless, co-exist (Hargreaves, 1995; Darling-Hammond, 1999; Krantz-Kent, 2008; Ballet & Kelchtermans, 2009). The integration, interaction and co-existence of these various forms of school-time are unique to each school, and are experienced differently by teachers in various schools (Hargreaves, 1994; Cuban, 1995; DECCD, 1996; Day & Leitch, 2001; Stoll, Fink & Earl, 2003; Day et al., 2006).

2.3 Phenomenology of Time in Schools: Why the Interest in time allocation?

Teaching is a social human activity that represents a distribution of teaching effort over time. This temporal dimension of teaching occurs in a range of spaces, and therefore teaching has a spatial component. Four components of the time concept of teaching are important. These are the duration, frequency, timing and sequence of teaching activities as part of social preoccupation. Duration refers to how long the activity takes; frequency refers to how often the activity occurs; timing refers to when the activity occurs, and sequence refers to the order in which the activity occurs. These four components occur within a defined time-window frame – this is the portion of time over which the activity is conducted. In general, the activities can only occur in one space at a time – with the notable exception of online teaching in which activities can occur over multiple spaces.

The literature suggests that time in teaching can be viewed as an allocation problem subject to individual, institutional, managerial and political constraints (Fullan, 1998). The art of teaching or act of teaching or the heart in teaching, whichever way one looks at it, involves allocating time to the teaching activity (its preparation, planning, execution and evaluation). Teaching is therefore a time-budgeting activity and therefore ought to be modelled in the same way as other similar budgeting activities that have a social, human, temporal and spatial component. In that respect, if time is money then models on household expenditure of income (Greene, 1993) create a unique source of techniques for modelling time-use of teachers, since for teachers time should be money too – with no reason for an exception. Time should therefore be the main currency, and the analysis expenditure of time should be given priority. Teaching is a form of activity-based social behaviour with time expenditure that can be revealed by recording, observing or studying teachers' activities over space-time (Turney et al., 1986; Maaranen, Kynaslahti & Krokos, 2008). These patterns of activities of teachers can

be those displayed by each individual teacher, or a group of teachers. Time budgets can be computed, therefore, to capture the patterns of this social behaviour (Dreeben, 1970; Blase & Pajak, 1986; Acker, 1989; Casey & Apple, 1989; Biddle, Good & Goodson, 1997; Cinamon & Rich, 2005). The duration, frequency, timing and the sequence of teaching is experienced differently by each teacher. The subjective experience of time and teaching (as work) varies from individual to individual, and between teachers and administrators (Hargreaves, 1990; Acker, 1992; Huberman, 1993; Smyth, 1995; Huberman, Thompson & Weiland, 1997; Swain & Swain, 1999; Easthope & Easthope, 2000; Woods & Jeffrey, 2002; Collet, Menlo & Rosenblatt, 2004; Cinamon & Rich, 2005; Rice, 2005; Kutcy & Schulz, 2006).

2.3.1 Multiple Meanings of Time for Teachers

Similarly, teachers' experiences of mixing and juggling student time, teaching time, learning time, innovation time (Stoll, Fink & Earl, 2003), managed time, administrative time, cyclical time (Connelly & Cladinin, 1990), political time and experienced time (Collet, Menlo & Rosenblatt, 2004) further define (characterise) the time allocation problem. This characterisation of time allocation is unique to the individual teacher in their unique school setting. All these time constructs are experienced by the teacher and encapsulate a teacher's life as it is lived in schools and out of schools (Kutcy & Schulz, 2006). This experience makes time idiosyncratic, unique and peculiar to the individual teacher (Woods & Jeffrey, 2002; Collet, Menlo & Rosenblatt, 2004; Cinamon & Rich, 2005; Gardner & Williamson, 2006). It is known that the different types of time overlap and interact with each other constantly (Hargreaves, 1990). The constant meshing of these time constructs and activities performed within those time constraints define the monochronic-polychronic experience of time in the phenomenology of teacher's time allocation. One way of inferring how teachers experience time differently is to examine any differences in time allocation behaviours across

teachers of different demographic characteristics such as years of teaching experience, ages, and year-class taught, to name a few.

Teachers construct time differently even though they are endowed with similar amounts of time to spend (Hargreaves, 1990) – that is the allocated time endowment, and have similar demographic characteristics. Most significant in teacher time-use is the view of time-inequity (Stoll, Fink & Earl, 2003; Kutcy & Schulz, 2006) where some teachers may be viewed as having an inequitable allocation of time. These inequities may take the form of a “lack of transparency ... when school funds [are] disbursed to support ... programs ... or inequity in administrative practices ... or conditions of classrooms and workspaces” (Kutcy & Schulz, 2006, p.82). Time expenditure over a variety of activities is therefore a function of the teachers’ allocated time, school settings, classroom dynamics, the teacher’s view of work, and the teacher’s personality (Jones, 2008), preference, and cognitive style. Different teachers see their work differently and the way in which they cope with change over time also is different. Similarly different teachers see and experience their teaching time differently. It is imperative, therefore, to understand the multiple meanings of time for teachers.

The literature suggests that teachers may be attaching multiple meanings of time because of the multiplicity of clocks of school reform that they observe (Cambone, 1994; Cuban, 1995). Teachers may be looking at time from the perspective of five clocks of school reform as described by Cuban (1995), cited in Stoll, Fink and Earl (2003). These five clocks operate on different time zones and are viewed from different perspectives. The clocks capture: media time; policy maker time; bureaucratic time; practitioner time; and pupil learning time (Cuban, 1995). The multiple meanings of time are constructed from these five clocks. For example, the media time “is the fastest reform clock that ticks every second for every day” (Stoll, Fink & Earl, 2003, p.9). Policy time chimes every two to four years. During policy time, it is common for governments to produce new policies that ignore the reality of life in schools.

Students require an inordinate amount of time to learn – the practitioner’s time may not be enough to support the speed and type of learning required by students.

2.3.2 Working in Monochronic or Polychronic Time

Teachers’ construction of time in schools is intricately linked to their teaching activities in schools and may involve a variety of activities that occur simultaneously or concurrently or in sequence. In performing their activities/duties teachers experience time in a polychronic time frame - a term used to characterise how teachers perform several tasks concurrently, and not necessarily in a defined sequential manner/order. Administrators on the other hand may use time in a monochronic time frame. In monochronic time frame activities are arranged in linear fashion. The literature suggests that the focus on polychronic and monochronic time by teachers and administrators respectively, creates a zone of conflict especially with respect to school reform in general, and (in particular) the practice of teaching in schools (Hargreaves, 1990). On one hand, polychronic time requires a very high level of complex interactions of activities, and takes considerable effort, concentration and dexterity on the part of the teacher. The polychronic use of time shapes, therefore, teachers’ workloads and teachers’ work lives. On the other hand, administrators in monochronic time may not be able to notice the complex competing tasks and workloads that teachers face (Tye & O’Brien, 2002). In the context of school reforms, teachers must devise ways to delineate different types of time (Carmona et al., 2000; Kutcy & Schulz, 2006; Ballet & Kelchtermans, 2009) and make decisions that depend on how teachers understand and value their relative use of time (Cotte, 1998; Churchill, Kelly & Mulford, 1999).

2.3.3 Time-Use and The School Environment

The literature suggests that there is more considerable overlap between teaching time and student time in primary schools, than in secondary schools. Teaching in primary schools is viewed fundamentally as the ‘socialization of children’ (Stoll, Fink & Earl, 2003) whereas secondary or high school teaching is more about teacher time spent on transmitting information. The whole phenomenology of teaching in primary schools is different from that in secondary (high) schools and the teaching experience is different, and thus there are differences in ways in which time is constructed by primary and secondary (high) school teachers and other education workers (Heath & Clifford, 1980). The use of time by primary school teachers and other allied workers differs from that of secondary school education workers because these groups of teachers construct time differently. The cycles of time in their respective schools are usually different, and therefore, their teaching time is usually different. The characteristics of these socio-temporal cycles in schools are important for understanding: (i) time in schools (Connelly & Cladinin, 1990), and (ii) the resistance or inertia among school personnel when reform requires changes in schedules and school calendars.

It is also reasonable to speculate that primary, secondary and tertiary teachers attach different multiple meanings to the use of time. For all these types of teachers a range of time-hungry activities seem to take the teachers’ time away particularly from instruction. These time-hungry activities and events include the systematic cuts in education funding, changes to curriculum, increased accountability, changes in assessing and reporting students’ work, and inclusive initiatives (Easthope & Easthope, 2000; Gardner & Williamson, 2004; Mulford & Edmunds, 2010).

2.4 Modelling Time Allocation of Human Activity

In looking at individual time allocation behaviour, it is practical to look at patterns of individual behaviour in the context of space and time, as well as how the individual interacts with other individuals (team members, team mates or work mates). The spatial aspect or context of teachers' work can be extended beyond working in different classrooms by also looking at the school environment. It is common also to limit the time schedules to a 24-hour time space when examining time allocation behaviour. Daily time diaries of human activity are thus useful. In modelling time allocation of human activity, it is important to draw lessons from the history of time-use research, and identify models and variables that have been used to model time allocation behaviour.

Research on individuals' time-use focuses mainly on finding explanations for the observed labour market behaviour. Mincer (1962) and Becker (1965) provide a seminal theory of the allocation of time. Pollack (2000) provides a theoretical framework for estimating structural and behavioural relationships with time-use data. Modelling time-use behaviour has been fairly limited as a result of the "cost and complexity of collecting data" (Juster, 1986; Juster & Stafford, 1991; Avery et al., 1996, p.411), difficulty of constructing longitudinal datasets, and the problem of identifying the impact of changes in time-use (Foote, 1961; Klepsis et al., 2001). Databases on time-use have also been limited to primary activities coded in minutes spent per day in any given activity (Flickinger, 1932; Jones, 1934; Gershuny, 1965; Anderson, 1971; Baxter & Bittman, 1995; Bhat & Koppelman, 1999; Bleckesame, 2005; Gonzalez-Chapela, 2006; Glorieux & Minnen, 2009; Krantz-Kent, 2009; Goodin, 2011). This limitation is quite severe. As yet, nothing is known or can be predicted from current workload allocations of teachers on the future labour market behaviour of teachers as well as the schooling outcomes of teacher workload allocations (Cameron, 1919; Gritz & Theobald, 1996; Tye & O'Brien, 2002). Such knowledge or prediction is quite important given that: (i)

“societal development in several domains confronts schools and teachers nowadays with even more and various demands” (Clement & Vandenberghe, 2001, p.81), and (ii) “education policy is increasingly driven by economic logic in which efficiency and effectiveness are becoming more prominent parameters” (Ballet & Kelchtermans, 2009, p.1).

The general results from research on time-use allocation show that allocation patterns differ depending on demographic characteristics of individuals under study (Chapin, 1974; Chapin, 1976; Acker, 1992; Avery et al., 1996; Carlin, 1997; Acker, 1999; Gardner & Williamson, 2004; Cinamon & Rich, 2005). In the context of time allocation in schools, the complexity in undertaking many activities simultaneously; stacking many activities into the same block of time, ‘increasing the intensity of time-use, and making secondary and tertiary time-use the norm rather than the exception’ (Goddard, 2000) is the reality of what teachers face at the workplace (Cambone, 1994; Churchill, 1998; Flecknoe, 1999; Grosvenor, 2000; Poppleton & Williamson, 2004; Kutcy & Schulz, 2006; Day, Sammons & Gu, 2008). It is this reality of how teachers allocate time that must be modelled appropriately in order to obtain a better understanding of teachers’ workloads.

What are the key variables important in modelling teachers’ time-use? It is important to have a conceptual model of teacher time-use, and then an analytical model, in order to identify the variables that are required in any model of teacher time-use. The variables selected must lead to an understanding of how educational or school change, modifies teachers’ work lives (Berliner & Biddle, 1995; Churchill, Williamson & Grady, 1997; Ingvarson, 1998; Fullan, 1999; Aspin, Chapman & Klenowski, 2001; Galton & MacBeath, 2002; Collet, Menlo & Rosenblatt, 2004; Kelchtermans, 2005; MacBeath et al., 2006). These variables include teacher characteristics (for example, age and gender of the teacher), school variables (class size, location and size of school for example, (see Holliday, 1992; Bonesronning, 2003; Blatchford et al., 2004; Milesi & Gamoran, 2006; Penrice, 2011)), and those variables that

capture the nature of the teacher's work (such as the number of tasks, participation in decision-making, the number of hindrance and/or supportive factors, and other general economic factors of time use (see Connell, 1985; Apples & Tietelbaum, 1989; Poppleton & Riseborough, 1990; Weiss, Cambone & Wyeth, 1992; White, 1992; McLaughlin, 1993; Pashiardis, 1994; Hargreaves & Phelan, 1996; Dondero, 1997; Goodson, 1997; Hargreaves & Neufeld, 1999; Menlo & Poppleton, 1999; Day et al., 2000; Lynn, 2002; Ingersoll, 2003; Metz, 2003; Polosky, Juric & Mankelow, 2003; Williamson & Poppleton, 2004; Okpara, Squillace & Erondy, 2005; Mulford, 2007; Maaranen, Kynaslahti & Krokos, 2008)).

2.5 Policy Implications of Teachers' Time-Use and Schools as Workplaces

In the previous sections, attention has been drawn to the way in which time is constructed by teachers and administrators. What is also important for teachers' construction of time is the understanding of how time is viewed as a variable in learning and teaching. For teachers, time is mostly used for teaching – thus defining learning time through allocated time, engaged time (Rosenshine, 1978; Rosenshine & Berliner, 1978; Smyth, 1980; Hornberger, 1987; Johns et al., 2008), academic learning time (Berliner, 1990; Sliva, 2007), and time-on-task (Anderson, 1984; Berliner, 1990; AERA, 2007; Rocha, 2007; Silva, 2007), among other time definitions (Bloom, 1974; Cuban, 1985; Berliner, 1990; MacBeath, 2000; McFadden & Munns, 2002; Woodward & Munns, 2003). Of particular importance is the academic learning time, defined “in terms of a combination of allocated time, student engagement, and student accuracy rate” (Hornberger, 1987, p.219: endnote #5; Berliner, 1990; McFadden & Munns, 2002; Woodward & Munns, 2003), and the “amount of time students are working on rigorous tasks at the appropriate level of difficulty for them” (AERA, 2007, p.1), thus giving students “time to gain and retain subject knowledge” (Silvia 2007, p.3). Hargreaves (1990) suggests that administrators are likely to view classroom practice monochronically, not necessarily

polychronically. The monochronic view of time may explain why changes initiated and supported by administrators seem to move much too slowly for the administrator's liking (Hargreaves, 1990). It is recommended generally that education policy experts and reformers must now view time in schools and/or teaching time as the same for all teachers or view teaching time as unrelated to other aspects of teacher time. The literature shows that teaching time is linked to the time teachers spend with students (Smyth, 1984; Wang, 1984; Darling-Hammond, 1999). In addition, the subjective experience of time by teachers also contributes to the use of teaching time.

A few conceptual frameworks for cross-cultural analysis of the effects of educational change on teachers have been suggested. In the literature Collet, Menlo and Rosenblatt (2004), for example, show that educational change affects teachers' work lives. Teachers' work lives affect their affective response to alterations in work lives. The affective response to changes to the nature of the teacher's work affects the teacher's disposition toward future changes (Poppleton & Williamson, 2004). Teaching time is a distinctly personal investment for teachers and they tend to covet it. There is 'a struggle among teachers and reformers over teaching time' and policy initiatives should be focused on facilitating 'teacher leadership, responsibility taking and involvement in school change' (Collet, Menlo & Rosenblatt, 2004, p. 246), providing time for teaching and better use of instructional time, as well as easier workloads for teachers. Policy makers must also endeavour to create "eureka time" – time when pupils can be left alone to use their own imagination and good learning time – when learning actually occurs (Galton et al., 2000; MacBeath et al., 2000). Also absent is time for the teacher's informal learning (Bound & Middleton, 2003; Lohman, 2006), and meaningful professional development (Clement & Vandenberghe, 2000; Day et al., 2008; Yamagata-Lynch & Haudenschild, 2009).

Darling-Hammond (1999, cited in Stoll, Fink and Earl, 2003, p. 98) argues that “the time teachers spend with each other and with other knowledgeable educators ... is just as important to students’ opportunities to learn as the time teachers’ spend in direct facilitation of learning”. Johnson (1990) suggests that reformers have advocated lengthening teachers’ working hours and the working year to bolster their public image and justify higher salaries. Reformers should therefore reduce the ‘excessive demands on non-teaching duties’ – ‘paperwork to the eyeballs’ (Gardner & Williamson, 2004) and ‘excessive and unproductive committee work consumes the precious after-school time of teachers’ (Johnson, 1990, p. 48).

Johnson (1990) stresses that schools as workplaces affect how teachers view their work, and by extension teachers’ attitudes to their own work should affect how teachers use their time at the workplace, and thus by a further extension affect how teachers use their time outside the workplace. Reeves, Emerick and Hirsch (2006, p. 1) argue that “teachers thrive in school environments where they have sufficient time to plan, collaborate with colleagues, and discuss student work and effective teaching strategies”. Johnson (1990) views the school as a workplace – a place of work where teachers must view their work from four dimensions or perspectives; namely, the sociological, political, economic, and psychological dimensions of work.

First, the sociological dimension requires teachers to focus (at their workplace) on the “roles of teachers and their subsequent/consequent relationships with colleagues, superiors, students and parents” (Johnson, 1990, p. xviii). How teachers respond to the requirements of work in order to create and sustain the “role of teachers and their subsequent/consequent relationships with colleagues, superiors, students and parents” (Johnson, 1990, p. xviii) is not clearly presented.

Second, teachers assess the political character of the schools and have a sense of the extent to which they can influence policy. This is the political domain of teaching. Third, the psychological dimension of teaching requires or involves teachers' assessment of the extent to which the meaning of teaching as a job is diminished or enhanced structures that define a teacher's workplaces. In other words, are the professional stresses tolerable? Is there enough scope at the workplace for personal development? In terms of teachers' time at the workplace one may ask the question: do teachers have time for their own learning, growth and professional development? Finally, it is imperative to look at the economic dimensions/perspective of teaching, in as far as it is related to the financial and non-financial rewards of teaching and the investment placed on education.

Given the complexities of schools as workplaces, it is imperative therefore that greater analytical and policy attention should be paid to how teachers allocate the available instructional time, contribute to organising the school curriculum, and teachers are enabled to cope with the scope, pace and complexity of classroom life (Benavot & Amadio, 2004). The organisation of the school-time is the object of sustained attention by education officials (Lortie, 1975; Brown & Saks, 1987). Especially important are decisions regarding how time should be distributed to meet the general educational objectives and specific curriculum goals (Benavot & Amadio, 2004).

2.6 Summary of Lessons from Literature on Teachers' Work

The literature suggests that teachers' use of time in schools has an effect on collaboration among teachers, and that research and policy interest must lie in both the space and time dimensions of teaching activities (Hargreaves, 1997). The need for this space-time dimension is reiterated in the development of the conceptual model of teacher time-use in Chapter 3. This space-time focus requires that the activities of teachers as well as the implied workloads

be described in terms of the “*things teachers do in time and space*”. Teachers’ work and workplaces are influenced by an array of physical, cultural, and organisational variables more than other work or workplaces (Johnson, 1990; Holder & McKinney, 1992; Leonard, 1999; Kutcy & Schulz, 2006). Sociological, economic, political, and cultural and psychological features of a teacher’s work life are stressed (Johnson, 1990). Certainly, the speed of reforms and the relatively rigid administrative and relationship structures in schools put time-use and time management at the forefront for teachers (MacBeath et al., 2000; Stoll, Fink & Earl, 2003; Kutcy & Schulz, 2006; Huntly, 2008). Teachers complain of having very brief, if any, brief periods of time to prepare for their classes, and very little time to attend to individual students (Swain & Swain, 1999). There is evidence that lack of time is the critical constraint to effective/productive teacher learning and school improvement (Gilmore & Manthei, 1994; Tye, 2000; Hargreaves et al., 2000, cited in Stoll, Fink & Earl, 2003, p.98; Kaff, 2004; Rice, 2005). In addition to time constraints, excessive workloads and insufficient classroom resources lower teacher morale (Black, 2001; Williamson & Myhill, 2008). Teachers, school administrators and policy makers alike need to evaluate, therefore, the ways in which their decisions and actions impact on the use of time in classrooms (Dimmock, 2000; MacBeath et al., 2000; Stoll, Fink & Earl, 2003), and in schools in general (Galton et al., 2000; Goddard, 2000; Rice, 2005; Carmona et al., 2006).

2.6.1 International Evidence on Teachers’ Work

International evidence on teachers’ work is extensive, and teachers’ work “continues to be the subject of discussion and debate ... [worldwide]” (Huntly, 2008, p. 125). Campbell & Neill (1994b) profiles the work lives of over 700 teachers in England, Wales, Northern Ireland and Channel Islands, and notes that teachers spend a significant proportion of their weekly time on school related tasks. Teachers’ work has intensified and greater scrutiny and debate has also been placed on the nature of teachers’ work and teachers’ time-use (Timperley & Robinson,

2000; Clement & Vandenberghe, 2001; LaGrange et al., 2001; Huntly, 2008; Ballet & Kelchtermans, 2009; Penrice, 2011; ATA, 2012). Other areas of teachers' scrutiny have included "teacher competence" (Huntly, 2008, p.125), teacher workloads (Gardner & Williamson, 2004). There are areas that have not received any significant policy attention, however, and these include teacher stress (Williams & Gersch, 2004), teacher job satisfaction (Dinham & Scott, 1997; Bolin, 2007), teacher emotional wellbeing (Naylor, 2001; Jones, 2008) and teacher individuality (Trevaskis, 2006; Dinham & Scott, 1997; Bolin, 2007; Ayako, 2008).

The international evidence shows that Japanese teachers tend to allocate a significant amount of daily school time on school tasks. The teacher's school time is generally structured in such as way enable teacher collaboration, and the opportunity to observe other teachers' classes (LeTendre et al., 2001). In addition, for Japanese teachers the boundaries between personal life and professional time are often not clear. The evidence presented in a study that mirrors the theoretical premise of Ingersoll (2003), suggests that teachers in schools "across the United States work every day in conditions shaped and controlled by a system that they do not control" (Vannest et al., 2009, p.86; Drago et al., 1999; Smith, 2000; Rocha, 2007; Silva, 2007). Overall, the evidence suggests that in many other countries school time is often structured 'in ways that tend to isolate teachers from one another' (Broadfoot et al., 1993; Hargreaves, 1994; Pashiardis, 1994; Hargreaves & Phelan, 1996; Bonesronning, 2003; Webb et al., 2004; Okpara, Squillace & Erundu, 2005), and that most teachers have to complete their school tasks during their private time (however defined). Williams and Coles (2007) note that the lack of time is often the major limitation to teachers engaging in functions such as reflective practice. Teachers' weekend work hours have also increased considerably. Krantz-Kent (2008, p. 56), for example, notes that "half as many teachers in the US work after a typical day has ended". In addition, the proportion of US teachers working at any

given hour during weekends is “generally less variable than on an average weekend” (Krantz-Kent, 2008, p. 56). Internationally, teachers’ work shows significant intensification (Connell, 1985; Poppleton & Riseborough, 1990; McLaughlin, 1993; Metz, 1993; Hargreaves & Neufeld, 1999; Menlo & Poppleton, 1999; Timperley, & Robinson, 2000; Polosky, Juric & Mankelow, 2003; Collins, 2004; Ingvarson et al., 2005; Lane & Mallon, 2006; Mulford, 2007; Rocha, 2007; Krokos, 2008; Maaranen, Kynaslahti & Krokos, 2008); Ballet & Kelchtermans, 2009; and Penrice, 2011). The extent of teachers’ work and impacts on teachers’ work lives, in various countries, has been collected generally using time diaries (Baxter & Bittman, 1995; Kitterod & Lynstad, 2005), and a review of the working conditions of teachers suggest significant changes to the nature of teachers work and time allocation in general (Baldwin, 1934; Huberman, 1986; Huberman et al., 1993; Acker, 1996; Chapel, Leask & Turner, 1997; Cherland & Neilsen, 1999; Helsby, 1999; Johnston, McKeown & McEwen, 1999; Duggleby & Badali, 2001).

Obviously some differences in teacher time-use are observable, and in most cases these differences have been attributed to differences in cultural settings in the various countries (Blaycock & Smallwood, 1987; Morgenstern de Finkel, 1991; Menlo & Poppleton, 1999; Poppleton & Williamson, 2004; Bennell, 2004; Webb et al., 2004; Penrice, 2011; ATA, 2012), schools (Corwin & Schmit, 1969; Broadfoot et al., 1993; Bonesronning, 2003), and individual teachers’ experience (Miller, 1949; Roger, 1992; Silcock, 1992; Cockburn, 1994; Smyth, 1991; Smyth, 1995; Kelcheterman, 1996; Kelcheterman & Ballet, 2002; Naylor, 2002; Lofty, 2003; Sari, 2005; Mulford, 2007; Johns et al., 2008; Jones, 2008; Katadae, 2008). However, LeTendre et al., (2001) argue that in spite of these observed cultural differences, an understanding of the specific features of teachers’ work and an examination of methods of improving teachers working conditions would benefit education policy, immensely. The purpose of this thesis is specifically to identify the specific features of

teachers' time-use as an aspect of teachers' work, and analyse how these time allocation behaviours vary across days of the teaching week, and also identify the key determinants of variations in teachers' times use. This is a significant contribution of this thesis to the literature.

2.6.2 Australian Evidence on Teachers' Work

What research has been done in Australia, on teachers' use of time? In Australia, like in many other countries, the work of teachers has come under intense scrutiny (Smyth, 1995; Aspin, Chapman & Klenowski, 2001; Smyth, 2001; Churchill & Williamson, 2004; Gardner & Williamson, 2004; Williamson & Myhill, 2008; Mulford & Edmunds, 2009; Mulford & Edmunds, 2010), as a result of, and as part of, a range of education reforms and initiatives undertaken (Marginson, 1993; Churchill, Williamson & Grady, 1997; Smyth, 2001; Mulford & Edmunds, 2010). Australian evidence shows that a significant proportion of teachers view increased workloads and stress as the main change effects brought about by educational change (Easthope & Easthope, 2000; Churchill & Williamson, 2004; Gardner & Williamson, 2004). Again, teachers are feeling the pressure to complete tasks on time (Goddard, 2000; Williams & Gersch, 2004), and are finding "little time left to put into actual teaching and preparing" (Churchill & Williamson, 2004, p.41). As a result, the amount of time required by teachers, within and outside the schools, has increased considerably. Research on the time allocation behaviours of Tasmanian teachers, the effects of reforms and general school restructuring, and the nature of teachers' work lives of Tasmanian teachers, has been conducted by Easthope and Easthope (2000), Gardner and Gardner (2004). So what is new? What was done? Why another study, now? What is being added to the literature?

Easthope and Easthope (2000) give a detailed account of the experiences of increased workloads and changed teachers work for Tasmanian teachers. The account focuses on changes over a 10 year period (1984-1994). In the study by Easthope and Easthope (2000),

the teaching situation in Tasmania is described as one requiring more work, dealing with a lot of students (while working with little time), and with teachers acting less professional than they did in the past. The intensification of teachers' work is seen as bureaucratically-driven, as well as being driven by teachers' desires to act professionally and maintain teaching standards. The major causes of increased teachers' workloads cited in Easthope and Easthope (2000, pp. 46-50) include less money spent on education, ..., changes in marking and assessment, ..., changes in administrative structures, ..., more heterogeneous student populations" and increased complexity of teachers' work. In terms of research methods employed, Easthope and Easthope (2000) use in-depth interviews and focus groups, and conduct qualitative research, through looking at themes used by teachers to describe their work. The study by Easthope and Easthope (2000) mentions the problem of teachers lacking time for the various activities. The study is, however, not a study about time-use patterns of teachers, although of course the time-use behaviour of teachers and teachers' workloads or overloaded status is raised. The study by Easthope and Easthope (2000) shows clearly that teachers are under the thumb too - as moves to "link education directly to corporate industrial goals has meant a massive shift in the nature of ... teachers' work ... [as teachers' work is being restructured because of the] "ideology of economic rationalism by administrators (Easthope, 2000, p. 44).

The study by Easthope and Easthope (2000) focuses on Tasmanian teachers, and thus provides a very good background on the historical significance of addressing the issue of teachers' time-use. In order to focus exclusively on time-use that is at "what teachers do and how much they should do within a teaching day" (Easthope & Easthope, 2000, p.44), it is imperative to select a study that has the capacity of according an analysis or several analyses of time use behaviours of teachers in Tasmania, while also embodying the intensification of teachers' work and the reforms clocks that have swept the Tasmania education landscape. In Tasmania the main study on teachers' use of time was conducted by Gardner and Williamson (2004) as part of an investigation of the workloads of government school teachers and allied educators in Tasmania and, as such, is a very good starting point. The study by Gardner and Williamson (2004) profiles the workloads of Tasmanian education workers. The study on workloads identified and described the key factors that determine the workloads of principals, teachers and other education workers (Gardner & Williamson, 2004). In the context of describing workloads, the constraint that availability of time imposes on workloads of the respective participants was profiled, with an intention of contributing to policy that will make the work of current principals, teachers and other education workers manageable, and thus harness the available resources in a way that contributes to a greater promotion of students' learning. The study by Gardner and Williamson (2004) used a combination of qualitative and quantitative analyses that were informed by face-to-face semi-structured interviews, focus groups and time diaries. The main participants in the study by Gardner and Williamson (2004) were "teachers from all school and college sectors, principals, professional support service staff, teacher assistants, library technicians and laboratory technicians" (Gardner & Williamson, 2004, p.x).

2.7 Conclusion

In this chapter, the literature on time-use is presented. Focus is drawn to the complexity and significance of measuring time-use in many occupations, settings, communities, societies and nations. The need to be able to describe human activity on the basis on time-use is stressed. How time is experienced in the process of undertaking human activity is also of significance. Equally important is how time is defined. The general literature on time-use is presented in a way that shows the motivation for studying teachers' time-use, and investigating how time is allocated to the various tasks and multiplicity of roles in schools and out of schools. The multiple meanings of time to teachers are presented, as well as the impact on reforms of how teachers experience time in-schools and out-of-schools. The time-squeeze and intensification of teacher's work has meant that teachers have had to devise creative ways of making the most of the available time. The idea of multitasking, although multi-taxing for teachers, is then mooted in the context of teachers' work being done within a monochronic-polychronic continuum. Drawing from past literature on teachers' time-use and the history of time-use research in general, key variables important in modelling teachers' time-use are showcased. Policy implications that stem from examining teacher time-use data are flagged. The imperativeness in analysing the use of time by teachers also is emphasised. Lessons from past studies on time-use analyses also are used to attempt to understand the workloads of Tasmanian teachers. It is fitting to conclude by indicating that time-use analyses and modelling contribute to informing public policy with regard to schools as workplaces. Of the many factors that comprise any workplace, time is the central factor (or currency), and as such its dominance in all areas, including teaching, requires one to explore a study of time-use by teachers.

CHAPTER 3

A CONCEPTUAL FRAMEWORK FOR ANALYSING TEACHERS' USE OF TIME

3.1 Introduction

A teacher's work comprises of a multiplicity of activities that are performed over time and space, often with the one main (sole) economic purpose – providing income for the teacher's household whichever way the household is defined. The activities that teachers pursue are purposeful, and provide additional satisfaction, gain or reward - (utility in economic terms) - that serves the material and spiritual needs of the teacher. Some of the activities that the teacher performs are clearly observable although not necessarily measureable in terms of their time expenditure. Clearly, there is one thing that is measureable with regard to a teacher's work – and that is the amount of time spent on the various activities that the teacher performs. Although the time spent in some of the various activities undertaken by teachers is observable and measureable (both in the short and long term) the teachers' output is not easily defined or measureable (both in the short and long term). The quantity and quality of the teacher's output is generally unknown and the impact of teachers' output in terms of learners' outcomes is not directly quantifiable. Therefore, the allocation of a teacher's reasonable level of effort that is adequate for meeting the objectives of schooling is often not known. It is clear that there is a general lack of advanced empirical analysis on time allocation by teachers. As a result the link between workload, time spent at school and output is often not clear.

Although some of the time teachers spend on various activities is often observable and measureable, most of the activities tend to be performed as a set by the teacher on their own (Kaufman, Lane & Lindquist, 1991; Davies, 1994; Hargreaves, 1994), or jointly with other teachers (Hargreaves, 1994; Adler, 2002; MacBeath, Frost & Swaffield, 2005; Krantz-Kent,

2008), or by combining a set of activities as part of time-saving. This joint use of time makes it difficult to untangle the different components of time-use (Davies, 1994; Goddard, 2000; Rice, 2005). One thing that is clear though is that there is need to distinguish between time spent teaching and time spent doing other things. It is also imperative to note that work patterns are not as linear as how time is often constructed and/or construed. In the thesis, time is used therefore as a resource to indicate the implied workloads, and teachers' activities can be measured in terms of time spent performing the various teaching activities. It is also recognised that time is a constraint in as far as it limits what a teacher can do in a day of teachers' work, and also just as there is a limit to what can be done by a teacher in a day's work. This view of time as a resource and constraint is not different from that stressed in the review of the literature. For all practical purposes, it is important to stress that ultimately all activities are done if time is available.

Keating and Murgolo-Poore (2001) argue that the central proposition in the construct of time is that time is a limited resource – limited to 24 hours a day. Within that 24-hour time window, Keating and Murgolo-Poore (2001) suggest that all human activity is accomplished in a monochronic fashion – one activity at a time. The literature shows, however, that human activity, for example, teaching, is fairly polychronic and as such should be investigated or analysed within the framework of a monochronic-polychronic continuum (Cochrane & Logan, 1975; Kaufman, Lane & Linqvist, 1991; Davies, 1994; Goddard, 2000; Adler, 2002; Floro & Miles, 2003; Kaff, 2004; Rice, 2005; MacBeath, Frost & Swaffield, 2005).

The conceptual framework employed in this thesis requires looking at teachers' allocation of time within a 24-hour time-window (within schools and outside schools). Each teacher is assumed to have an observable, unique and idiosyncratic manner of perceiving, thinking and coping with time pressures (Hargreaves, 1993; Huberman, 1993; Hargreaves, 1994; Miles, 2003). This manner defines the individual teacher's 'tempo-cognitive style' (Cotte, 1998) that

is shaped by personal characteristics as well as the school and home environment. The individual teacher's tempo-cognitive style is multidimensional in terms of the planning of activities (Turney et al., 1986; Little & McLaughlin, 1993c) and the time used for the planned activities (Little & McLaughlin, 1993c) – be it group activities or sequenced activities or jointness in production of output. It is also noteworthy that there are work-time and non-work time allocations (Little, 1993; Cotte, 1998; Gardner & Williamson, 2006) and these time allocations are across a variety of activities. The share of time allocated to each activity is important in understanding the spatial and temporal allocation of teaching effort in schools, as well as in having an appreciation of the workload implications of how time is allocated over space and time in schools.

3.2 Time As a Resource and Constraint

It is generally acknowledged that time is both a resource and a constraint for the teacher (Walker & Woods, 1976; Huberman, 1993; Hargreaves, 1994; Thody, Gray & Bowden, 2000; Michelson & Harvey, 2000; Keating & Murgolo-Poore, 2001; Frazis & Stewart, 2004; Phillips, 2009). It is therefore of importance to find a theoretical framework with which to analyse the concept of teacher's time and extract a more informative picture of the use of time by teachers, in order to inform educational policy. A way to initiate a study of teachers' use of time is to start with data that profiles how teachers spend their time during a typical school week. The data give a record of activities performed over time, as well as the demographics of teachers, and the characteristics of their schools – teachers' workplaces. The narratives on and metaphors of what it means to work in schools point to the time pressures, long hours and critical shortage of teaching time (Lakoff & Johnson, 1985; Sztajn, 1992; Huberman, 1993; Hargreaves, 1994; Hooks, 1994; Perlow, 1999; Thody, Gray & Bowden, 2000; Giacomino & Gose, 2002; Dwyer & Dwyer, 2005; Kutcy & Schulz, 2006; Phillips, 2009). Teachers use the available time for their teaching and non-teaching activities, as well

as their school and non-school activities. In that regard teachers aim at maximising the net gain per hour spent on each activity. The teachers' time budget represents, therefore, the time constraints that teachers face in attempts to optimise a range of goals and/or targets. How teachers shape their daily teaching and non-teaching lives (through allocation of time) in order to meet the sociological, political, psychological and economic conditions of their work is important for educational policy. In cases where educational change or reform is implemented, teachers then attempt to adjust their time expenditure in ways that minimise the impact of educational change on teacher time-use. It is important, therefore to understand the extent to which teachers' time-use affects the effectiveness of school reforms.

3.3 Metaphors of Teaching and Teachers' Work

The impact of educational change on schools and teachers work lives is fairly complex (Goddard, 2000; Rice, 2005), and has implications on the role teachers' play in today's schools (Hutchby & Wooffitt, 1998; Goddard, 2000; Kaff, 2004; Gardner & Williamson, 2004; Rice, 2005; Carmona et al., 2006; Williamson & Myhill, 2008), and teachers' welfare. In addition, what teachers do inside and outside schools is also a very complex process – often too complex to describe and/or model adequately.

To make the complexity of teachers' work understandable to some degree the descriptions of teachers' work have to rely on the use of metaphors to describe the nature of teachers' work, schooling, learning; and, the act, art and heart of teaching, and education reforms. These metaphors have included describing teaching as 'boat building' (Dwyer & Dwyer, 2005), bricolage (Little & McLaughlin, 1993), 'knowledge dispensing' (Goddard, 2000), and "flying a plane ... because the greatest danger is in takeoff and landing" (Giacomino & Gose, 2002, p.3). Teaching has also been described as being like "pulling teeth" (Kutcy & Schulz, 2006, p.79), 'teaching from the heart' (Apps, 1996), and also being like "a box of chocolate – ya

never know what you're gonna get" (Phillips, 2009, p.1) – quoting from the movie *Forrest Gump*. The teacher has been described as a “nurse, ... , listener, ... , confidante, ... , go-between, role model” (Goddard, 2000, p.301).

The education process has been described as a ‘hand-made process’ (Sztajn, 1992), such as making bread – “where for a good dough there are tolerances for variation in ingredients but virtually everything impacts the outcomes” (Giacomino & Gose, 2002, p.7). School administration has been described as working like the inner mechanism of a grandfather clock (Cuban, 1995; Stoll, Fink & Earl, 2003) where “different gears rotating at different speeds, but somehow working together toward the same uniform goal” (Giacomino & Gose, 2002, p.8; Stoll, Fink & Earl, 2003).

Although these metaphors make it “easier to understand” (Dwyer & Dwyer, 2003, p.97) abstract concepts in teaching, teachers’ work and education, and show “attempts to understand our world” (Moore, 1993, p.452), it is important to make sure that the images portrayed by the metaphors do “not cause others to misunderstand the phenomena” (Dwyer & Dwyer, 2003, p.97). However, it is clear from the literature that the phenomenon of time allocation to teachers’ work has not been examined empirically and within the confines of a theoretical model that houses a metaphor. This is a big challenge in this thesis.

To rise to that challenge, a metaphor of teachers’ work that harmonises well with other metaphors suggested earlier is developed and examined empirically. The next section, Section 3.4, outlines the process of developing the metaphors of teachers’ time allocation behaviour. The name ‘the teacher’s thumbprint’ is coined this metaphor of teachers’ time-use.

3.4 Teachers' Time Allocation Behaviour (Teacher's Thumbprint)

Teachers can also be thought of as a group of individuals that is socially integrated within a defined school, workplace or environment (Turney et al., 1986; Huberman, 1993; Little & McLaughlin, 1993c). Although teacher group synergy can be considered, or some form of contrived collegiality claimed (Huberman, 1993; Hargreaves, 1994), teachers' activities are essentially unique, peculiar, personal and private to the individual teacher. Teachers perform their roles functioning in patterned ways in relation to various community and social systems. The allocation of time by teachers is best examined, therefore, by looking at the time allocation patterns of each individual teacher, as they perform their daily activities. Teachers choose how to allocate time among alternative activities that compete for the limited resources. The choices that teachers make generally depend on the teachers' desire to fulfil certain needs formal and personal subject to the set of competing constraints (Joyce & Stewart, 1999).

A way towards analysing teachers' time-use is to look at the ways in which teachers allocate time to their various activities within a defined time period (Krantz-Kent, 2005; Krantz-Kent, 2008). Teachers allocate time to various activities, and these activities tend to have unique spatial contexts and time configurations. An analysis of the rhythmic patterns in time allocation is not complete if the spatial context of time allocation is not included. The spatial context or unit of time allocation may be a classroom, outside the classroom, the school, and also outside the school – to name a few (Huberman, 1993; Krantz-Kent, 2008), or outside the workplace (Eldridge & Pabilonia, 2007).

A conceptual model of time allocation behaviour of teachers that is based on the literature, (see Chapter 2), is developed in this chapter (Chapter 3). This conceptual model is supported by an empirical model (see Chapter 4). The results from the empirical model are reported in

Chapter 5. This conceptual model that forms the backbone of Chapter 4 through 5 is given in Figure 3.1 below.



Figure 3.1: The Teacher's Thumbprint

Figure 3.1 is referred to as the teacher's thumbprint and shows the locus of teachers' work. The idea of the thumbprint is the metaphor that teachers allocate time with a view of leaving an academic and non-academic impression on their students, and peers. At the same time, the metaphor recognises that teachers are also under the thumb when it comes to resources and constraints such as time, and how the education system keeps turning up with countless, short-lived reforms. The purpose of using the metaphor of the thumbprint is to guide the reader through the process involved in: (i) capturing the elements of teachers' time-use in one conceptual model (see Chapter 2), and (ii) developing the analytical structure (in this chapter, Chapter 3), and (iii) identifying likely systems of equations used later, in Chapters 4 and 5, to describe teachers' time-use. The approach of the teacher's work as the thumbprint is novel, and indeed covers a simple but effective description of teachers' work inside and outside schools. This descriptor is shown as the teacher's thumbprint, Figure 3.2 below.

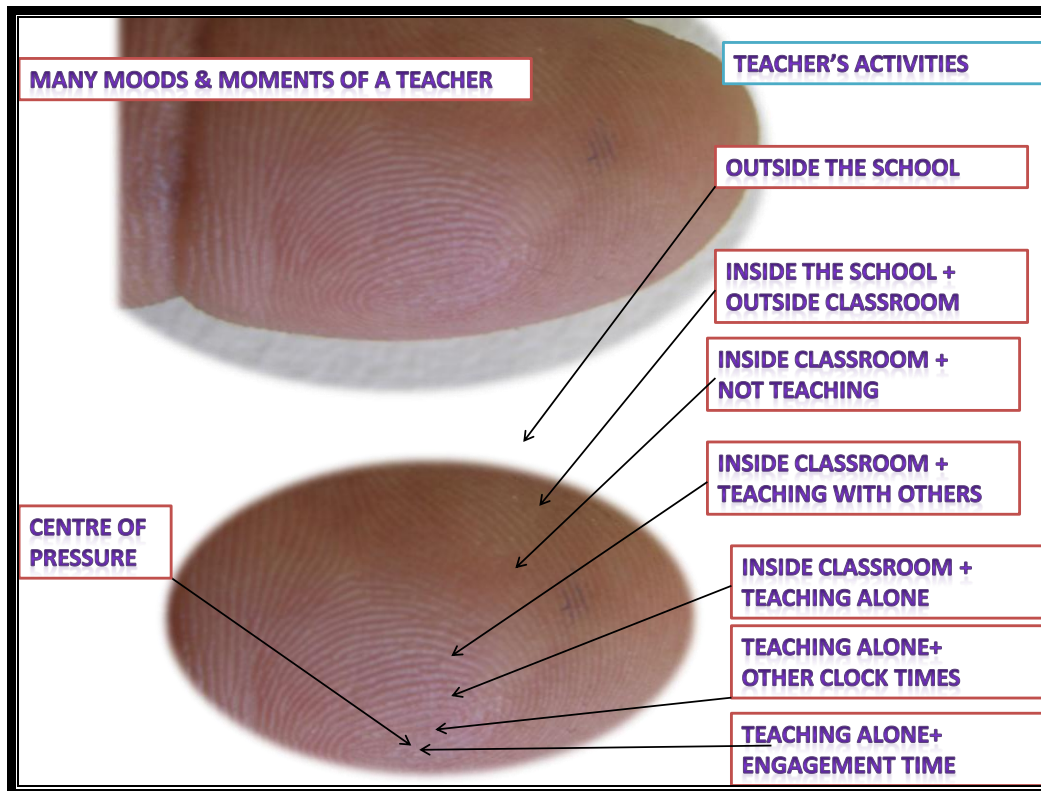


Figure 3.2: The Teacher's Thumbprint With Activities and Teacher Moods

To develop the framework (the teacher's thumbprint), consider the teachers' various domains as suggested by Gardner and Williamson (2004), for example. Suppose the realities of teachers' work lives are all well-defined within the context of what teachers do outside and inside the school, as they accomplish a series of tasks inside and outside the school. The next task would, therefore, be to look in particular at what teachers are actually juggling in schools (Cotte & Ratneshwar, 1999; Voydanoff, 2005). Figure 3.3 shows the teacher's juggling act. Twelve activities are shown in Figure 3.3. These twelve activities are selected in order to mimic the hours on the face of the clock, and conjure the image of the desirability of an ideal mechanism – in which each note strikes at its predetermined time and the working of this school still resembling those in the metaphor by Cuban (1995), and Stoll, Fink and Earl (2003). It is important to stress though that often there is a big gap between ideal and reality.

In reality most teachers cannot juggle successfully and continuously, in a predetermined uniform and sequential manner.

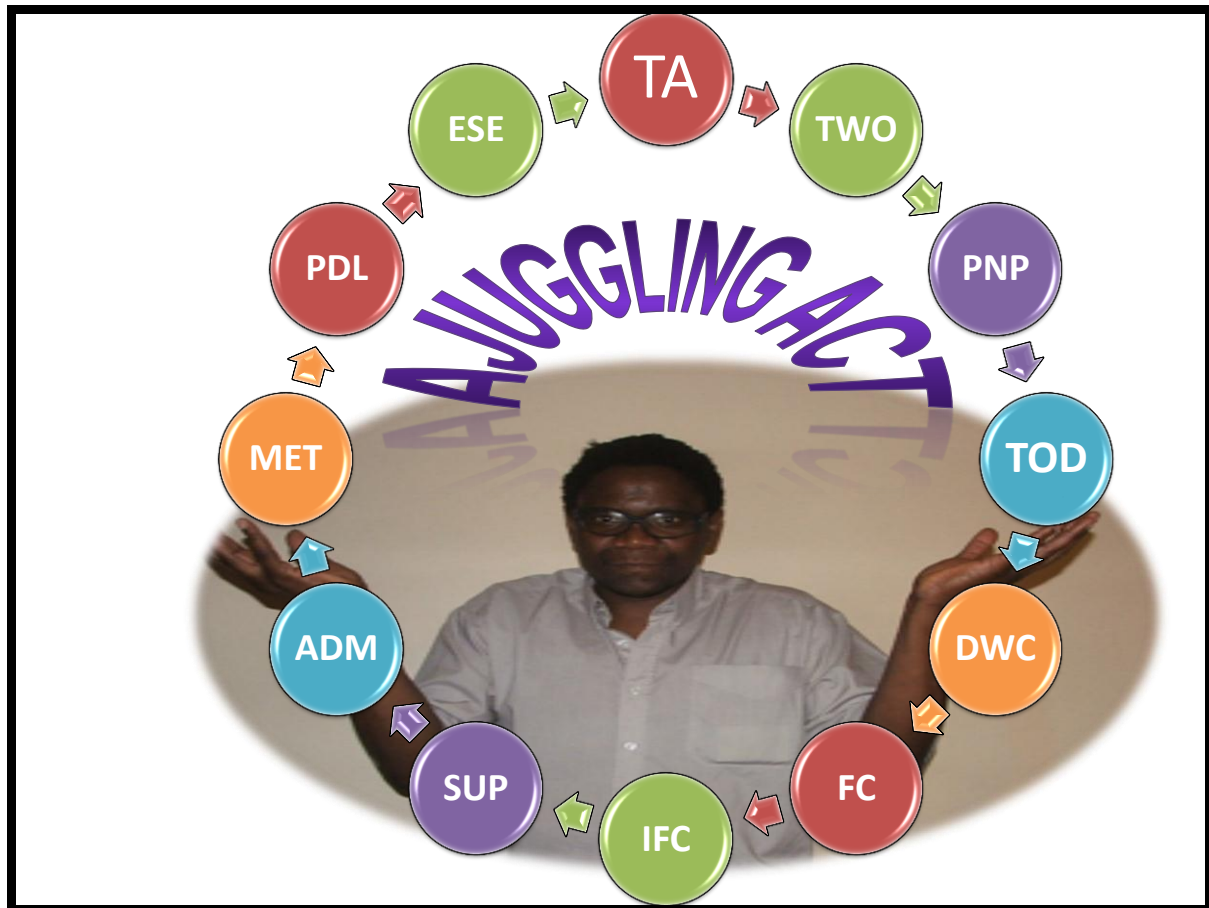


Figure 3.3 Example of Set of Tasks That Teachers Have to Allocate Time To In Schools

Figure 3.3 shows teachers teaching alone (TA), teaching with other (TWO), planning and preparing (PNP), having time on duty (TOD), discussing with colleagues (DWC), engaging in formal communication (FC) and informal communication (IFC), undertaking staff and student supervisions, participating in administrative tasks (ADM), attending meetings (MET), attempting professional development and learning (PDL), and fulfilling extra school expectations (ESE). The teacher is assumed to be constantly juggling these activities, and hence optimising their own time allocation behaviour subject to constraints of time and other resources. In the context of the focus of Chapter 3, and modelling time-use, it is important

therefore to develop an analytical structure that ties together what the teacher is juggling (Figure 3.3), what happens inside and outside schools (Figure 3.2), and the idea of the teacher's thumbprint (Figure 3.1). The following time allocation behaviour model is developed, therefore.

Denote the individual teacher as \mathbf{i} , and suppose that at any point in time, \mathbf{t} , the teacher can only be in one of several spaces, \mathbf{s} . This is quite straight-forward – as the saying goes – ‘*one (i) cannot be in two places(s) at once at any one time (t)*’, and reinforces the idea of space-time allocation of teachers’ work raised in Chapters 1 and 2 of this thesis. Take the case of teacher “ \mathbf{i} ” who can only be either at school or outside school. The teacher’s state, being at school or outside school is then denoted by \mathbf{j} . When outside school, teacher \mathbf{i} undertakes activities $\mathbf{j}_1, \mathbf{j}_2, \dots, \mathbf{j}_{n1}$, all of which are elements of the state defined as set \mathbf{j} . So, $\mathbf{j} = \{\mathbf{j}_1, \mathbf{j}_2, \dots, \mathbf{j}_{n1}\}$. In the case where the teacher is at school, there will also be two choices: teacher \mathbf{i} is either, inside the classroom, or outside the classroom. When outside the classroom, teacher \mathbf{i} performs set of task denoted \mathbf{k} such that $\mathbf{k} = \{\mathbf{k}_1, \mathbf{k}_2, \dots, \mathbf{k}_{n2}\}$. If the teacher is inside the classroom, two options are also available: teaching or not teaching. In the case of not teaching, then teacher \mathbf{i} undertakes another set of activities $\mathbf{l} = \{\mathbf{l}_1, \mathbf{l}_2, \dots, \mathbf{l}_{n3}\}$. If teaching, then consider two options: teaching alone or teaching with others. If teaching with others, the teacher then performs another set of activities denoted \mathbf{m} , such that $\mathbf{m} = \{\mathbf{m}_1, \mathbf{m}_2, \dots, \mathbf{m}_{n4}\}$. If not teaching with others, then the teacher is teaching alone and undertaking a set of activities denoted by set \mathbf{p} , and making use of either engagement time or other types of class time. The set \mathbf{p} represents the teacher’s personal teaching time – the time the teacher needs to put a ‘thumbprint’ of that which defines his or her work, in terms of engagement time or other time clocks. The set of activities undertaken when teaching alone in the various clock-times, are defined such that $\mathbf{p} = \{\mathbf{p}_1, \mathbf{p}_2, \dots, \mathbf{p}_{n5}\}$. Within the context of the conceptual framework shown using Figure 3.1 and expanded in Figure 3.2, the analytical structure for the metaphor

of the teacher's thumbprint is thus shown in Figure 3.4. This analytical structure is estimable if the sets of activities undertaken by a teacher are identifiable and separable.

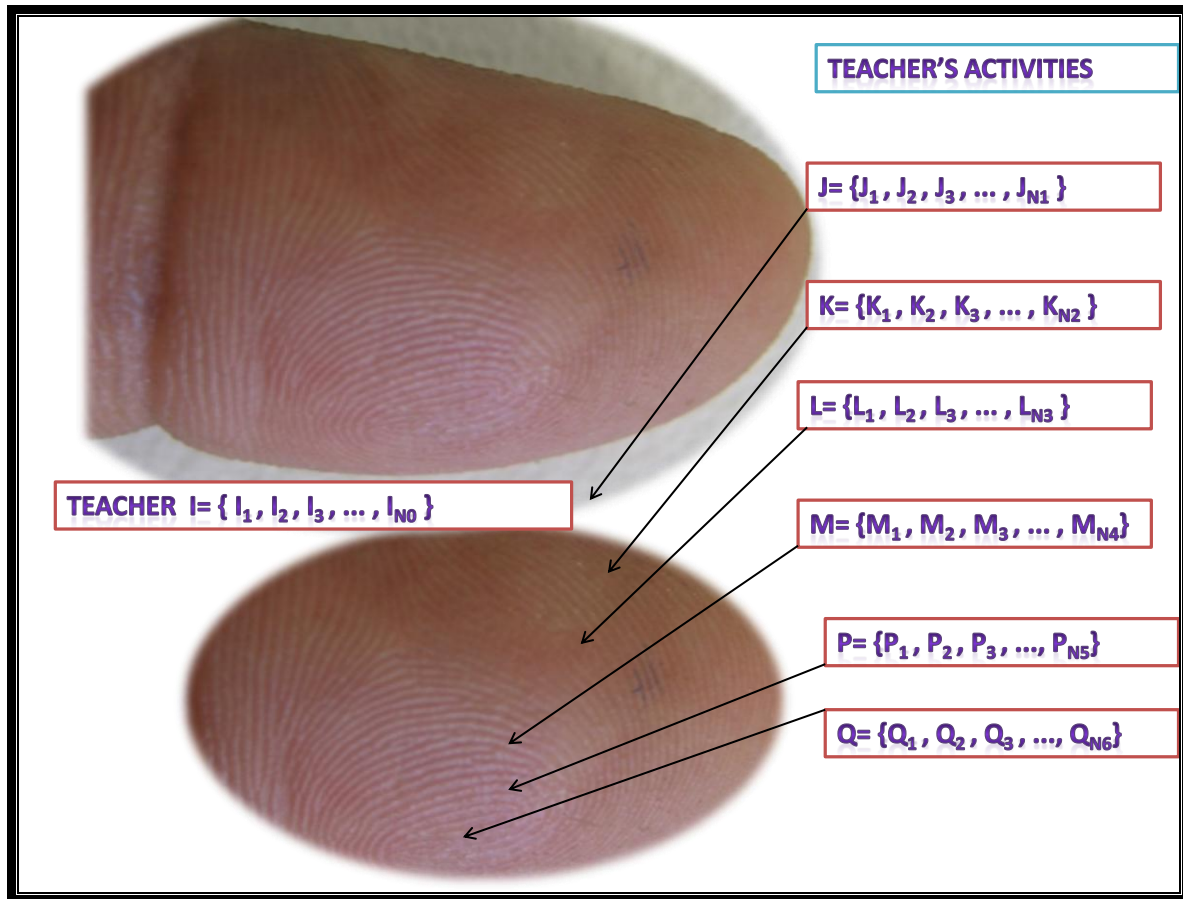


Figure 3.4 Analytical Framework for Teacher's Thumbprint

When performing these activities the effectiveness of these activities will also depend on the amount of an engagement time. During engagement time, the teacher performs tasks denoted by set $\mathbf{q} = \{q_1, q_2, \dots, q_{n6}\}$. This set represents the locus of all activities where quality time is spent in sufficient quantity to enable the ideal conditions for student learning (Frow, 2001; Fischer, 2009).

How the teacher juggles the different times within **p** and **q** activity sets defines the research problem of the teachers' time-use; and, to get to sets **p** and **q**, the teacher has to make considerable tradeoffs in terms of what gets done or not done out of all the other sets **j**, **k**, **l**, **m**, and ultimately **p** and **q**. The sets **p** and **q** represent the core of the teacher's work.

So far, the teacher's work has been modelled conceptually using six spatial zones, **s**, defined by sets **j**, **k**, **l**, **m**, **p** and **q**, such that $s = \{j, k, l, m, p, q\}$. Only two time dimensions (**t**) for these spatial zones are considered. These time dimensions are **t**₁ and **t**₂ for daily and weekly time, respectively. Hence $t = \{t_1, t_2\}$, for simplicity. But **t**₁ and **t**₂, each have two of their own time dimensions, such that $t_1 = \{t_{11}, t_{12}\}$, and $t_2 = \{t_{21}, t_{22}\}$. To keep the discussion tractable, think of **t**₁₁ as school-time and **t**₁₂ as non-school time, in any given day (**t**₁). Similarly, think of **t**₂₁ as school-time and **t**₂₂ as non-school time in any given week (**t**₂). This is fitting because, in this thesis, the analyses will be restricted to daily time (**t**₁) allocation behaviour and weekly time (**t**₂) allocation behaviour of Tasmanian teachers.

In order to describe teachers' time-use fully, it is important therefore to find out how many activities teachers undertake in each of these spatial units. It is also worth pointing out that each of these sets of activities: $\{j_1, j_2, \dots, j_{n1}\}$, $\{k_1, k_2, \dots, k_{n2}\}$, $\{l_1, l_2, \dots, l_{n3}\}$, $\{m_1, m_2, \dots, m_{n4}\}$, $\{p_1, p_2, \dots, p_{n5}\}$, and $\{q_1, q_2, \dots, q_{n1}\}$, has its own unique thirstiness for time, as well as its unique compatibility with other activities. Similarly, the elements of each set of activities have their unique time-thirstiness and peculiar relationships with other elements with respect to time-use. Certainly, the concept of polychronicity covered earlier in Chapter 2, recognises this relative time-use and compatibility in time-use. Not all activities can share time, and that difficulty in time-sharing also defines the time needs for each set of activities **j** through **q**. As a result of the time-thirstiness of the various sets of activities and their component elements, teachers are therefore required to make time-use choices. The teacher's time allocation behaviour then becomes an important research problem to solve.

In the context of the various domains of a teacher's time, and the realities of teachers' work (Gardner & Williamson, 2004; Valli & Buese, 2007), and the work-intensification thesis (Hargreaves, 1994; Bartlett, 2004; Williamson & Myhill, 2008), it follows that within this conceptual model of teacher time-use, the realities of teachers' work lives are all defined by the unique interaction of how time is allocated in order to undertake and accomplish elements of sets **j**, **k**, **l**, **m**, **p** and **q**, and the like. Time allocated to these sets of activities has implications on the well-being of teacher **i**, or the elements of teacher **i** such that $\mathbf{i} = \{\mathbf{i}_1, \mathbf{i}_2, \dots, \mathbf{i}_{n0}\}$. The inclusion of set $\mathbf{i} = \{\mathbf{i}_1, \mathbf{i}_2, \dots, \mathbf{i}_{n0}\}$, to describe the teacher as the performer, the actor, mentor and other characters adds a twist to the conceptual model. Here is the twist: while important to note that, in this conceptual framework, it is assumed that the nature of teachers' work varies over the spaces **j**, **k**, **l**, **m**, **p** and **q**, and the like; as well, as varying over time (**t**₁ and **t**₂); attention must also be drawn to how the teacher is represented as an individual **i**. This indeed is an oversimplification and under-representation of the teacher in this framework. However, the inclusion of the set $\mathbf{i} = \{\mathbf{i}_1, \mathbf{i}_2, \dots, \mathbf{i}_{n0}\}$ to describe the teacher alludes to the fact that recognition must be given the nature of the teacher – the idiosyncrasy, moods, emotions, cognitive styles and the like as described earlier in Chapter 2. Ideally, the teacher ought to be represented as $\mathbf{i} = \{\mathbf{i}_1, \mathbf{i}_2, \dots, \mathbf{i}_{n0}\}$ to signal the significance of how the teacher is defined, self-defines, and is perceived (Day, 1998; Woods & Jeffrey, 2002; Kutcy & Schulz, 2006; Peralta, 2006; Song & Wei, 2007; Jones, 2008). This set may signal the perception that each time students see the '*same different teacher*' or '*the different same teacher*', and the teachers may also perceive themselves as '*same different teacher*' or '*the different same teacher*', to capture the many moments and moods in teaching.

The thumbprint metaphor also has its own policy implications. The teacher and through engagement time and all activities **p** and **q** leaves a thumbprint on the students. Similarly, the class has its unique thumbprint through their classroom activities. Similarly, teaching with others has collegial imprints (among other imprints) on students, teaching staff involved, and groups of classrooms. What happens in the school through sets of activities **k**, **l**, **m**, **p** and **q**, to name a few, defines the culture and conditions the outcomes of schooling. The whorls of the thumbprint are interrelated and undertaking activities **j** through **q** requires an understanding of the type of school and school leadership and community requirements. The type of school the teacher works in, and how the school community is linked with the school (and the school linked with the community) is captured through activities **j**.

In representing the teacher's time-use as a thumbprint attention is drawn to the fact that the sets of activities defined so far as **k**, **l**, **m**, **p** and **q**, are not independent sets with their own unique boundaries – they are not closed sets. There are no boundaries around these sets, if anything they are open. The walls are there to simply guide the teachers and policy makers to the core. Short cuts – good short cuts can be taken as practitioners and policy makers make their own constituent sets to move from **i** to **q**. The sets serve the purpose of containing activities temporarily in space and time. This makes sense because time is very dynamic and teachers' time-use is equally a complex dynamic process, and as such must be modelled in that way. The sets are intertwined in a way that suggests that when one starts from **i** (the teacher) then they will always get to the core (**q**=engagement time with the student). As such Figure 3.5 has been drawn to show teachers and administrators coming and achieving outcomes, and leaving the system in some steady-state of some form of sustainable equilibrium (Darling-Hammond, 1999; Virtanen et al., 2007; Mulford & Edmunds, 2009; Mulford & Edmunds, 2010). The idea of some stability was not intentional – this framework and its metaphor can also show the case where the school system has become dysfunctional

such that movement is no longer from **i** to **q** but from **q** to **j**, and teacher **i** cannot even enter the system (Woofter, 1917; Steffy & Wolfe, 2001; Lashway, 2003; Kirkgoz, 2008). In the case of the dysfunctional school, teacher time-use still needs to be examined since time is still being expended. In the case of dysfunctional schools, the time-squeeze or time-thirstiness of the sets of activities **j** through **q**, are so demanding that the system spirals outwards. Figure 3.6 shows the possibility of such a scenario. There are, however, some regular adjustments that stop the dysfunctional system from spiralling out of control. These adjustments are partially due to the ‘buffering capacity of teachers’ (Ballet & Kelchtermans, 2009, p.11) and the related coping strategies that teachers employ (see Cottee, 1998; Churchill, Kelly & Mulford, 1999; Carmona et al., 2006)

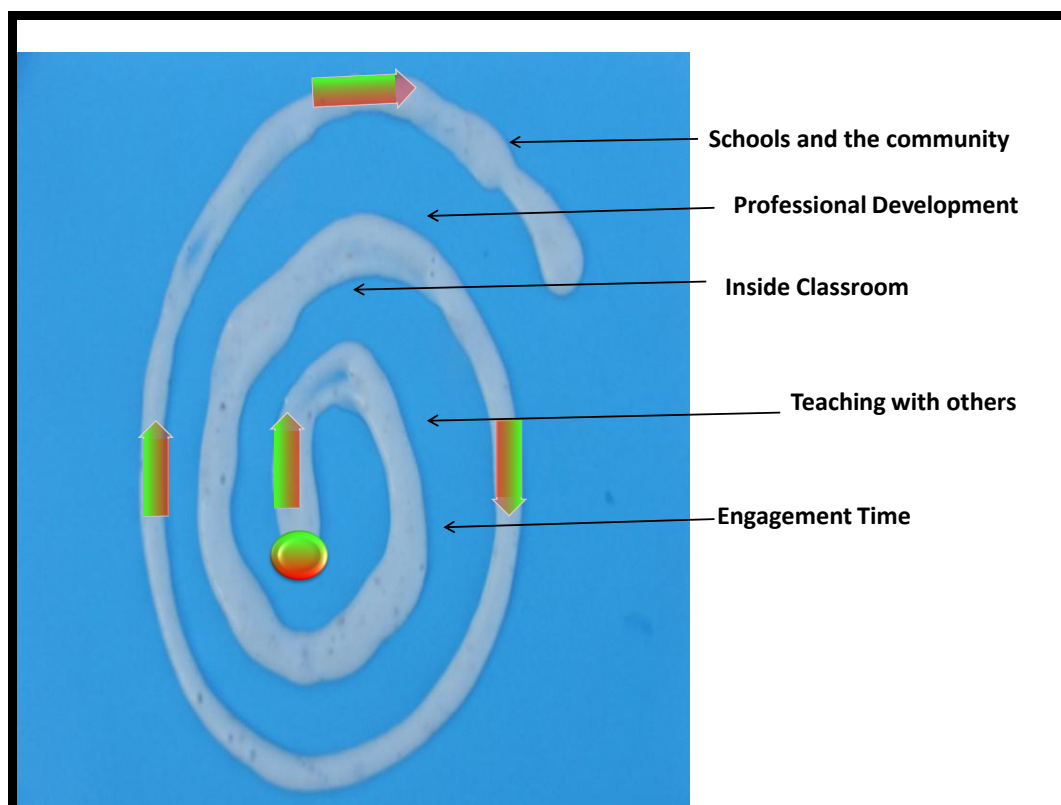


Figure 3.6: Thumbprint in Dysfunctional Schools (Clockwise, but Dispersing) Dynamics

The path away from the core is one in which learning has gone through the window, spirally outwards, and the teacher is trying to get in to put some learning in place – or staying away from the school as a way of coping. The time pressures, stress and loss of job satisfaction that result in this case can be unbearable to most teachers. It is also prudent, therefore, to think of this thumbprint framework in terms of neighbourhoods of schools, because schools generally do not exist in isolation (Hargreaves, 1990), and some schools are very hard to staff (Woofter, 1917; Steffy & Wolfe, 2001; Lashway, 2003; Kirkgoz, 2008).

Finally, it is worth emphasising that this thumbprint framework will focus only on the measurement of time-use across typical days and typical school activities, and over a typical week. The thumbprint presented in Figure 3.1, and its subsequent variations given in Figure 3.2 through Figure 3.6, are quite systematic in approach. For the purpose of illustrating the approach taken to address the research problem (time-use patterns of teachers) – the

conceptual model had to be simple enough to give readers an appreciation of what the modelling is focussed on. It is possible, and obviously appreciated in this modelling that the thumbprint can also turn out to be a ‘smudge’ in some classrooms and schools. It is for that reason of the likelihood of some ‘smudges’ and the need to reduce the incidence of these likely ‘smudges’ that an empirical estimation of how teachers use their time is done in this thesis.

Therefore the teacher’s time-use is a composite function: $\mathbf{H} = \mathbf{h} (\mathbf{I}, \mathbf{J}, \mathbf{K}, \mathbf{L}, \mathbf{M}, \mathbf{P} (\mathbf{Q}), \epsilon)$, where:

\mathbf{H} = time spent on a typical day by teacher \mathbf{i} ,

\mathbf{I} = teacher characteristics,

\mathbf{J} = outside school activities and characteristics,

\mathbf{K} = inside school and outside classroom activities and characteristics,

\mathbf{L} = activities when in classroom but not teaching,

\mathbf{M} = activities and characteristics of time use while teaching with others,

$\mathbf{P} (\mathbf{Q})$ = activities while time teaching alone and their implied engagement time; and,

ϵ = other things that have been left out by the model.

The time used for each of the activities $\mathbf{J}, \mathbf{K}, \mathbf{L}, \mathbf{M}$, and $\mathbf{P(Q)}$ is a resource and the availability of time for each of these activities $\mathbf{J}, \mathbf{K}, \mathbf{L}, \mathbf{M}$, and $\mathbf{P(Q)}$ is a constraint, in teachers’ pursuits to leave an excellent, indelible thumbprint. This equation, $\mathbf{H} = \mathbf{h} (\mathbf{I}, \mathbf{J}, \mathbf{K}, \mathbf{L}, \mathbf{M}, \mathbf{P(Q)}, \epsilon)$, is presented here to simply illustrate how the conceptual model (the thumbprint), presented in this chapter, connects to literature in Chapter 2 and the equivalent empirical representation in Chapter 4. This, hopefully, helps the reader to appreciate the need

to keep Chapter 3 separate from Chapter 4 in terms of focus and purpose. Chapter 3 shows a concept, - the metaphor, ‘the thumbprint’, and then how that concept could be ‘mathematised’. In Chapter 4 the ‘mathematisation’ is done, and then the specific parts required in order to estimate any of the structural equations that can be used to describe the conceptual model are unveiled. It is important to estimate the teacher’s work times in schools described by Figure 3.5 (steady-state) and Figure 3.6 (chaotic schools). These structural equations are then estimated and their results reported in Chapter 5. Chapter 3 presents therefore a novel concept of a teacher’s thumbprint. Chapter 4 gives the mathematical aspects of the thumbprint model, and points to the likely novel techniques that can be used to estimate teachers’ time-use within the context of the teachers’ thumbprint metaphor (model).

The metaphor of the thumbprint portrays clearly that teachers’ time allocation is about the spatial and temporal use of time. It is simpler to look at the space component as being at school, or outside school; and, then look at the time component as what teachers do on a day-to-day basis, or typical day – when at school or out of school. The space-time view of teachers’ work and teachers’ work lives, shown using the thumbprint illustration and metaphor, will be captured using a series of equations that are developed in Chapter 4. For the time being it suffices to say there is a need to analyse teachers’ time-use within the conceptual framework presented. The next section presents, therefore, evidence on the instruments that can be used to capture the time required to leave the thumbprint or attempt to leave a thumbprint. The key instrument is the use of questionnaires, unstructured interviews and daily diary entries.

3.5 Techniques for Collecting Data on Teachers' Time Use

3.5.1 Use of Time Diaries

Qualitative data collected through content analysis, narratives, tend to depict a reality of teachers' time-use that is generally reflective of many teachers' lives (Cinamon & Rich, 2005). Questionnaires involving structured and/or semi-structured interviews are used to obtain data on time allocation to various activities – most preferably during a typical day or typical week or collated from a 24-hour diary. The use of time-diaries is generally one preferred way of collecting data on time-use. In social science research, the use of time diaries as a method of collecting time-use data has a long history (for example, Ruggles & Ruggles, 1970; Chapin, 1974; Juster & Stafford, 1991; Rosenbloom & Whittington, 1993; Robinson & Bostrom, 1994; Avery et al., 1996; Schwartz, Herz & Frazis, 2002; Frazis & Stewart, 2004). Time diaries have proven to be fairly reliable sources of information on quantitative aspects of time allocation decisions.

Time diaries capture the rhythm of activities around the clock. The time diary data includes the types, location, timing and duration of teachers' activities that are conducted during a typical day. The quality of data collected using time diaries is generally high where the research participants are instructed properly, and are also monitored in their record-keeping (Rosenbloom & Whittington, 1993). However, time diaries often lack the capacity to capture the more qualitative aspects of time-use decisions (Avery et al., 1996). It is also observed that in time diary studies, “over-reporting was greater among managerial and professional workers” (Frazis & Stewart, 2004, p.3). This over-reporting was attributed to the fact that since managers and professional workers tend to be salaried it is therefore “unlikely that their employers kept records of their actual hours worked” (Frazis & Stewart, 2004, p.3). This observation by Frazis and Stewart (2004) raises an interesting likely hypothesis – that of the difference in time-use patterns and time-use reporting of full-time and part-time workers.

In the context of the teachers' workloads it is clear that part-time teachers are likely to have clearer, more accurate records of their activity time patterns compared to full-time teachers. Teachers that work on fractional basis are likely to pay significant attention to hours worked because these hours contribute directly to their (fortnightly) earnings. Most important in distinguishing part-time teachers from full-time teachers is the fact that part-time teachers do not generally have other after-school activities related to their on-school tasks. For part-time teachers and relief teachers – it is assumed that what happens at school stays at school as it were. It is posited that relief teachers are unlikely to plan for the next day's series of activities given the general uncertainty of their location on that next day. It is also posited that these relief and part-time teachers are likely to carry an emotional labour, in terms of what happens in schools, that is larger than that experienced by their counterparts. Part-time and relief teachers have routines too, and they too have to plan their day to accomplish the tasks at hand. Similarly, teachers that teach across several subjects may also experience the same time limitations although certainly in a different context.

It is important or imperative therefore, that attention is focused on the proper description or categorisation of the actual nature of the teacher's role, job or work. In the case of part-time and relief teachers, work that is done at home may be missed by the time diary measure, and/or the direct relevance of work done at home to the next day's relief work may be difficult to incorporate into the study. It is nonetheless, important to model time-use of all educators and then use dummy variables to capture differences in work classifications. In the context of the metaphor of the thumbprint relief and part-time teachers still travel the same journey through the sets **(j)** to **(q)**. How the journey is experienced is mainly a function of the types of activities that they teachers undertake. The path they follow is shown in Figure 3.7. The system or requirements of the work of relief teachers may be such that teachers may not

have to be responsible for certain parts of the chain – because time is just a constraint and a resource to best use as efficiently and effectively given the tasks in hand.

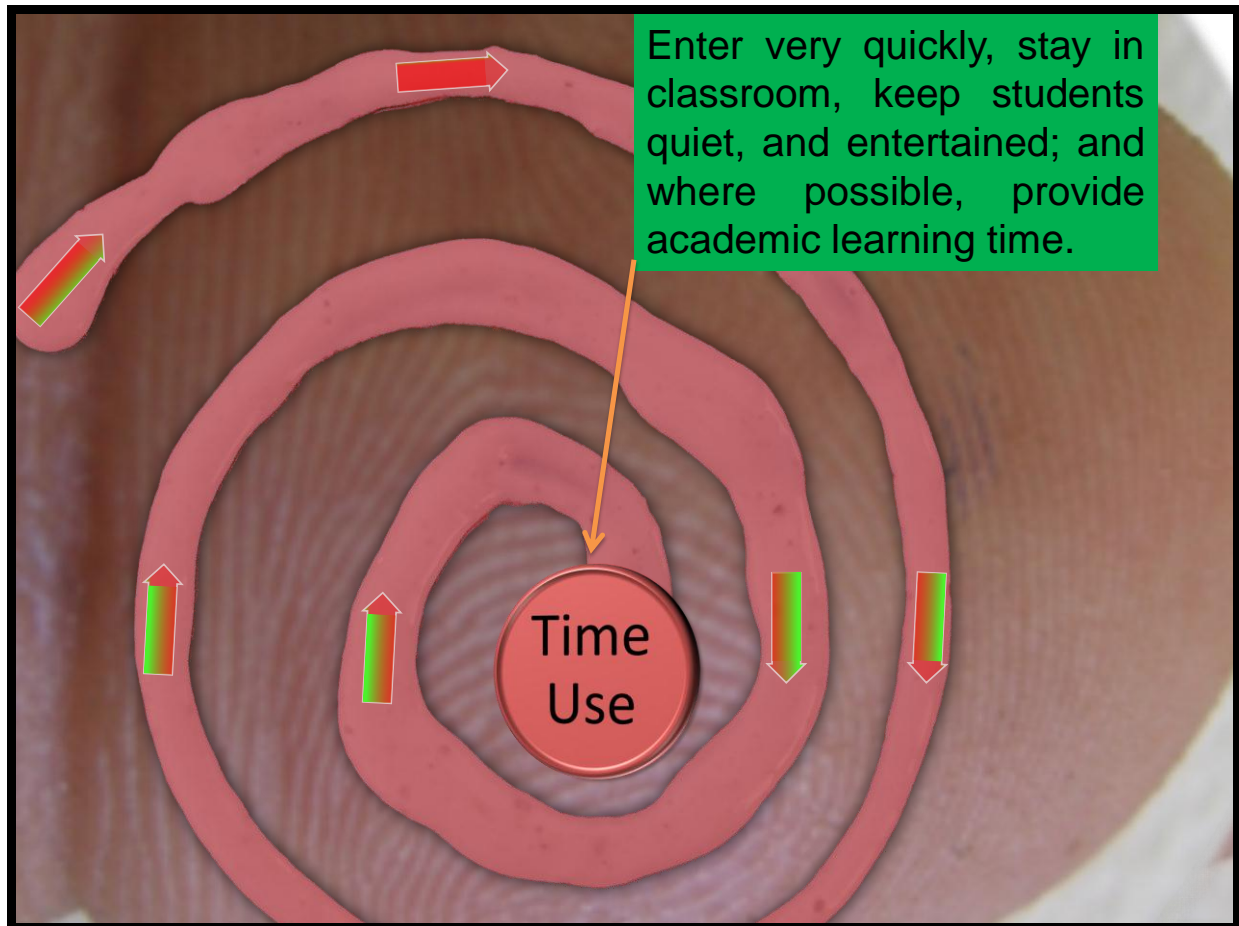


Figure 3.7 Part-time Teachers' Thumbprint

Equally important is the need to have a schematic view of the thumbprint model as it describes beginning teachers and how they circle through teaching, administrative task and also understanding the school administrative system, as they gain acceptance and experience in their chosen field of teaching. The following schematic diagram (Figure 3.8) captures also the beginning teachers' thumbprint, and the possible emotional exhaustion of beginning teachers (Goddard et al., 2006, p.867). These beginning teacher negotiates “at least three identities: ... those they bring with them into teacher education; ..., those they develop while doing university course work, and those they develop during student teaching practicums”

(Sumara & Luce-Kapler, 1996, p.65). This stage-based thumb print is based on personal communication (Marilyn Pietsch, pers. com., 16 June 2009), and also studies on beginning teachers (see: Sumara & Luce-Kapler, 1996; Kutcy & Schultz, 2006; Melnick & Meister, 2008).

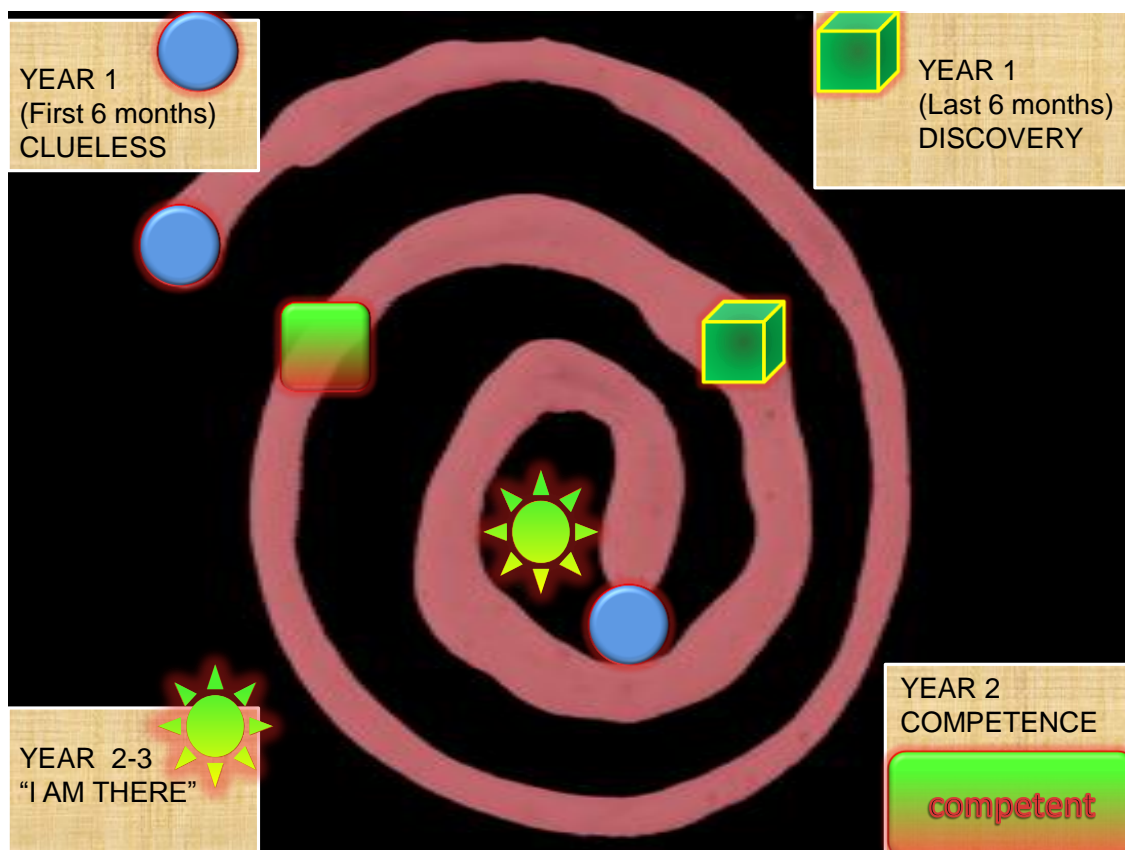


Figure 3.8: A Schematic Representation of Thumbprint of Beginning Teachers

The various stages may be used to represent the cycles of growth and development of teachers, as these teachers go through a period of survival, gain greater independence in classroom management, experiment with new ideas and consolidate and reflect on their classroom practice, before finally obtaining ‘higher levels of confidence, flexibility and a sense of professional autonomy (Dondero, 1997; Kutcy & Schulz, 2006). It is important, therefore, to advance the analysis of time diary data beyond what is offered traditionally by quantitative analysis, and incorporate qualitative variables. The qualitative information in

time diaries may yield additional evidence on how time is spent on various activities, and capture the subjective, lived-time experienced as teachers juggle the sets of all the activities that comprise a teacher's workload. The duration and timing of activities influence the meaning teachers attach to time in schools.

How can the analysis of time-use data make a substantial contribution to an understanding of the nature of a teacher's work? In general, an analysis of time-use data can (i) improve our understanding of the change in time allocation; (ii) provide for an interpretation of the link between time allocation, teacher emotional states, teacher job satisfaction, and general teacher wellbeing; and, (iii) further the understanding of economic and non-economic incentives that can alter teachers' time allocation, teachers' view of their work, as well as community views of teachers' work.

3.5.2 Mixed Research Methods

The manner in which teachers experience time and attach meaning to the experience of time is unique to the teacher. Qualitative data on the nature of teachers' work yield themes that allow one to grasp the time resource-constraints that teachers face. The subjective experience of time, the polychronic or monochronic nature of activities, and public and private aspects of time create thematic variables that are important for analysing aspects of teachers' time allocation behaviour; and, a quantitative modelling of teachers' time-use. For modelling time-use it is useful to consider qualitative as well as quantitative evidence on teacher time-use (Smith, 1983; Firestone, 1987; Johnson & Onwuegbuzie, 2004; Day, Sammons & Gu, 2008). It is in this regard that there is need to combine qualitative perspectives and quantitative assessments of teachers' work lives in providing a conceptual and analytical framework of teachers' time-use.

3.6 Time diary Data and Teachers' Time-Use

Previous research by Gardner and Williamson (2004) uses the themes from diary and interview data to show how teachers' time-use and work lives can be viewed from three domains. Gardner and Williamson (2004) consider thematic issues regarding time spent on direct work with students (the caring domain), time spent working with and for students (the teaching domain), and time spent as a part of being a part, component, player or actor in a large education system - the organisational domain (Gardner & Williamson, 2004).

It is argued that within each domain there is a set of core activities that are performed, and that these core activities determine the amount of time allocated to each domain. This is not suggesting that the three domains are separate, independent or unrelated – no, they are still intertwined, and the teacher performs tasks or activities within these domains by locating themselves somewhere on the monochronic-polychronic continuum (MacBeath, Frost & Swaffield, 2005). For example, given the importance teachers attach to teaching as an activity, it is not surprising that teachers perform other 'work' that is required by the education system and the community but not regarded as related directly the core business of teaching and interacting with students (Gardner & Williamson, 2004).

It is clear from the account given above that various activities are performed within the caring, teaching and organisational domains. Each of the domains has tasks or activities that are performed along the '*monochronic-polychronic*' continuum. The amount of time taken to perform these tasks or activities then becomes collected quantitatively using diaries. This indeed is the interface between qualitative methods and quantitative methods in this research. The process outline above highlights the importance of mixed methods research in explaining teachers' workloads and work lives.

In the analytical framework pursued in this thesis, it therefore becomes important to determine the relative shares of time teachers spend on all domains (teaching, caring and organisational). The determinants of time shares of teachers' time in all three domains should indicate the way teachers allocate time - through viewing time as both a resource and a constraint. From a modeller's point of view, it is important to assume that the requirement to have these domains can be understood or appreciated easily by an individual teacher, although not necessarily given the same weighting by the teacher – relative to the teaching domain. Equally important is whether activity time, within each domain, can be easily partitioned.

In the context of the teacher's thumbprint, shown in Figures 3.1 through 3.6 earlier, it follows that the time spent, by teacher **i**, on the set of **j** activities robs the teacher of time that could be spent on set **k** to set **q** activities. The time budgets and time shares devoted to activities **j** through **q** are the focus of attention in the thesis. It is posited that the key determinants of time budgets and time shares can be identified from time diary activities, using a suite of empirical techniques and then assessed or identified through suitable regression techniques.

Clearly, from Figure 3.1 and its variations (Figures 3.2 through 3.6), the inter-mix of domains occurs through all activity sets from **j** through **q**, and to be specific, one may argue that the domains also include **i** – hence the set of influence is **i** to **q**, and even beyond. The total amount of time the teacher spends on all activities, regardless of the domain, is both the resource and constraint. The share of total time spent on each activity is the activity time share. The total time spent on each day on all activities (regardless of the domain) is the daily time budget. This time budget, when expressed as a proportion of total available time over a typical week is the daily time share or simply the time share. The term time share will be used throughout the thesis to refer to relative time-use; and, the term time budget will be reserved for the actual (absolute) amount of time spent by a teacher, on a typical day.

It is posited that the time share definition carries a different meaning from that conveyed by the time budget. It is anticipated that the empirical framework of this thesis and results thereof will show the difference between the two concepts. Most important and indeed quite significant is that the time share and time budget concepts are not proposed as alternative views of time allocation. Rather, the two concepts will turn out to be complementary in use – at least they should, theoretically.

3.7 Use of Linear Time as a Measure of Teachers' Activities

Teachers' work changes and is discontinuous (Walker & Woods, 1976; Turney et al., 1986; Little & McLaughlin, 1993; Hargreaves, 1994; Frazis & Stewart, 2003). The teacher's activities are not uniform. Teaching and non-teaching activities, as well as school and non-school activities overlap (Floro & Miles, 2001; Floro & Miles, 2003; Miles, 2003; Cinamon & Rich, 2005) and, some activities are performed infrequently. Other activities require very little time – so *minute* that it is often hard to measure that time requirement, or not economically feasible to measure that time requirement. In some instances the time required is so small to be measured with reasonable accuracy and yet the impact of those activities performed in these minute time capsules has an immense bearing on the teachers' workload. Walker and Woods (1976, p.3) show that often teachers' activities use very little time such that it is “not economically feasible to record the precise time of the beginning and ending of work”. This limitation in measuring and interpreting time used is due to the cultural, social and psychological variation and dimensions of estimating time. In spite of the limitations presented here, it is generally accepted that “time budget studies on how people divide their total time among different competing/conflicting roles and activities would be highly informative” (Ruggles & Ruggles, 1970, cited in Walker & Woods, 1976, p.4).

It has been emphasised earlier that time spent on secondary and tertiary activities is rarely collected in time-use studies (Frazis & Stewart, 2004). In the literature it is often assumed, therefore, that this lack of information on secondary activities should have only a minor impact on time allocation for paid work. This claim or proposition is on the assumption that most paid work is done as a primary activity (Frazis & Stewart, 2004), and therefore should consume a large share and often the only share of work-time. This assumption implies that models based on primary activities only are still robust if secondary and tertiary activities are ignored. This assumption then leads one to ignore other arguments for including secondary and tertiary activities in analysing time-use data. In this thesis secondary and tertiary time allocation are incorporated implicitly by looking at time budgets and time shares of all daily activities undertaken over a 24-hour time-window, over a typical week. By using time budgets and through calculating the time shares, the model proposed in this thesis fundamentally bypasses the limitations of the inability to collect reliable data on secondary and tertiary activities, and hence calculate the time-use shares of secondary and tertiary activities.

Avery et al., (1996, p. 414), among others, note that “many...interesting and dynamic aspects of time-use have been ignored in previous studies, probably because of the added expense of collecting and coding the sequential (24-hour) data” shown traditionally using time diaries. In this thesis a framework for collecting such dynamic aspects of time is presented. Empirical evidence is presented that showcases the value of using the time diaries in the context of the theoretical framework that is developed. Through the use of linear time in understanding teacher time, this study adds to the suite of theoretical models undertaken to understand time-use allocation.

3.8 Non-linear Time and School Reform

In the previous section, diaries, time budgets and time shares were used to partition time allocated to activities and also interpret time in a linear fashion. The noticeable complexity of secondary and tertiary activities and their impact on time-use was noted. Given the earlier discussion regarding the monochronic-polychronic continuum, it is significant to look at time shares and time budgets in the context of non-linear time. As discussed earlier in the metaphors of clock-times in schools, in Chapter 2, the various clocks of time in schools should indeed make time non-linear (Rosenshine, 1978; Rosenshine & Berliner, 1978; Stoll, Fink & Earl, 2003).

Benavot and Amadio (2004) argue that there is an educational rhetoric that claims that teachers' instructional time has a positive impact on academic achievements of learners. Benavot and Amadio (2004) argue that this conjecture, although not tested for scientific merit, has diffused rapidly in the world to an extent that the claim or conjecture has assumed global significance. The positive reaction to this conjecture has also been rather surprising: education policy has required that instructional time be increased. The principle of more-time more-learning has been institutionalised and globalised; and, at an individual level teachers are always asking for more time. Policy recommendations presented in the literature point to the need for reforms that: (i) do not interfere with the way teachers allocate time to teaching (ii) develop a broader skill set as required by teachers; (iii) that allows teachers and administrators to negotiate the critical aspects of the reform efforts, in an engaging, consultative and collaborative manner (Cambone, 1994). In the context of developing the conceptual model for teachers' time allocation, it is imperative therefore that data provide adequate information about experienced-time, 'eroded school-time', and 'eureka-time', to name a few. It is also worth reinforcing that although the 24-hour diary is used, the diary represents a summary of non-linear processes at work in the allocation of time by teachers.

3.9 Teachers' Work Is Real Work

Is a teacher's work real work? As noted in Krantz-Kent (2008) teachers' work patterns differ considerably from those of many other professionals. The context and content of a teacher's work is shaped by many factors including being "shaped much by teachers themselves as by situational constraints" (Hatton, 1987, p.55). The acknowledgment of "teaching itself ... as work in which emotions are central" (Spencer, 1997; Day & Leitch, 2001, p.406; Timms, Graham & Cottrell, 2007), has only been recent. Williams and Gersch (2004, p.157) indicate that evidence suggests that "teaching is a stressful profession", and as part of this stressful, emotional professional labour, teachers actually "make more difference in student achievement than any other school factor" (Reeves, Emerick & Hirsch, 2006, p.1). Clearly teachers view the school system and recent reforms as interfering with their day-to-day activities (Easthope & Easthope, 2000; Gardner & Williamson, 2004; Kutcy & Schulz, 2006; Williamson & Myhill, 2008). In that respect; teachers, as part of their work, "feel voiceless and powerless to change within the larger educational system ... and have similar feelings in relation to the general public" (Kutcy & Schulz, 2006, p.84). The sentiment seems to suggest that the public view teachers' work as "easy work which is paradoxically poorly performed" (Rice, 2005, p.183), – but would still prefer to see "schools taking up the slack left by other institutions ... [such as the] ... church, family" (Goddard, 2000, p. 314).

In this context, how do teachers view their own work? The work of teachers involves considerable 'emotional intensity' and 'emotional labour' (Rice, 2005, p.188). The way teachers perceive their own work and work status is construed as heightening the emotional intensity (Szebo & Cebotarev, 1990; Shalem, 1992; Smyth, 1992; Manrai & Manrai, 1995; Williamson & Poppleton, 2004; Bullough, Bullough & Mayers, 2006). Evidence regarding teachers' work status is mixed (Easthope & Easthope, 2000; Webber, 2007). As noted in Shalem (1992) teachers are viewed as "the lowest of the low ... [even though] ... people at the

top know much less about being in the classroom” (p.317). Clearly, “social, cultural, economic and political factors (Hornberger, 1987, p.207) do impinge on education and the work of teachers in schools, and the way teachers think of themselves and their work.

While the public and school administrators have their view of what entails teachers’ work, teachers themselves also may have a different view of the kind of things that comprise their work. Teachers will obviously recognise what they do as work - but will be quite quick to defend or argue the case of what really constitutes real teachers’ work. The sentiment or perspective towards work may differ depending on teacher’s levels of teaching experience and age demographic. For example, Kutcy and Schulz (2006, p.84) present the view that the new generation of teachers may hold definitions of what teachers’ work entails, that are completely different from the realities of work experienced by older teachers, or the realities of work as expected by communities. This crisis of expectation, as it were, is a very important problem on which to reflect. Certainly, the public often views school in the context of what school was like when they were at school, and may see the level of funding, the level of resourcing, the number of teachers in schools and diversity of programs as reflecting overstaffing and also suggesting less work being done by a lot of people who are paid very high salaries (Goddard, 2000). The question of the “other stuff” that teachers do (Gardner & Williamson, 2004; Kutcy & Schulz, 2006) is seen by the public as justified given the high tax-payer costs of running modern schools. For teachers though, be they experienced or newly qualified, there are those intrinsic aspects of teaching that teachers really consider to represent ‘teaching as work’ (Churchill, Williamson & Grady, 1997; Helsby, 1999; Webb et al., 2004), and often consider the “other stuff” as the everything else apart from teaching that leaves many teachers reconsidering whether teaching is a good profession for them (Shalem, 1992; Beaudin, 1993; Michelson & Harvey, 2000; Goddard, O’Brien & Goddard, 2006). Painter, Haladyna and Hurwitz (2007, p.110) consider these intrinsic factors to include “work

content - the culture, recreation, working hours, support, planning time, and length of day” as important. In addition, teachers do stay in the teaching profession in spite of the salary and the way the schools are managed, controlled or regulated (Anderson, 1994; Watterreus & Dobbelsteen, 2001; Ingersoll, 2003; Weiss & Brown, 2003). Indeed, “teachers preserve, in spite of the deprivations and challenges” (Kutcy & Schulz, 2006, p. 79) because of liking and loving the teaching part of the job (Strober & Tyack, 1980; Strober & Lanford, 1986; Perrachione, Rosser & Petersen, 2008).

In the framework proposed in this thesis, and also in a manner similar to that proposed by Pollack (2000), teachers are considered or modelled as individuals engaged in production such that they allocate their time towards school and non-school activities (Gardner & Williamson, 2004) in order to produce commodities or services that are then consumed and produce gain, rewards (Juster, 2000; Pollack, 2000; Watterreus & Dobbelsteen, 2001; Frazis & Stewart, 2004) or utility (Becker, 1965).

In looking at the work of teachers, it is paramount to consider teachers’ time allocation behaviour as part of a broader behavioural model. The patterned behaviour of one individual teacher must also be looked at from the point of view of the patterned behaviour of aggregates of other individual teachers with whom a teacher interacts at the workplace. It is important that the allocation of time by individuals is also a matter of choice. It is therefore important to consider what factors motivate teachers to make the time allocation choices and display the actions and choices they display. Juster (2000, p.75) suggested that “work hours defined by a time-use study not only include work for pay in the market but also unpaid household work, commuting time to and from work, work hours during leisure time and leisure time during work time”. This statement provides ample support to the conceptual framework for analysing linear and non-linear time, presented earlier in Chapter 3.

3.10 Conclusion

Teachers perform a multiplicity of tasks in schools and outside schools. These tasks define the nature of the teacher's work. It is important to describe the nature of the teachers' work – in particular through developing a simple conceptual model of teachers' allocation of time to a host of activities that are of different time-thirstiness. The time-squeeze that the teacher feels and how the teacher's work intensifies highlight the importance of understanding time as both a resource and a constraint. Teachers' time allocation behaviour is governed thus by the different domains of teachers' work and, also, governs the domains of teachers' work.

A conceptual model of teachers' time allocation has been presented in this chapter. The conceptual model captures a significant volume of the key elements of the teacher's work as presented in the literature reviewed in Chapter 2. The conceptual model is novel and fairly simple, but nonetheless, illustrates the complexity and dynamism of teachers' work with great creativity, but without going overboard in terms of the technical elements. These technical elements are encapsulated in the metaphor of a teacher's thumbprint – stressing the uniqueness of a teacher's work. The metaphor of the teacher's thumbprint is used to highlight the realism of the conceptual model, showcase the core objective of teachers' work, as well as show the sphere within which the teachers' work is influenced by the individual teacher (*i-teacher*), activities **j** through **q**, the school, and the endless short-lived education reforms. The conceptual model stresses that time spent on various activities by teachers in Tasmania is reliably measurable using time budgets and time shares that are computed from data provided in the Gardner and Williamson (2004) study.

A skeletal structural equation system is provided to give a glimpse of the series of equations that links the conceptual model in Chapter 3 to the empirical model developed in Chapter 4, and the results thereof reported in Chapter 5. The glimpse in the skeletal structural model identifies teacher characteristics, school characteristics and policy variables as influencing

time-use, theoretically. The derivation of the specific equation system that is housed in this skeletal structural equation is given in Chapter 4. How the skeletal structural equations will be estimated, also is the subject and focus of the next chapter, Chapter 4.

CHAPTER 4

AN EMPIRICAL FRAMEWORK OF TEACHER TIME-USE

4.1 Introduction

The allocation of time by teachers will inevitably determine how they perform their jobs as teachers over time, and in the various locations they work. The allocation of time to school work is as important to the teacher's well-being as the allocation of time to non-school and non-work activities. From an economics modelling point of view – teachers are individuals who allocate their time across a series of activities as part of a production process (Shackle, 1958; DeSerpa, 1971; Gronau, 1977; Sharp, 1981; Bechtold, Janaro & Summers, 1984; Graham & Green, 1984; Strauss & Thomas, 1985; Juster, 1986; Brown & Saks, 1987; Mroz, 1987; Robinson & Gershuny, 1994; Jenkins & O'Leary, 1995; Apps & Reeves, 1997; Fortin & Lacroix, 1997; Maassen van den Brick & Groot, 1997; Bhat & Misra, 1999; Waterreus & Dobbblesteen, 2001; Robinson, Chenu & Alvarez, 2002; Axon & Carlin, 2004; Ruuskanen, 2004;). If teaching or school activity, in general, is the main activity in production, then the time spent elsewhere outside the school (in a non-work environment) is considered consumption-time. Time spent at school is considered work-time or production-time. This consumption-time embraces leisure consumption as well. In addition, it is important to note that time spent at school produces satisfaction, utility and/or income – and income generated then determines the teacher's consumption patterns as well as the allocation of time to activities outside the school, which in turn determines the allocation of time spent on activities inside the school. The account given above is an essential way of qualifying that teachers' work is real work (some parts of communities tend to dispute that – see Section 3.8 in Chapter 3). Therefore, teachers' work should be modelled as work with significant and unique emotional labour and the unsocial work hours attached to the emotional labour. The teacher's work is not static, it changes over time and hence the analysis of teachers work

requires an approach that is dynamic and can track changes as teachers adapt or respond to changes in the education system.

To answer the question of how teachers allocate time in the workplace – attention is diverted to using existing survey data (time-diary data), and looking at both the qualitative and quantitative empirical evidence. The diary data represents aspects of teachers' work through records of activities completed over space and time. The empirical findings from the study are generalised for the population of primary school teachers in Tasmania. In this thesis data for unionised Tasmania Education workers are considered. The use of unionised data is important given that, traditionally, empirical estimates from diary data have been criticised for focusing on cross-sections of the total population without sufficiently sampling a well-targeted subpopulation (Avery et al., 1996). The need to use a well-targeted subpopulation is also recognised by Gardner and Williamson (2002) and Frazis and Stewart (2004). Frazis and Stewart (2004) also restricted their analysis to the time study of unionised, fulltime workers. In their work, data were also collected using time diaries.

The conceptual framework proposed in Chapter 3 is consistent with that used in other models of economic allocation of work by individuals (Becker, 1965; Heiner, 1983; Blundell & Meghir, 1987; Kitamura, Fujii & Pas, 1997; Wattereus & Dobbelsteen, 2001; Ruuskanen, 2004; Lee & Waite, 2005; Kan, 2008; Kan & Pudney, 2008). It is expected therefore, that this work enriches the literature on individual allocation of time by conducting a microanalysis of activity patterns of Tasmanian teachers; and, also draws some implications about the dynamics of change in the education sector. If the developed framework is fully-tested and supported empirically, then this study can be used in future in three ways: first, as a basis for collecting new data; second, as a way of re-examining new evidence; and, third, as an alternative method for testing sensitivities to workload allocations and the responsiveness to changes in workload allocations. To the best knowledge of the researcher no study has so far

been attentive to the empirical estimation of the problem of teachers' time budgets and time shares in the teaching profession, in the context of a conceptual model (framework), and from which policy implications can be extracted.

What is done in the thesis that is different from what is presented in the study by Gardner and Williamson (2004)? The Gardner and Williamson (2004) study on workloads of Tasmanian education workers uses descriptive statistical analysis. In this thesis, descriptive statistical analysis by Gardner and Williamson (2004) are used as a background and resource with which to build a model of time allocation or time-use by teachers in Tasmania. In addition to modelling time-use, a unique approach to analysing activities of teachers is developed. Empirical evidence on the model of time-use by Tasmanian teachers, and the allocation of time among or across competing tasks is presented. The thesis complements and extends the work by Gardner and Williamson (2004); and, in addition, creates the crucial joiner between time-use analyses, workloads analyses and the general study of allocation of time using time shares and time budgets. The time-use analyses conducted in the thesis is informed, therefore, by the Gardner and Williamson (2004) study, and also extends the Gardner and Williamson (2004) study.

Chapter 4 is presented as follows. Following this brief introduction, a brief summary of the equation structure of the conceptual model on which the econometric model rests, is presented in Section 4.2. The estimable equations and key variables are presented in Section 4.3. The suite of techniques that provides excellent candidates for extracting empirical content out of these estimable equations is presented in Section 4.4. The set of structural and/or behavioural equations required is shown in Section 4.5. How the data are analysed is described in Section 4.6, and the likely extensions to the data analyses and analytical framework are presented in Section 4.7. Concluding remarks are drawn in Section 4.8.

4.2 Connecting the Empirical and Conceptual Frameworks

Suppose that, in the self-reporting of time expenditure by teachers, the link between hours reported and time expected on task is given by the following equation 4.1:

$$R_i^d = E_i^d + \varepsilon_{i1}^d, \quad [\text{Equation 4.1}]$$

where, d = day of the week, i = teacher, R_i^d = reported hours in a day, and E_i^d = expected hours in a day, and ε_{i1}^d is a random error term that is assumed to be well-behaved such that $R_i^d \geq 0$, for $E_i^d \geq 0$. Within the context of the teacher's thumbprint, this equation is equivalent to the following sentiment: *"Today was my busiest day. I worked all day – 10 hours non-stop"*. So $R_i^d = 10$, but according to the Department of Education in Tasmania, teachers are expected to allocate 7.5 hours per day. Thus, $E_i^d = 7.5$. This is the contractual time as defined, for example, by Drago et al., (1999).

Now; a different time measurement then surfaces when teachers are asked to complete time diaries. This measurement is the diary hours reported for any selected day of the teaching week and is expressed as equation 4.2:

$$D_i^d = R_i^d + \varepsilon_{i2}^d, \quad [\text{Equation 4.2}]$$

where D_i^d = recorded diary hours in a day, and R_i^d = reported hours in a day (as defined earlier in equation [4.1]), and ε_{i2}^d is a random error term for equation 4.2, bearing the same assumption as in equation 4.1.

Again, in the context of the teacher's thumbprint the sentiment is: *"Today was my busiest day, I worked all day – 10 hours non-stop. Now that I have actually completed my diary entry for the day, it turns out that I have done 12 hours of work"*. In this case, $R_i^d = 10$, $D_i^d = 12$, and the expectation of working a 7.5 hour day still holds: so, $E_i^d = 7.5$. This expectation, although not shown explicitly, is nested in the definition of R_i^d . The random error is made available to

allude to the fact that these times are generally measured with error. From the values of D_i^d the time recorded in teacher's diary for each working week (Monday to Friday) can be obtained from equation 4.3

$$W_i^{mf} = \sum D_i^d = \sum R_i^d + \sum \varepsilon_{i2}^d, \text{ [Equation 4.3]}$$

where, W_i^{mf} = total time expenditure for days Monday to Friday. This equation simplifies to $W_i^{mf} = \sum D_i^d = \sum (E_i^d + \varepsilon_{i1}^d) + \sum \varepsilon_{i2}^d$, by substituting the expression for equation [4.1], and can be expressed in the form shown in equation 4.4:

$$W_i^{mf} = \sum E_i^d + \varepsilon_i^{mf}, \text{ [Equation 4.4]}$$

This equation simply relates the total time recorded by diary entries to the expected time in schools. The error structure is fairly complex since it is a summation of errors from other structural equations, as well as errors peculiar to equation 4.4. For the sake of simplifying the analysis, it is assumed that ε_i^{mf} is also well-behaved, and that the errors ε_{i1}^d , ε_{i2}^d and ε_i^{mf} , will be contemporaneous (for example, Zellner, 1962; Nelson & Olson, 1978; Dougherty, 1992; Greene, 1993; Griffiths et al., 1993; Niemi, 1993; Cameron & Trivedi, 1998).

How is equation 4.4 placed in the context of the teacher's thumbprint? Since equation 4.4 gives the cumulative hours expended over a typical teaching week, then this equation captures the following sentiment: *"Thank God, it's Friday – that was another big week"*. It is important here to impose the restriction that: $E_i^d \neq E$, where E is the constant E=7.5 hours that the Department of Education expects. This restriction is crucial because it allows individual teachers to have different expected hours of work for each particular working day.

This is particularly important given that there are part-time and fulltime teachers, as well as casual or relief teachers, in school systems and in the sample data analysed in thesis.

It is clear from the literature and the conceptual framework that teachers' work extends to the weekends. In that regard, time allocation on Saturday can be thought of as some proportion of time that has been allocation for Monday through Friday. Hence, it is prudent to argue that

$$W_i^{sa} = (1 - \rho_1)W_i^{mf} + \varepsilon_{i4}^{sa}, \quad [Equation 4.5]$$

Similarly, is expected that the time spent on Sunday will depend on how much time has been spent on Saturday, as well how much time was spent during the teaching week Monday to Friday. Hence it is also clear that Sunday times can be expressed as:

$$W_i^{su} = \lambda_1 W_i^d + \lambda_2 \{W_i^{sa}\} + \varepsilon_{i5}^{su}, \quad [Equation 4.6]$$

In this equation the Sunday working hours for an individual teacher are represented by W_i^{su} .

The parameters λ_1 and λ_2 measure the time allocated to Sunday work as a fraction (proportion) if time allocated to the teaching week, and Saturday, respectively. Therefore, W_i^{ss} represents Saturday-Sunday teacher hours. Therefore the weekend hours are now

$$W_i^{ss} = \{W_i^{sa} + W_i^{su}\} + \varepsilon_{i6}^{ss}, \quad [Equation 4.7]$$

The total number of reported hours, in diary data, for the entire week are then represented as W_i^w , in equation 4.8 below:

$$W_i^w = W_i^{ss} = W_i^{sa} + W_i^{su} + \varepsilon_{i6}^{ss}, \quad [Equation 4.8]$$

Through a series of substitutions it is shown that an estimate of the weekly hours expended on all activities can be represented by the following equation:

$$W_i^w = \sum_i^d E_i^d + W_i^{sa} + W_i^{su} + \xi_i \quad [Equation 4.9]$$

At this juncture in explaining the equation structure it is important to go back to equation 4.1 and to recall that equation 4.1 shows how the reported time may differ from what is expected in terms of work time commitments. Unfortunately, the expression as presented in equation 4.1 does not include the interrelatedness between time-use in various days. This was a deliberate omission earlier and designed to allow the reader to easily connect the next set of equations to the ones derived earlier. Ideally, equation 4.1 should reflect the cumulative effect of time-use. This creates a very complex equation structure which nonetheless needs specifying in a form similar to that of equation 4.9.

Each of the terms on the right hand side of $W_i^w = \sum E_i^d + W_i^{sa} + W_i^{su} + \xi_i$, is dependent on a host of factors that are peculiar to the teacher (X), the school (Z), the classroom (C), the day of the week (D), and some policy and school reform variables (S_R). In expanded form, equation 4.9 will look like this [equation 4.10]:

$$W_i^w = D_i^{d=1} + D_i^{d=2} + D_i^{d=3} + D_i^{d=4} + D_i^{d=5} + W_i^{sa} + W_i^{su} + \xi_i, \quad [Equation 4.10]$$

However, as pointed out each of the seven terms of time allocation is dependent on a host of factors, X, Z, C, D and S_R . So, ideally,

$$W_i^w = \sum_{d=1}^{d=5} D_i^d(X, Z, C, D, S_R) + W_i^{sa}(\dots) + W_i^{su}(X, Z, C, D, S_R) + \xi_i, \quad [Equation 4.11]$$

In the thesis each of the daily time allocation equations is estimated, using a suite of techniques. In using these equations, there is need to focus on the teacher as a unit of analysis (see argument in Chapter 3, and then Section 4.3), and then show variables required for estimating a teacher's time-use (Section 4.4), mention and identify a suite of techniques that are good candidates for estimating time use (Section 4.5), present the estimable/estimating equations (Section 4.6), and highlight some software requirements (Section 4.7).

4.3 The Individual Teacher As The Unit Of Analyses

An analysis of how teachers spend their time (this is expenditure of time by teachers) requires one to capture the sequencing of activities undertaken by the individual teacher. This sequencing of activities over a typical hour, day, or week (or any other defined time interval) is important in time analysis. This sequencing has always been considered as a future research agenda that required “accounting for in future research efforts” (Avery et al., 1996, p.414). Therefore, this thesis makes significant contributions to the literature and empirical examination of time-use in teacher’s workloads, by: (i) focusing on the teacher as the unit of analyses, (ii) presenting a conceptual framework of teachers’ time-use, and (iii) providing a suite of empirical models to support the conceptual framework. The theoretical framework presented in the thesis, as well as the model and its empirical components, – in particular, the use of activity budgets, time budgets, and time shares that capture the dynamics of teacher time allocation behaviour, have been identified as often ignored in the literature. So, in this thesis, the duration and timing of teachers’ activities is examined and expressed in terms of *time budgets* and *time shares*. Dummy variables are also created in order to capture some of the salient properties presented in the qualitative data. The time-space separation of activities must be observed strictly.

In this chapter key estimating variables that are of interest to teachers, planners and academics, and affect teachers’ workloads and time budgets and time shares, are explored. The selection of the variables is motivated by the literature on teachers’ time-use, the impact of time-use on schooling, as well as some stylised facts and past findings on how teachers use their time. It is of interest, therefore, to examine how teachers allocate time, and assess the sensitivity of these time allocations to institutional and personal factors, and the likelihood that teachers have the flexibility and capacity to adapt to externally induced changes.

The choice of explanatory variables and the empirical models are all aimed at having a peek into the blackbox of models of teacher time allocation and are inextricably linked to the economic models of individual and collective time-use. This link is not coincidental but is grounded in models of the household time-use choices because of (i) the link between teachers' private time and public time, (ii) the link between teacher's work and teacher's leisure, and (iii) the general or specific tradeoffs in teacher time allocation behaviour. The art and act of income generation for each teacher's private time and public time, and also the tradeoffs between private and public time, require different investments in the respective times. The time budget survey and 24-hour diaries used in the study cross over private and public time, and capture data on a phenomenon (teachers' time-use) that occurs both in time and space and in the context of the school and home environment. In the polychronic time framework that teachers are assumed to work within, it is clearly the case that out-of-school activities are also performed and synchronised into school-time.

The individual teacher ultimately serves as a useful unit for analysis and planning, since the teacher's time allocation behaviour shows - the allocation of effort, the specialisation of effort and the extent to which time is used as both a resource and also a constraint. Educational change may disrupt the observed patterns of time allocation or represent a different type of constraint to education workers. Clearly, it is often hard to predict the effects of educational policy on each individual teacher; however, the responsiveness to change by individuals is captured if the patterned behaviours of teachers are analysed or understood in terms of time budgets and time shares across selected sets of activities.

Although such an approach is purely quantitative, more can be extracted from previous data on time-use by using qualitative analyses to complement the quantitative assessment of workloads of teachers, teachers' work lives and time allocations. The conceptual framework of the teachers' thumbprint presented in Chapter 3, and the empirical component thereof

presented in this chapter (Chapter 4), both contribute to an understanding of how qualitative and quantitative data on teachers' time allocation can provide that theoretical and empirical peek into the black box of teacher time-use. The variable public time (daily time-use) is useful for understanding teachers' time allocation. However, during public time a lot of activities are pursued (singularly or jointly as the case might be). In that regard, it is imperative to partition public time into various activity times, and then look at those activity times in terms of their share of total public time. Initial reaction to this approach is that public time for teachers has been changed from polychronic time to monochronic time. That is only the case if each of the time budgets or time share equations is estimated independently of any other time budget or time share equation. In a model where all activity times are estimated simultaneously, clearly the framework is still within the polychronic time framework. In this thesis, the estimation of the *time budgets* and *time shares* as a system, using a suite of techniques, makes the analyses of time allocation essentially polychronic.

4.4 Using Quantitative and Qualitative Analyses

In making the case for the determinants of teachers' allocation of time across the range of activities that teachers undertake, each of the teacher's activities is uniquely defined and/or identified. In this thesis a framework for collecting such dynamic aspects of time allocation using time-diaries is presented. Empirical evidence is presented that showcases the value of using the time diaries in the context of the theoretical framework that is developed. In the thesis the various combinations of activities that teachers understand are extracted from the time-diary data. These combinations of activities are represented simply as the number of activities undertaken by a teacher. As argued earlier, these activity patterns capture the teacher's perceived priorities and the relative value of time to the teacher.

This study uses qualitative and quantitative data in the following ways. First, qualitative data are used to test theory and assumptions, and construct a model of time allocation by teachers. Second, qualitative data are used to extract common themes from the teachers' discourse about their work lives. These common themes are then used to explain and interpret the various aspects of the constructed time-allocation model. The qualitative and quantitative methods employed in this thesis complement each other, and in the process should offer a more coherent model of time allocations in teachers' work lives.

Dummy variables are used to capture the qualitative variables in ways that make them quantifiable (Madalla, 1983; Doti & Abidi, 1988; Dougherty, 1992; Greene, 1993; Griffiths et al., 1993). The term '*quan-quals*' is coined for these types of variables. The developments of techniques for analysing qualitative data have implications for a revival of interest in analysing the salient features of qualitative data on time-use by teachers. A linkage or coupling of qualitative and quantitative analyses in understanding time allocation within spatial contexts of human activity is important for understanding both the theoretical and empirical aspects of spatial-temporal allocation of time in schools.

The variables identified in the Gardner and Williamson (2004) study fall into two categories, namely variables extracted directly from the questionnaire, and variables that were constructed from the themes that emerged from focus groups, face-to-face interviews, and the transcribed qualitative responses. In the thesis, additional variables are constructed from the themes identified by Gardner and Williamson (2004). As a result, three variable categories are presented and used in the empirical evaluation of the model proposed for analysing time-use by teachers. These three variable categories are: (i) direct questionnaire variables; (ii) thematic response variables, and (iii) constructed variables. It is noteworthy that the constructed variables are designed to align the current empirical result from the Gardner and Williamson (2004) study, with the current literature.

These constructed variables, together with the direct variables and the thematic variables are used to test or examine some stylised facts about intra-household time allocation that are espoused in the literature. The use of constructed variables is a new approach that is unique to the thesis, and the methodology of analysing time-use data. The technique of using constructed variables accords the researchers the flexibility of analysing thematic responses in a quantitative manner. It is important to note that most software for qualitative research identifies themes quite well (NVIVO, for example; QSR, 2009), and researchers tend to use these themes in discussing/reporting research findings. These thematic outputs are rarely used in further modelling and empirical analyses. In this thesis, the thematic variables are used as part of modelling time-use. In this regard, this unique contribution to the cross or mix of quantitative and qualitative methods deserves considerable mention and exposure; and, is an advancement to mixed-methods research (Johnson & Onwuegbuzie, 2004; Day, Sammons & Gu, 2008).

4.5 Suite of Techniques

The conceptual framework and empirical framework require that all activities that embody a teacher's time-use are estimated simultaneously – consistent with the polychronic interpretation of the nature of teachers' work. The allocation of time across typical days of the week requires a system that estimates equations simultaneously and takes into account interrelationships across equations. Individual ordinary least squares (OLS) and errors in variable (EIV) estimation of each of the time budget or time share equations is indeed monochronic. Estimating the time budgets and time shares equations as a system, using Seemingly Unrelated Regressions (SUR) and Instrumental Variable Regressions (IVREG) and multivariable regressions (MVREG) makes the analyses of time allocation polychronic. It is for the simple reason (of avoiding the monochronic interpretation of time) that results of OLS, EIV, SUR, MVREG and IVREG are also reported jointly in Chapter 5. The suite of

these regressions techniques is thus used in estimating equation 4.11. The suite of techniques is shown in Figure 4.1A.

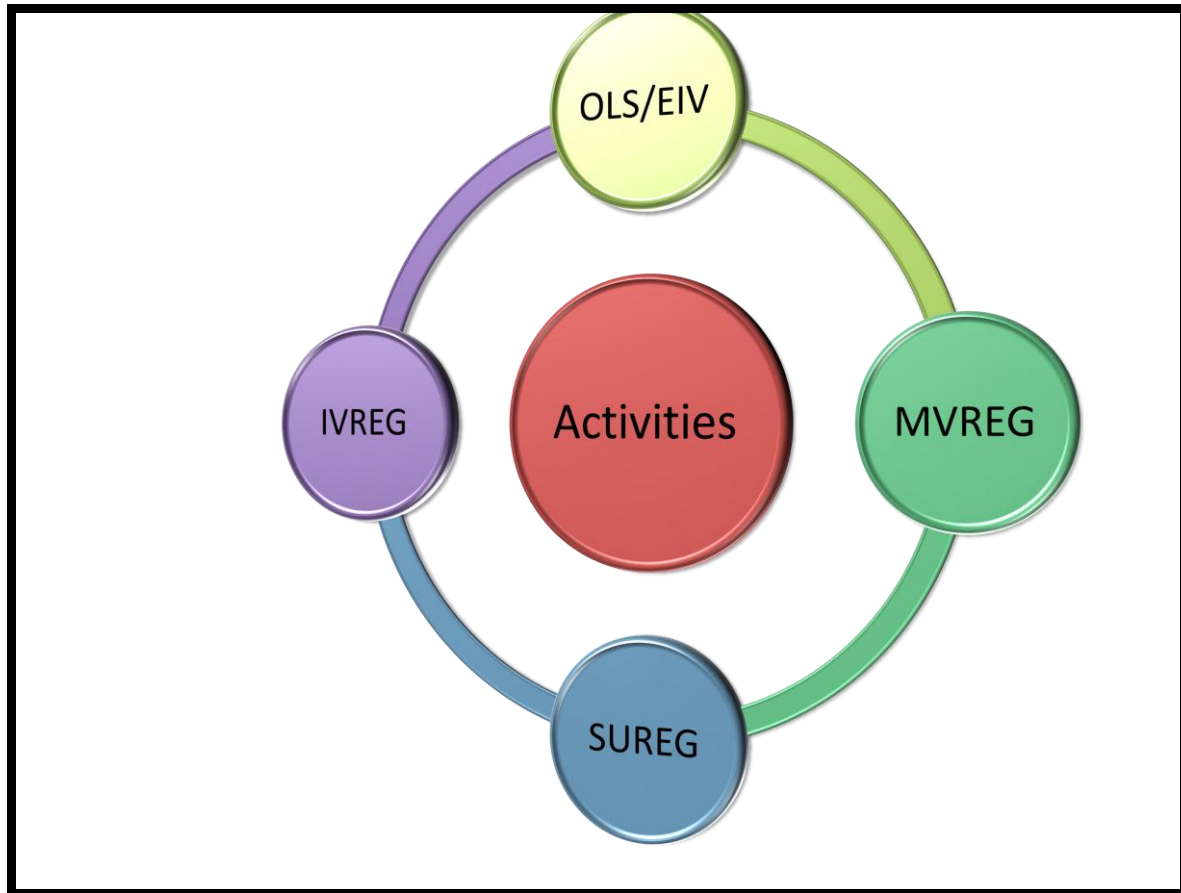


Figure 4.1A Suite of Estimation Techniques and Focus on Teachers' Activities

Therefore, the teacher's time-use is a composite function: $\mathbf{H} = \mathbf{h}(\mathbf{I}, \mathbf{J}, \mathbf{K}, \mathbf{L}, \mathbf{M}, \mathbf{P}(\mathbf{Q}), \epsilon)$, where: \mathbf{H} = time spent on a typical day by teacher \mathbf{i} , \mathbf{I} = teacher characteristics, \mathbf{J} = outside school characteristics, \mathbf{K} = inside school and outside classroom characteristics; \mathbf{L} = in classrooms and not teaching activities, \mathbf{M} = time teaching with others, $\mathbf{P}(\mathbf{Q})$ = time teaching alone and implied engagement time or quality time (\mathbf{Q}); and, ϵ = other things that have been left out by the model. It is imperative to relate this composite function $\mathbf{H} = \mathbf{h}(\dots)$ to the host of factors \mathbf{X} , \mathbf{Z} , \mathbf{C} , \mathbf{D} and \mathbf{S}_R , as defined for equation 4.11.

4.6 Estimated Equations

Teachers' patterns of work involve (i) deciding whether to perform tasks simultaneously or individually or in combination with other activities; and, (ii) allocating a certain length of time required for successful (fruitful) or gainful completion of the tasks at hand. The length of time spent by teacher i on activity j^* can be defined as h_{j^*} , for $j^*=1,2,3,\dots,J^*$. It is important here to remember that, in Chapter 3, the teacher is i and the activities run from j to q . For the sake of simplicity, j^* represents all types of activities embedded in sets j through q . Clearly, the notation j^* differentiates j (as used in Chapter 3) from j^* as used in this Chapter to represent a set of all activities of type j through q that the teacher undertakes. Similarly, h_{j^*} represents the time requirement for each of the activities $j^*=1,2,3,\dots,J^*$. To preserve the definition of total hours expended used for the skeletal structural equation (Equation 3.1, in Chapter, Section 3.7), it is important to interpret \mathbf{H} as the sum of h_{j^*} , for $j^*=1,2,3,\dots,J^*$. This notation also preserves the requirement that h_{j^*} values be elements of the set H . Thus, it follows, under special conditions that: $H_{ij^*}^d = \sum h_{j^*}$, for all $j^*=1,2,3,\dots,J^*$, where $H_{ij^*}^d$ represents the total time allocated by teacher i to activity j^* in a typical day, d for $d=1,2,3,\dots,7$. It must be qualified, with emphasis, that this summation only holds when the activities are purely monochronic, or where extreme care has been exercised in interpreting time-diary data and mapping all activities undertaken polychronically; and, then assigning them to their respective h_{j^*} , categories. Such a mapping was conducted by a qualified teacher, investigator and postdoctoral researcher, in the Gardner and Williamson (2004) study. As will be evident in Chapter 5, the total hours expended over a week match the time requirements for the individual activities.

The time endowment for each day is therefore given by $H = \sum_1^7 H^d = \sum \sum H_{ij}^d = \sum \sum \sum h_j^*$. This is the double summation across all the activities during that particular day, d. From this expression, the total hours expended over a typical week H are computed, using a further summation. Recall that this time expenditure was required in the only equation presented in Chapter 3. The time endowment is represented, therefore, as $H = \sum_1^7 H^d = \sum \sum H_{ij}^d = \sum \sum \sum h_j^*$, where H is the total time expenditure over the typical week and is a sum of time spent during the teaching week (Monday and Friday), and time spent on the weekends, since $\{d=1,2,\dots,5\}$, captures teaching week time, and $\{d=6,7\}$ covers weekend time. This time endowment (H) measures total time required for all activities. The proportion of time claimed by each activity is called the time share of the activity and is defined as h_j^*/H . The time share of each activity is modelled as a function of a host of variables – teacher characteristics and activities, school attributes, to name a few. Therefore, for the set of J^* activities, it is claimed that

$$\frac{h_j^*}{H} = f(X_i, Z_i, C_i, D_i, S_R, \xi_i) \quad \text{Equation 4.12}$$

where $H = \sum_1^7 H^d = \sum \sum H_{ij}^d = \sum \sum \sum h_j^*$ as defined above. It is important to note that school reform affects all schools, but the effect is different for each school's setting or for a group of schools as workplaces. With this school reform effect in mind, the variables S_R ought to be thought of in a broader context S_R^* that captures the different school effects of school reform.

$$\frac{h_j^*}{H} = f(X_i, Z_i, C_i, D_i, S_R^*, \xi_i) \quad \text{Equation 4.13}$$

$$\text{Similarly, } \left. \begin{aligned} \frac{h_1^*}{H} &= f(X_i, Z_i, C_i, D_i, S_R^*, \xi_{i1}) \\ \frac{h_2^*}{H} &= f(X_i, Z_i, C_i, D_i, S_R^*, \xi_{i2}) \\ &\dots \\ \frac{h_j^*}{H} &= f(X_i, Z_i, C_i, D_i, S_R^*, \xi_{ij}) \end{aligned} \right\} \quad \text{Equation 4.14}$$

These equations represent the activity shares of the activity reported by teachers. All in all 13 equations are required. This is shown in Chapter 5. The equation $H = \sum_1^7 H^d = \sum \sum H_{ij}^d = \sum \sum \sum h_j^*$ is quite significant in this thesis. First, it represents the **activity share**, as illustrated above, as h_j^*/H . Second, where H^d is used directly it represents the teacher's time expenditure as the actual time spent on a typical day, and defined as the daily time budget (or simply **time budget**). Where H^d is expressed as a proportion of H , then the daily **time share** of teacher's work is computed. Third, when H is subtracted from the required workload **R**, then one obtains a value that represents the extent of a particular teacher's **overload**. Finally, when H is estimated as the dependent variable, then the total **weekly expenditure behaviour** is captured.

Since data have been collected for each day of the week, over 13 activities, it follows then that the entire system of equations presented in this thesis comprises 13 activity share equations, 7 *time budget* equations, 7 *time share* equations, 1 equation representing weekly expenditure behaviour. These 28 equations are supported by one extra equation on the determinants of the number of activities undertaken by the teacher (this is the **J** equation), and 5 equations on the extent of teachers' overload. Of these 33 equations, the time budget and time share equations are estimated using the OLS, SUR, MVREG, IVREG and EIVREG, thus generating an extra 18 equations. It is important here to note the econometric conditions required for the estimation of these systems of equations, particularly dropping one equation from the system during the estimation phase (Zellner, 1962; Nelson & Olson, 1978; Madalla, 1983; Dougherty, 1992; Greene, 1993; Griffiths et al., 1993; Niemi, 1993; Cameron & Trivedi, 1998). Attention has been given to the conditions for estimating OLS, SUR, MVREG, IVREG and EIVREG, as stipulated in Griffiths et al., (1993), Greene (2004), StatCorp (2005), StatCorp (2009) and StatCorp (2010). A schematic diagram of the equation system estimated is shown in Figure 4.2A.

4.6.1 Estimating Activity Budgets and Activity Shares

Consider activity (j) in a classification set S, such that the total time available for all the activities (T), and the time allocated to each activity is T_j . This time allocation T_j represents the activity budget. The share of time taken by each activity in the classification set is given by $\frac{T_j}{T}$. This activity share is computed as $t_j = \frac{T_j}{T}$. Now the question is what are the key determinants of the activity shares (t_j), activity budgets (T_j), and total time on activities (T)? In this thesis, activity shares, activity budgets and total time on activities are modelled as functions of several selected variables, guided by theory and past research. The time budget for each activity can be shown as:

$$T_j = f(X, Z, C, D, S_R, \xi) \text{ Equation 4.14}$$

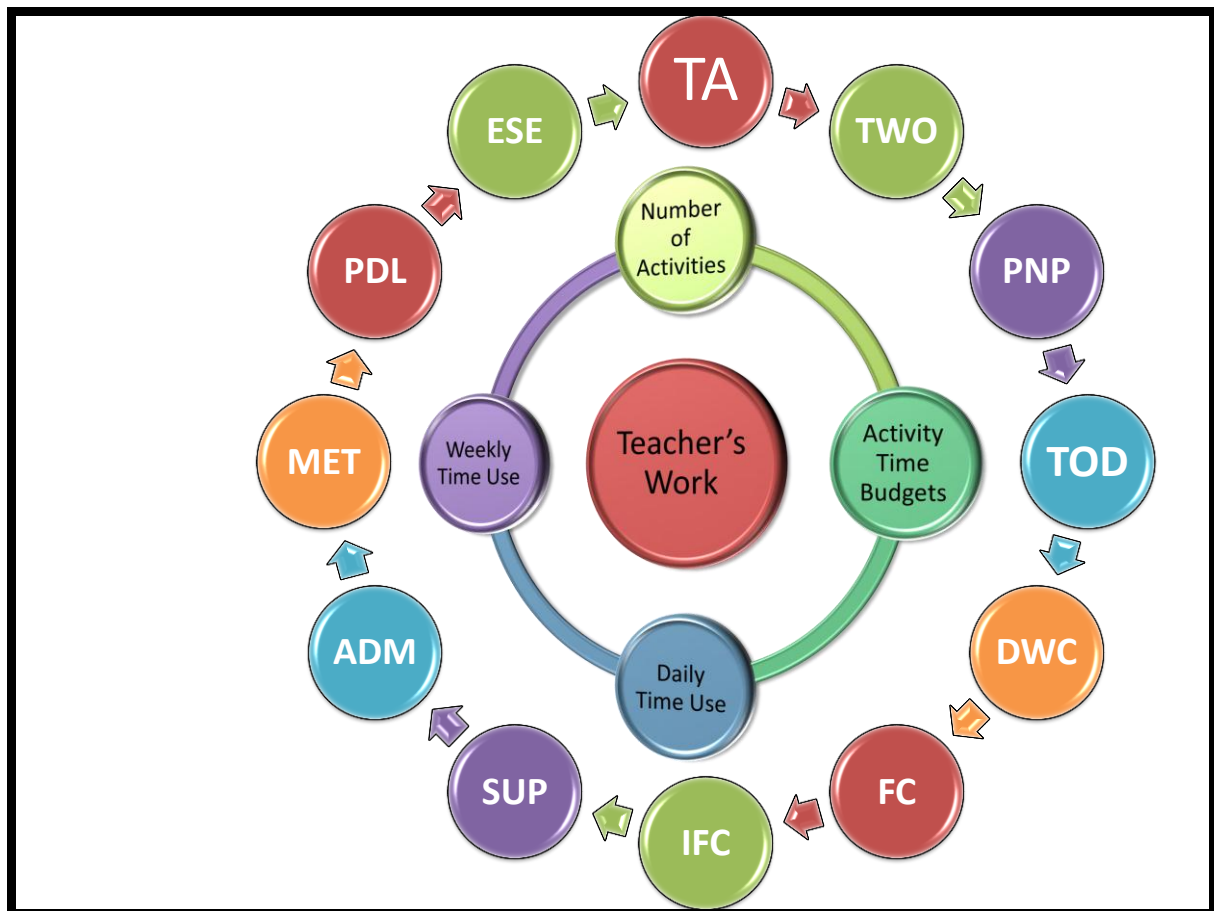


Figure 4.2A Activity Shares, Suite of Techniques and The Nature of Teacher's Work

Similarly, the activity shares for each activity can be shown as

$$t_j = f(X, Z, C, D, S_R, \xi) \quad \text{Equation 4.15}$$

For a system of these J+1 activities, only J activity equations must be estimated in the system (Zellner, 1962; Griffiths et al., 1993), and these J activity share equations are estimated as:

$$\left. \begin{aligned} t_1 &= f(X, Z, C, D, S_R, \xi) \\ t_2 &= f(X, Z, C, D, S_R, \xi) \\ &\vdots \\ t_J &= f(X, Z, C, D, S_R, \xi) \end{aligned} \right\} \quad \text{Equation 4.16}$$

where, X are the endogenous variables, Z exogenous variables, D - dummy variables, as defined for the equation [4.11]. The dummy variables might include factors such as skill requirement for each activity. These dummy variables (quantified qualitative variables – ‘*quan-quals*’) are crucial in that they allow researchers to look at the “totality of a teacher’s work – not just their time in the classroom” (Campbell & Neill, 1994a, p.7).

How are activity time equations estimated? Activity time equations are estimated as simple OLS equations that express time spent on an activity as a function of variables X, Z, C, D, and S_R . Theoretically, for each day there is a set of activities that a teacher performs. For example, for Monday (d=1), the equations for the hours of time allocated to activity 1 through j by each teacher, i, would be

$$\left. \begin{aligned} h_{i1}^d &= f(X, Z, C, D, S_R, \xi) \\ h_{i2}^d &= f(X, Z, C, D, S_R, \xi) \\ &\vdots \\ h_{ij}^d &= f(X, Z, C, D, S_R, \xi) \end{aligned} \right\} \quad \text{Equation 4.17}$$

Similarly, over the course of a typical week, the number of hours allocated to activity j will depend on the space within which time is allocated to activity j. The total time spent on any given day on activities within the classroom, for example, could be H_{ij}^{ds} where H is the number of hours, d is the day of the week, s is the locus of activity j (the space; classroom,

for example), i is the teacher, and j is the activity. Therefore, H_{ij}^{ds} represents time (hours) taken from day d and allocated to activity j by teacher i who is teaching alone in a classroom. In the case of dealing with one primary activity ($j=1$) then

$$H_{ij}^{ds} = f(X, Z, C, D, S_R, \xi) \text{ Equation 4.18}$$

If it is assumed that all the teachers' time is spent on one primary activity, then equation 4.18 holds. Similarly, if it is assumed, however, that all the teacher's time is spent on two activities, then for each day, equation $H_{ij}^{ds} = f(X, Z, C, D, S_R, \xi)$ becomes, $H_{i1}^{ds} = f(X, Z, C, D, S_R, \xi)$ and, $H_{i2}^{ds} = f(X, Z, C, D, S_R, \xi)$. In other words the allocation of time on day d to two activities $j=1$ and $j=2$ is expressed by the two equations

$$\left. \begin{aligned} H_{i1}^{ds} &= f(X, Z, C, D, S_R, \xi) \\ H_{i2}^{ds} &= f(X, Z, C, D, S_R, \xi) \end{aligned} \right\} \text{ Equation 4.19}$$

This simple generalisation would hold true if monochronicity is assumed. In reality, this is not the case – as evident from the literature that some activities are performed jointly and that there is a tendency for events to overlap (Miles & Floro, 2003). So, an ideal set of equations would be one that shows the equation for $H_{i1}^{ds} = f(X, Z, C, D, S_R, \xi)$ feeding on the equation $H_{i2}^{ds} = f(X, Z, C, D, S_R, \xi)$, and similarly for equation $H_{i2}^{ds} = f(X, Z, C, D, S_R, \xi)$ to feed from the expression $H_{i1}^{ds} = f(X, Z, C, D, S_R, \xi)$. A simple way of representing this is to make H_{i2}^{ds} a function of H_{i1}^{ds} and also make H_{i1}^{ds} a function of H_{i2}^{ds} , and then estimate the equations simultaneously. This new specification transforms equation $H_{i1}^{ds} = f(X, Z, C, D, S_R, \xi)$, and equation $H_{i2}^{ds} = f(X, Z, C, D, S_R, \xi)$ to

$$\left. \begin{aligned} H_{i1}^{ds} &= f(X, Z, C, D, S_R, H_{i2}^{ds}, \xi) \\ H_{i2}^{ds} &= f(X, Z, C, D, S_R, H_{i1}^{ds}, \xi) \end{aligned} \right\} \text{ Equation 4.20}$$

It is crucial to note that H_{i2}^{ds} could be one other activity or the total time allocated to all the other non-primary activities. If it is the case that H_{i2}^{ds} refers to the sum total of all the time spent on other non-primary activities, then H_{i2}^{ds} can be written as H_{i2}^* in order to distinguish H_{i2}^{ds} from H_{i2}^* . In this case - where several activities are accounted for it follows that the equation for time allocation on day d becomes $H_{i1}^{ds} = f(X, Z, C, D, S_R, H_i, \xi)$. This equation system would be cumbersome to estimate for all teachers, over a typical week, because one would have to consider all the activities on each day. Typically the number of activities will differ across days. To keep the framework simple and in a reasonably balanced, tractable and estimable form, it has been important in this thesis to look at the total time allocated to each activity, and then compute the share of time allocated to the activities by each teacher. How is this done? The expression $h_j = \frac{H_j}{\sum H_j}$ is considered to be the share of the time spent on each activity OLS equations for the key determinants of h_j over the typical week. The equation system is therefore: $h_j = f(X, Z, C, D, S_R, H_i, \xi)$ for all days of the week.

4.6.2 Estimating Daily Time Equations

In the case of daily time budgets (H^d) and $h_j = \frac{H_j}{\sum H_j}$ is the time share component representing time allocated across the seven (7) days of the week. Thus, the equation system for the seven days of the week will look like this:

$$\left. \begin{aligned} h_1 &= f(X, Z, C, D, P, Q, S_R, H_i, \xi) \\ h_2 &= f(X, Z, C, D, P, Q, S_R, H_i, \xi) \\ h_3 &= f(X, Z, C, D, P, Q, S_R, H_i, \xi) \\ &\dots \\ h_6 &= f(X, Z, C, D, P, Q, S_R, H_i, \xi) \\ h_7 &= f(X, Z, C, D, P, Q, S_R, H_i, \xi) \end{aligned} \right\} \text{Equation 4.21}$$

In cases where the equations are estimated individually, or separately, then a technique such as Ordinary Least Squares (OLS) is used to obtain the parameters on the daily time allocation behaviour of teachers. In the case of simultaneous equation systems such as SUR, it is

important to estimate four of the five equations of time allocation during a teaching week, and similarly estimate six of the seven equations describing time allocation over the entire week (teaching and non-teaching week).

4.6.3 Estimating Weekly Time Expenditure

As noted earlier in Section 4.2, time spent by teachers over the weekend is given by W_i^w . The total number of reported hours, in diary data, for the entire week is then represented as, W_i . These two variables W_i^w and W_i are estimable using equation 4.8 and equation 4.9, specified as:

$$W_i^w = W_i^{sa} + W_i^{su} + \varepsilon_{i6}^d, \quad [Equation 4.8]$$

$$W_i = \sum E_i^d + W_i^{sa} + W_i^{su} + \xi_i \quad [Equation 4.9]$$

These two equations ([equation 4.8] and [equation 4.9]) are estimated as follows. First, use is made of the following components of weekly time-use: W_i^{sa} , W_i^{su} , W_i^w , and W_i^{mf} , representing Saturday, Sunday, weekend and Monday to Friday time-use, relative to time spent over the total week (teaching plus non-teaching time). These components are estimated using their time budgets or time share equivalents. This system of equations is estimated and reported in Chapter 5.

4.6.4 Estimating Overload in Teachers' Work

The total number of reported hours, in diary data, for the entire week are then represented as, W_i^w , and are estimated as: $W_i^w = \sum E_i^d + W_i^{sa} + W_i^{su} + \xi_i$ [Equation 4.9]. Clearly, there are instances in which the number of hours expended (W) has exceeded the number of required hours, and vice versa. In the case where $W > E$, then the teacher is overloaded. Where $W = E$, then the teacher is on-load. Where $W < E$, then the teacher is underloaded. The overloaded/underloaded or just on load status of teachers depends on the definition of the

official work hours as well as their employment status in terms of fulltime equivalence. To estimate the overload function, the following equation is defined, and used:

$$O_i = (W_i - E_i) = f(X, Z, C, D, P, Q, S_R, H_i, \xi) \text{ Equation 4.22}$$

where is O_i overload for each teacher. In theory, the extent of overload should be easy to compute because E_i is set by the Department of Education. However, from a practical point of view of teachers' work realities, it may be useful to consider E_i as being defined by any one of these statements: working over median hours, 35, 40, 45, 50 and over 50. In the thesis equation 4.22 is estimated on the basis of a 35, 40, 43 (median), 45 and 50 hour week definition. This system of equations is estimated and reported in Section 5.11 of the thesis.

4.7 Software Requirements

Original data from the Gardner and Williamson (2004) study are converted from EXCEL to Stata 9.2 using Stat/Transfer 4. The initial analyses extract descriptive statistics and other related cross-tabulations. Ordinary least squares (OLS) regressions are run to estimate the number of activities undertaken by teachers, and capture the parameters of simple time budget equations across activities and days of the teaching week. For ease of managing the data, deriving important variables as suggested by theory and past empirical findings, and using software that allows econometric estimations of relationships, the equations used in the thesis are estimated using STATA 9.2. Additional qualitative variables are obtained, in the form of dummy variables, using STATA. The econometric estimations based on time-budget and time-share expenditures are conducted in STATA. The prevalence of dummy variables is obviously noticeable, and represents an extensive use of qualitative dependent variables. The prominence or prevalence of dummy variables, and qualitative dependent variables in the modelling of Tasmania teachers' time-use is a way of incorporating some of the capability of

qualitative research software such as NVIVO, and attempting to use key capabilities within the STATA environment.

4.8 Conclusion

In this chapter, an empirical framework for modelling teacher time-use has been presented.

The framework supports the metaphor of the teacher's thumbprint and recognises the impact of external and internal factors on teachers' work. A system of equations and their derivations is provided to show the link among recorded diary data variables, expected and contractual school times, weekend work and the extent of overload. The individual teacher has been emphasised as the unit of analyses. The need to use qualitative and quantitative variables, a suite of techniques, and several estimable equations has been put forward.

This thesis has so far added to the suite of theoretical models undertaken to contribute to an understanding of time allocation behaviour of Tasmanian teachers. Two key concepts: *time budgets* and *time shares* are used; these two concepts are used to investigate time allocation to activities and days of the week. The equations relating time allocation to teacher and school characteristics are estimated using the equation structure detailed above in sections 4.2 through 4.6, and summarised by equation 4.11, and its variations. Total weekly time expenditure also is estimated. It is realised that weekly expenditures tend to be above the required, official weekly outlay. As a result, the extent of teacher's overload also is estimated.

So, what is next? Clearly, the stage has been set to report some empirical findings in the next chapter, Chapter 5. The technical aspects of the results have been pushed to the Appendices in order to help with clarity, readability and interpretation of the results (see Appendices A through H). A discussion of the empirical findings in the context of past evidence, new evidence, and likely policy is deferred to Chapter 6. Concluding remarks relating to the research objectives and research questions of this thesis are then drawn in Chapter 7.

CHAPTER 5

RESULTS

5.1 Introduction

Time plays a crucial role in shaping society, and more specifically the teachers' workloads. The types of activities undertaken by teachers as they make their time allocation decisions are important also in shaping societal outcomes and the realities of teachers' work lives. In Chapter 5 results of time allocation between and/or across teachers' activities are reported. The results are from a suite of econometric techniques developed and described in Chapter 4, that are used for estimating the structural equations of the conceptual framework (teacher's thumbprint) developed and presented in Chapter 3. Two key concepts are used: (i) the actual allocation of time across activities, days, the teaching week and weekends; and, (ii) the proportioned allocation of time across activities, days, the teaching week and weekends. These two key concepts are referred to as the time budgets and time shares, respectively.

As developed in Chapter 1, time budgets measure actual hours of time expended on activities, days, or typical week. The time shares are the relative use of time as part of the time budgets in a typical day or week, and therefore time shares simply reflect the proportion of time allocated by a teacher to a day's activities relative to the weekly activity time budget (endowment/expenditure). In that regard, the relative share of the daily time budget is measured by the proportion of daily time budget in total time budget for the week. These relative shares will be referred to, throughout the thesis, as *time shares*. Similarly, the amount of time allocated to an activity, by a teacher, will be referred to as an *activity time budget*. The proportion of time allocated to each activity, expressed as a fraction of total activity time budget will be referred to as the *activity time share*. The activity time share measures, therefore, the proportion of the total time budget for the week that is allocated to each activity performed during the week. So, activity shares depend on the type of activity performed over

a typical week, and time shares depend on the total time allocated to all activities on a given day. Therefore, daily time shares are not activity-specific, whereas activity time shares are activity-specific. This reminder assists in the linking of the results presented in this chapter with earlier theoretical work on the teacher's thumbprint, in Chapters 1 through 4. Therefore, consistent with the framework of the teacher's thumbprint provided in earlier Chapters – the results of the empirical, inferential analyses of time budgets and time shares are presented in this chapter.

In the analyses of activity patterns of teachers, descriptive and inferential analyses of time allocation and activity budgets and time shares are presented. Differences in time allocation and activity times across selected demographic variables are also examined, empirically. Tetrachronic correlations are employed to ascertain any linear correlations between selected variables that may influence the allocation of time. The tetrachronic correlations are used to identify variables that are related linearly instead of the usual Pearson correlations because several dummy variables for categorical variables (limited dependent variables) have been constructed (see Stata 9.2). The results of the correlation analyses are used to guide the choice of variables that are suitable for inclusion in the empirical model of time allocation. The empirical model of time allocation then uses ordinary least squares (OLS), multivariate regressions (MVREG), seemingly unrelated regressions (SUREG), instrumental variable regressions (IVREG), and errors in variables (EIV) regressions to establish the extent of the dependence of time allocation on a host of selected variables. The results thereof address the key research objectives and questions of the thesis.

The results reported in this Chapter are presented as follows: A list of selected variables used in this thesis, and summary statistics thereof, are presented in Section 5.2. This list includes variables describing teacher demographics, activities of teachers, school factors, teacher decision-making in schools, and other variables derived from the original instrument by

Gardner and Williamson (2004). These derived variables are mainly in the form of dummy variables and other selected aggregates such as the number of hindering factors identified by the teacher.

Analyses of actual and relative daily hours expended by primary school teachers during a typical week are presented in Section 5.3. The analyses of time allocation focuses only on teachers' time allocation (expenditure) – time budgets, time shares and the number of activities performed by the teacher. The time shares of relative use of actual daily hours expended by primary school teachers during a typical week also are presented. Time spent on activities during a typical week, and the relative time spent by teachers on various activities, reflect, therefore, the allocation of time across activities and across days.

Section 5.3 presents also the descriptive analysis of actual daily hours spent by primary school teachers during a typical week, as well as the share of daily time allocation relative to the total hours expended by each teacher during a typical week. The analysis of daily time budgets and time shares is presented in Section 5.3.1. The type and number of activities performed by teachers are presented in Section 5.3.2. How these activities are performed by teachers in different age groups is presented in Section 5.3.3. Similarly, the statistical dependence of the size of class taught by a teacher and the number of activities undertaken by the teacher is examined and presented in Section 5.3.4. Clearly the number of statistically dependent connections that can be established between teachers' activity patterns and school variables, in this study, is extensive. For the sake of brevity, Section 5.3.5 presents a summary of tests of various statistical dependences or likely connections between teacher activity, and school variables and teacher variables. The tests for these connections are motivated by the broad literature on teacher demographics and teachers' activity patterns.

Section 5.3 is followed by Section 5.4. Section 5.4 reports the results of the analysis of primary teachers' time budgets and time shares. This analysis is based on actual time spent on each activity undertaken by the teacher. These activity times are then re-examined by looking at the relative shares of time spent on each activity.

It is noteworthy that the results presented in Section 5.2 through 5.4 have so far focused mainly on univariate analyses and limited bivariate analyses, in the form of chi-square tests of statistical independence. These results give a general picture of primary teachers' time allocation across days, and also across activities. The results presented in Section 5.2 through 5.4 show variations in hours allocated over the days of the week and activities, and also variations in time shares across days of the week, and across activities. It is, therefore, imperative to conduct, inferential analysis of the observed variations in primary school teachers' time allocation. To that end, results on the inferential analysis of time allocation behaviour of primary school teachers are presented in Section 5.5, by examining differences in allocation of time budgets and time shares. In Section 5.5, pair-wise differences in daily time budgets and time shares are computed and presented for all teachers, as well as for full-time, and other full-time equivalent (FTE) teachers (0.5 and 0.8).

In Section 5.6, differences in teacher time allocation by key teacher variables, such as age, employment status, and teaching experience, as covered in the literature, are considered. The results highlight any significant differences in time allocations by teachers' in different age categories (Section 5.6.1), employment status (Section 5.6.2), kindergarten teaching only (Section 5.6.3), primary teaching only (Section 5.6.4), length of teaching experience (Section 5.6.5), and teaching out of area of expertise (Section 5.6.6). Section 5.7 reports results on the variation of time allocation by teachers under different selected school characteristics. The selected school characteristics include school size (Section 5.7.1), small versus large schools (Section 5.7.2); and, school location (Section 5.7.3).

Tetrachronic correlations are presented in Section 5.8. Only those correlations that are significant at the 5 percent level are reported. These correlations are between: the number of teaching activities and time budgets and time shares (Section 5.8.1), respective time budgets are presented (Section 5.8.2), and respective daily shares are presented (Section 5.8.3). Sections 5.8.1 through 5.8.3 are followed by an examination of correlations between time budgets and time shares, in Section 5.8.4. The correlations between time shares and selected activity variables are reported in Section 5.8.5. The correlations between time shares, school variables, and variables that capture how teacher perceive school management and education reforms are reported in Section 5.8.6. The correlations in Section 5.8.1 through Section 5.8.6 set the scene for investigating the determinants of: (i) the number of activities undertaken by teachers, (ii) activity time budgets and activity time shares, (iii) daily time budgets and time shares, (iv) weekly time-use, and (v) the extent of teacher overload.

Determinants of the number of activities undertaken by teachers are then presented in Section 5.9. These determinants of the number of activities undertaken by teachers are examined using the set of explanatory variables identified from correlation analyses and Ordinary Least Squares (OLS) estimation. Determinants of time budgets and time shares identified using OLS, MVREG, SUREG and IVREG regression techniques are reported in Section 5.10. Determinants of teacher overload are reported in Section 5.11. The reported results are based only on the EIVREG estimation technique. A reliability factor that is useful in comparing and contrasting the results of EIVREG to those obtained from OLS is presented also. The impact of uninterrupted breaktime (UBT) on teachers' time allocation behaviour is presented in Section 5.12. Concluding remarks are drawn in Section 5.13.

5.2 Descriptive Statistics of the Sample of Primary School Teachers

In order to model teachers' time use selected variables are used as dependent or independent variables in the econometric estimations. The variables used are mainly those that capture the main tasks performed by teachers. In addition, teachers' demographic variables are analysed. Factors that change, assist or hinder teachers' work in schools are included. In schools some teachers participate in decision-making. The variables showing teachers' satisfaction with symbolic decision-making, communication, teachers' roles, among others, are incorporated into the models. In Gardner and Williamson (2004), teachers also submitted up to ten (10) suggestions that would improve the work-lives of teachers. The variables that capture these suggestions are entered as potential explanatory variables in the suite of models used. Variables that capture the hours expended on each day of the week allow the explaining of time-use, through treating time-use as a dependent variable. In addition to these time-use variables, the total time worked over the week (Sunday to Saturday) is computed. This total will be useful later in calculating time shares, the amount of weekend school work, and the extent of teacher work overload. Similarly, the proportion of time spent on each activity performed by the teacher is calculated by expressing activity time-use as a fraction of total activity time. In order to extend the data analysis beyond what was presented in Gardner and Williamson (2004), several variables also are derived from the original data. These derived variables capture some of the qualitative aspects of the thesis. Figure 5.2.1 shows a selected list of original and derived variables used in this thesis.

Each one of these variables has a unique distribution in terms of measures of central tendency, measures of spread (dispersion and relative dispersions), measures of shape (skewness) and measures of peakedness (kurtosis). Of these variables, selected properties of distribution of the last variable, UBT, are displayed in Table 5.2.2, and also described,

briefly. A glance of the results displayed in Table 5.2.2 is important, especially for the purpose of motivating the policy statement about UBT that is made in the conclusion (Chapter 7).

Table 5.2.1: Selected variables used in the suites of models of time-use

Overload	Extent of overload	
Skoolsize	Size of school	
c19	Teaching Grade 3	
c20	Teaching Grade 4	
Hinfac	Hindering factors in schools	
Stscl	Size of class taught	
P	Primary teaching only	
Xcrtsc	Experience at current school	
Dmo	Monday time use (in hours)	
Dtu	Tuesday time use (in hours)	
Dwe	Wednesday time use (in hours)	
Dth	Thursday time use (in hours)	
Fulltime	Full-time employment status	
over40s	Aged 40 and over	
tt1	Teaching alone	
tt3	Planning and preparation	
tt5	Professional discussion with colleagues	
tt7	Informal communication with parents and students	
tt8	Formal communication with parents and students	
tt9	Student supervision	
tt10	Performing administrative tasks	
tt11	Attending meetings	
Dminv	Satisfaction with involvement in decision making	
Kindergarten	Teaching kindergarten only	
Primary	Teaching primary school classes only	
Age	Age of teacher	
Teaching Experience	Years of teaching experience	
Class size	Size of class taught	
Teaching week	Length of teaching week	
Weekend Hours	Hours expended over the weekend	
Number of Activities	Number of activities undertaken	
UBT/Mybreak	Uninterrupted Break Time (UBT)	

The results reported in Table 5.2.2 show the distribution of UBT experienced by Tasmanian teachers. The lowest level of UBT is 30 minutes per week (on average, 6 minutes a day), and the largest level of weekly UBT is 4.25 hours (that is, 255 minutes which on average is about 55 minutes a day). The median shows that 50 percent of teachers have UBT of at most 1.5 hours (90minutes/week or 18 minutes/day). A large proportion of teachers (74.14%) experience UBT that ranges from 30 minutes to 135 minutes. The spread of UBT shows that the upper 50 percent of this cohort of teachers experiences at least 105 minutes of UBT a week, to a top of 255 minutes a week. These descriptive results show, therefore, that the daily distribution of UBT is skewed, and could be as low as 6 minutes a day to a high of 55 minutes per day.

Table 5.2.2: Distribution of teachers' uninterrupted break time (UBT)

Time (hours)	Time (minutes)	frequency	Proportion	Relative proportion
0.50	30	1	1.72	1.72
0.75	45	4	6.90	8.62
1.00	60	8	13.79	22.41
1.25	75	7	12.07	34.48
1.50	90	9	15.52	50.00
1.75	105	4	6.90	56.90
2.00	120	8	13.79	70.69
2.25	135	2	3.45	74.14
2.50	150	4	6.90	81.03
2.75	165	3	5.17	86.21
3.00	180	1	1.72	87.93
3.25	195	2	3.45	91.38
3.50	210	1	1.72	93.10
3.75	225	3	5.17	98.28
4.25	255	1	1.72	100.00

5.3 Analyses of Time Allocation (Activities, Time Budgets and Shares)

In this section, the teachers' time expenditure is described using daily time budgets and time shares for teaching days (Monday to Friday), as well as weekends (Saturday and Sunday). In order to differentiate the analysis based on time budgets from that based on time shares, two things are done. First, the variable names are different; for example, the variable name for the Monday time budget is `dmo` and the variable name for the Monday time share is `dmo_s`. The notation is simple: "d" indicates that the measurement is for daily data, "mo" is the day of the week (Monday in this case) and "_s" indicates that a time share is being used. The absence of "_s" indicates that a time budget is being used. Hence `dmo`, `dmo_s`; `dtu`, `dtu_s`, ..., `dsu`, `dsu_s`; represent the corresponding daily time budgets and time shares for Monday through Sunday, respectively. Remembering this convention is crucial especially for reading and interpreting the additional statistical inferences that have been pushed to the Appendices. Second, the descriptive results are presented in separate sections; section 5.3.1 gives the results for the time budgets and section 5.3.2 gives the results for the time shares. It has been important in both cases to show the total hours expended by teachers during the teaching week (Monday to Friday). It is important to show also the time budgets and time shares side-by-side in order to reinforce the comparison and contrasting of actual time-use and relative time-use. The variables that capture these expenditures are `dmf` for time budgets and `dmf_s` for time shares. Weekend time allocation has also been computed and is shown as `dss` for Saturday-Sunday time budgets, and `dss_s` for Saturday-Sunday time shares. The data provided by Gardner and Williamson (2004) also capture the cumulative amount of time over which teachers have enjoyed uninterrupted break-time. The variable "mybreak" is used to represent this cumulative uninterrupted break-time during the days of the teaching. In this research thesis, the variable "mybreak" is a significant policy variable that can be set easily or agreed upon by both the Teachers' Union and the Department of Education in Tasmania. It is

important, therefore, to track the significance of this variable (“mybreak”) in terms of influencing the number over activities, time allocation behaviour, and controlling for the likelihood of teachers being overloaded. The idea of ‘mybreak’ is quite simple and yet used in a very novel way in this thesis. The variable captures the idea of ‘giving the teacher a few moments to recharge batteries so to speak’, refresh, and rejuvenate. In economics terms, it is equivalent to finding ways of lessening the likelihood of the setting in of diminishing returns to teachers’ productivity.

5.3.1 Daily Time Budgets and Time Shares Over A Typical Week

The results displayed in Table 5.3.1 show the average daily time-allocation by primary school teachers. The results show that, on average, teachers spend between 8.29 and 8.83 hours on Mondays through Thursdays. The mean daily time allocation by teachers on Fridays is generally lower than that on other days. The mean allocation of time on Fridays is around 6.31 hours with a confidence interval of between 5.60 through 7.03. This confidence interval does not overlap significantly with any other confidence intervals for teaching days Mondays through Thursdays. This suggests that any differences in the time allocation are likely to be statistically significant at the 5 percent level. The average time-allocation over the period Monday to Friday is 40.84 hours with a lower 95 percent confidence limit of 38.79 and an upper 95 percent confidence limit of 42.89. The average allocation of time by teachers over the entire week is 43.97 hours, with a lower 95 percent confidence limit of 41.65 hours and an upper 95 percent confidence limit of 46.29 hours. This result is over the 40-hour week that is generally considered in most studies on labour supply and time allocation. This value will be of significance in subsequent analyses when constructing an indicator of being overloaded. International and national evidence on teachers’ work points to teachers spending over 50 hours a week on school-related activities.

Table 5.3.1: Primary teachers' daily time allocation in hours and percentage over a typical week

Period of Week	Time Budgets				Time Shares			
		Mean	L95%	U95%		Mean	L95%	U95%
Monday	dmo	8.83	8.25	9.40	dmo_s	20.20	19.03	21.37
Tuesday	dtu	8.79	8.32	9.26	dtu_s	20.54	19.35	21.72
Wednesday	dwe	8.62	8.14	9.11	dwe_s	19.84	18.88	20.79
Thursday	dth	8.29	7.71	8.87	dth_s	18.73	17.59	19.88
Friday	dfr	6.31	5.60	7.03	dfr_s	13.99	12.28	15.69
Monday-Friday	dmf	40.84	38.79	42.89	dmf_s	93.29	92.10	94.49
Saturday	dsa	1.34	0.89	1.79	dsa_s	2.86	1.87	3.85
Sunday	dsu	1.79	1.45	2.13	dsu_s	3.85	3.18	4.51
Monday-Sunday	dms	43.97	41.65	46.29				
Saturday-Sunday	dss	3.13	2.54	3.72	dss_s	7.12	5.51	7.90
mybreak	UBT	1.84	1.64	2.04				

It is important to provide a summary of the cumulative amount of break time (mybreak) that teachers believe they may have enjoyed. The mean of 'mybreak' is 1.84 hours per week. The general picture shown by these results is that teachers spent a sizeable amount of time on week days (dmf), allocate over 8 hours in most days and rarely enjoy any significant break during a typical week.

Time spent on Saturdays (dsa) is the lowest allocation over the typical week. The allocation of time for Sunday (dsu) is marginally higher than that for Saturday (dsa). Overall, it is clear that a significant proportion of weekend hours (dss) are spent on school tasks. The mean time expended is 3.13 hours with a 95 percent confidence interval of 2.54 to 3.72 hours.

The 95 percent confidence interval provided for the Monday (dmo), Tuesday (dtu), and Wednesday (dwe) time budgets do not show significant variation at the 5 percent level. The confidence intervals for Thursdays (dth) and Fridays (dfr) show significant differences. A

simple test to verify this claim is to check whether the confidence intervals overlap. This rule of thumb suffices and is therefore used reliably without need for extensive formal tests of significance. These extensive formal tests of significant difference and STATA 9.2 code and output are available, if required. Appendix H shows an example. The confidence intervals for the weekend times (Saturday (dsa) and Sunday (dsu)) also overlap slightly, suggesting that differences in teachers' time allocation across weekend days may be statistically significant at levels of significance slightly greater than 5 percent. So in general, there is very little difference in time allocations for Monday, Tuesday and Wednesday. There is a difference in time allocations for Thursday and Friday. Weekend time budgets also are different.

The results reported in Table 5.3.1 focused on time allocation behaviour in terms of both time budgets and time shares. The results of shares of daily time allocations indicate that just over 20 percent of the time is allocated to Mondays (dmo_s) and Tuesdays (dtu_s). The time shares allocations for Mondays and Tuesdays are 20.20 percent and 20.54 percent, respectively. The time share allocations for Wednesday (dwe_s) and Thursday (dth_s) are 19.84 percent and 18.73 percent, respectively. Consistent with the findings from time budgets, the allocation on Fridays (dfr_s) is lowest, around 14 percent. The allocation for Monday to Friday (dmf_s) is 93.29 percent, on average, with a 95 percent confidence interval as stated. The balance, of 7.12 percent is the time share of Saturday-Sunday (dss_s).

The results highlight the relatively larger share (over 7 percent) of time allocated over the weekend. Notable in these results is that time allocation to Saturdays (2.86 percent) is lower than the time share for Sundays (3.85 percent). On the basis of using a simple overlap test for confidence intervals, it is clear that there are some significant differences in the way teachers allocate their time shares over a typical week. The results reported for time shares are similar to those observed and inferred for time budgets.

In general, using time shares highlights that the differences in daily shares that are larger than those shown by using actual hours expended. This is a very significant result in that it shows that the teachers' time-squeeze is more pronounced when reported in terms of time shares than time budgets. This is a significant contribution of the thesis for two reasons, among many. First, the problem of the equivalence of time budgets and time shares has not been researched in the primary literature. Second, the primary literature does not provide a '*prima facie*' case to argue that time budgets and time shares are equivalent in effort allocation.

5.3.2 Types and Number of Activities Performed By Teachers

Having looked at the time budgets and time shares of Tasmanian teachers in Section 5.3.1, it is significant to examine, therefore, the kind of activities or tasks to which the time allocation was made. It is worth reiterating that the set of activities undertaken by teachers are the main tenet in the teachers' thumbprint conceptual model unveiled in Chapter 3. To capture the time allocation to specific activities undertaken by teachers, thirteen activities are considered and they represent the full set of activities reported in the teachers' time diaries (Gardner & Williamson, 2004). The thirteen (13) activities have variables names tt1 through tt13. Full definitions of these activities are given below in Table 5.3.2A. Figure 5.3.2A highlights these relative proportions.

The largest proportion of teachers (98.82 percent) spends time planning and preparing for their classes. Of the 85 teachers whose records were examined, 95.29 percent spent their time teaching alone, and 85.88 percent performed administrative duties. These results show clearly that a large proportion of teachers perform a common set of teaching and non-teaching tasks. The activities of professional discussion with colleagues and attending staff meetings were reported by 84.71 percent of teachers. Informal communication with parents and students was reported by 78.82 percent of teachers; whereas, 69.41 percent of teachers reported

undertaking formal communication with parents and students. Staff supervision (tt8) and performing extra school activities (tt13) were reported only by 25.88 percent of the teachers.

The results reported in Table 5.3.2A show the variation in the proportion of primary teachers undertaking the thirteen activities. The distribution of activities across teachers has implications on how teachers allocate time to the respective activities that are in their set. Results in Table 5.3.2A are rearranged and presented in a way that graphically substantiates the activity patterns of primary school teachers in Tasmania.

Table 5.3.2A Activity definitions and proportion of teachers performing these activities

Definition of Activity			Hours	%
Teaching alone	TA	tt1	12.33	95.29
Teaching with others	TWO	tt2	2.99	57.65
Planning and preparation	PNP	tt3	11.22	98.82
Spending time on duty	TOD	tt4	2.21	98.82
Professional discussion with colleagues	DWC	tt5	1.88	84.71
Formal Communication with parents and students	FC	tt6	1.15	69.41
Informal communication with parents and students	IFC	tt7	1.03	78.82
Staff supervision	SUP1	tt8	0.43	25.88
Student Supervision	SUP2	tt9	1.40	62.35
Performing administrative tasks	ADM	tt10	3.35	85.88
Staff attending meetings	MET	tt11	2.21	84.71
Staff attending professional learning	PDL	tt12	2.77	55.29
Extra school expectations	ESE	tt13	1.00	25.88

Note: The (%) represents the number of teachers, as a fraction of the sample in the study, that undertake the nominated activity. SUP1 and SUP2 will be combined to form SUP.

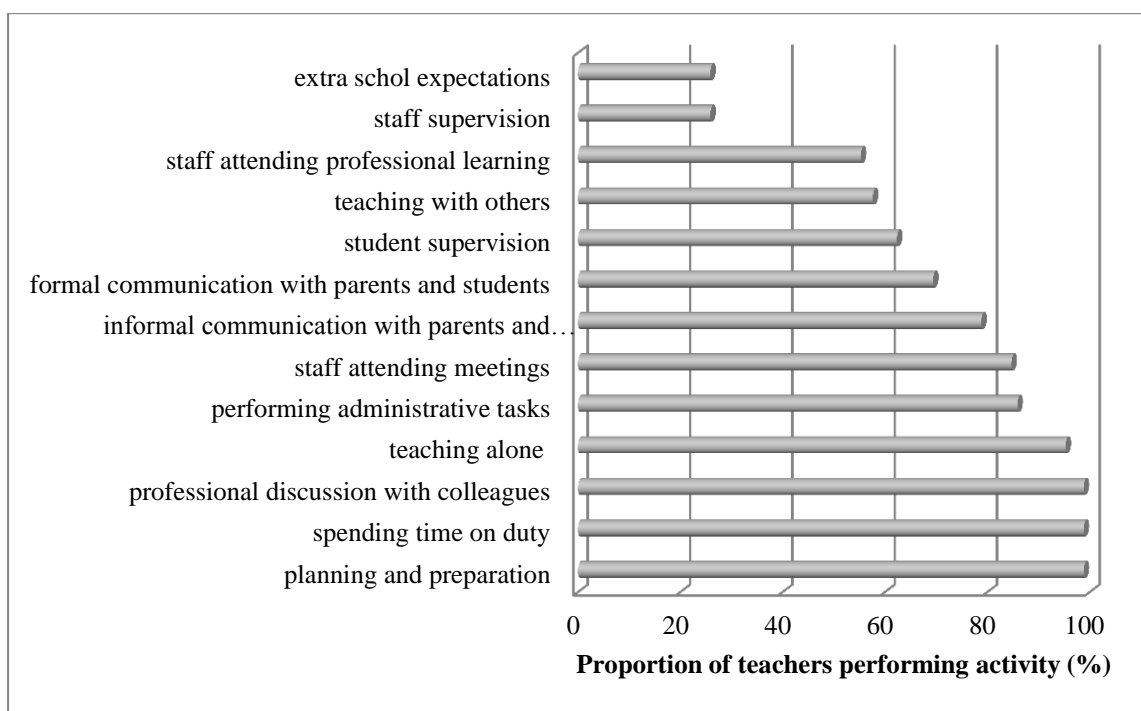


Figure: 5.3.2B Proportion of teachers undertaking type of activity over a typical week

The results reported in Table 5.3.2B and substantiated graphically in Figure 5.3.2B show clearly that not all teachers perform all of the 13 activities. Table 5.3.2B shows that 27 teachers performed 10 of the 13 activities listed in Table 5.3.2B. Forty-one teachers performed 9 or less of the 13 activities listed. Forty-four teachers performed 10 or more of the thirteen activities listed in Table 5.3.2B. No teachers performed only 1, 2, 3, 5 or all 13 of the activities.

Table 5.3.2B Number of activities performed by kindergarten or primary teachers

Teacher Group	Number of Activities Undertaken									
	0	4	6	7	8	9	10	11	12	Total
Kindergarten Teachers	0	1	2	3	10	10	21	6	6	59
Primary Only Teachers	1	0	1	1	8	4	6	3	2	26
Total	1	1	3	4	18	14	27	9	8	85
Cumulative Distribution	1	2	5	9	27	41	68	77	85	

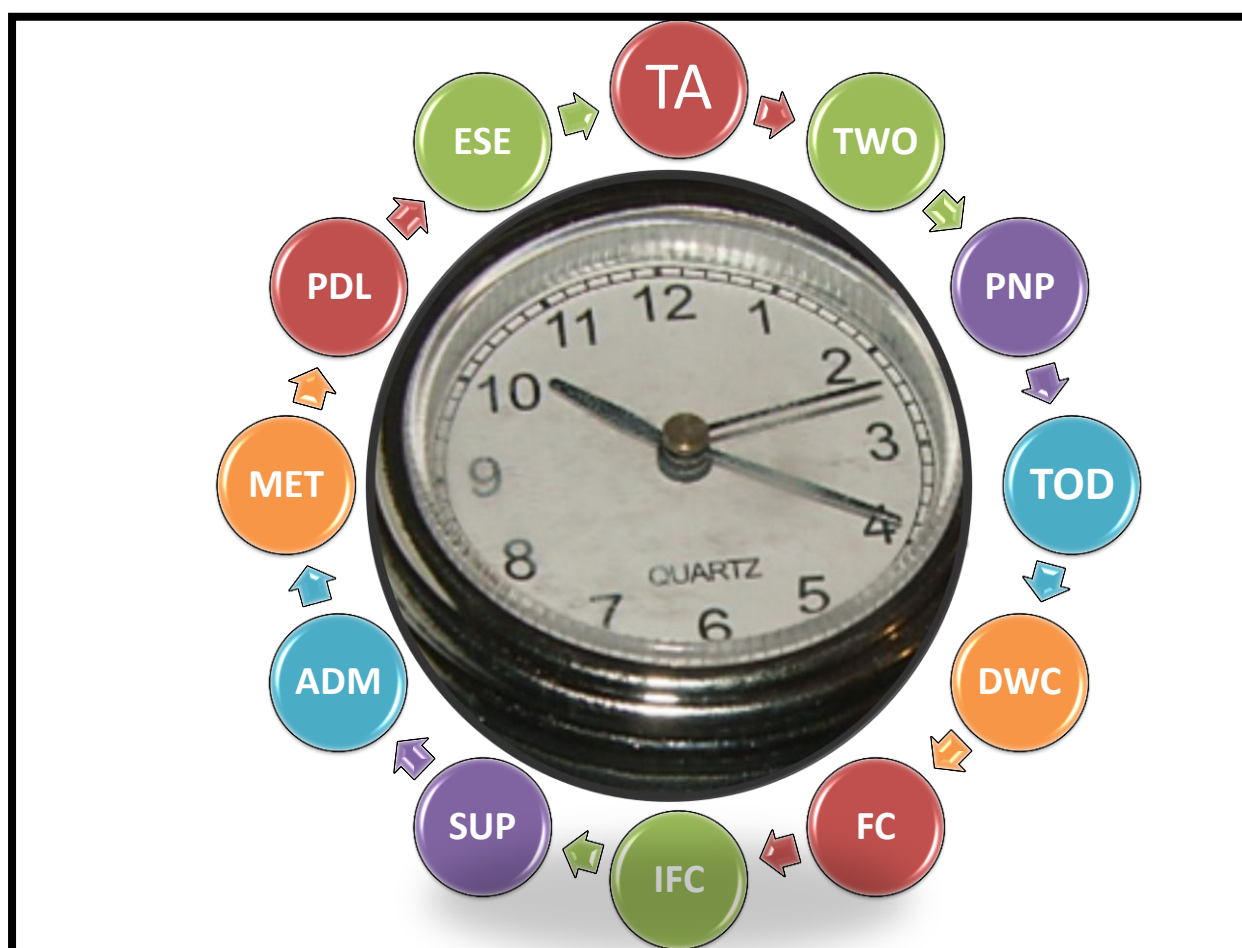


Figure 5.3.3B What teachers juggle and must allocate time to.

Note: The Figure shows 12 activities. Staff supervision (SUP1) and student supervision (SUP2) have been grouped together under the variable SUP. This then gives 12 activities and a graphic that represents a clock, to show that these activities are juggled around the clock.

The mode for the number of activities performed by teachers is ten. This cross-classification table shows that most teachers perform 10 activities from a set of 13 activities. The results show that the majority of teachers perform well over 10 different tasks. The cumulative distribution tapers towards the end and flattens, indicating a decline in the number of teachers undertaking all 13 activities. The highest concentration of activity by teachers is centred around 8 to 10 activities. Clearly the distribution may be different for various teacher characteristics. However, the degrees of freedom limit breaking the group to smaller groups on the basis of demographic variables. In Section 5.3.3 the number of activities undertaken by teachers is recoded for each of the age groups.

5.3.3 Teacher's Age and Number of Activities Performed

Earlier, in Table 5.3.2A the distribution of activities of 85 teachers was reported. Since some of the teachers did not report their respective age group, the sample size has reduced to 80. Of the 80 teachers in the survey group, 38 perform at most 9 activities, and 42 perform more than 9 activities. Of those teachers that perform more than 9 activities, the largest proportion is from the age cohort 41-50 years. Similarly, for teachers performing at most 9 activities the modal age group is 41-50 years. The distribution of activities across the five age groups is shown in Table 5.3.3A.

Table 5.3.3A Number of activities performed by teachers in various age groups

Activities \ Age	Age of Teacher					Total
	21-30yrs	31-40yrs	41-50yrs	51-60yrs	over 60yrs	
At most 9 activities	4	7	21	5	1	38
More than 9 activities	1	8	25	8	1	42
Total	5	15	46	13	2	80

There are also several small non-zero entries in activity patterns of teachers, and these empty cells make tests for statistical independence of age and number of activities, unreliable (invalid). In order to have validity in testing for the dependence of activity on age – it is necessary to recode the age categories as well as the main tasks performed categories. Two groups of performers are identified: all teachers performing the modal number of activities, or more; and, those teachers performing less than the modal number of activities. Similarly, all teachers are recoded into two groups: those teachers aged 41-50 years, and teachers in other aged categories. This recoding yields a new 2x2 cross classification table that has adequate degrees of freedom with which to perform chi-squared tests of independence. The results of the recoding and analysis, thereof, are shown in Table 5.3.3B below.

Table 5.3.3B Common of activities performed by teachers in various age groups

	Age Groups		
Activities, Test Statistics	Other age	41-50 years	Totals
Activities ≤ 9	19	25	44
Activities >9	20	21	41
Totals	39	46	85
Tests (Diagnostics)			
Level of significance	$\alpha=0.05$		
Chi-square critical value	2.7055		
Chi-square test statistic	0.2679		
p-value	0.6050		

At the 5 percent level of significance, the chi-square critical value is 2.7055, given the degrees of freedom associated with this cross-classification. The chi-square test statistics ($\chi^2=0.2679$, p-value=0.6050), suggest that the evidence available is not sufficient to reject the null hypothesis of independence of number of activities and age of the teacher. In other words, undertaking less than the modal number of activities is independent of a teacher's age.

These results might suggest that, this cohort of teachers and the subgroups in their respective age groups are essentially polychronic. That is, there is no discernible difference in the way in which teachers accomplish a set number of activities. In other words, it is not the younger or older teachers undertaking too many activities in the school. This result is important because years of teaching experience is normally linked to age, and teachers in the 41-50 year age group are often assumed to be taking too many responsibilities in the school. All the 85 primary teachers in the sample may simply be juggling all the activities presented to them, and then allocating time to a multiple of activities that are often performed concurrently.

It is also possible that the lack of evidence with which to reject the null hypothesis of independence of number of activities and age of the teacher may be a result of the way the activity and age groups are clustered, or the fact that 'years of teaching experience' should have been used instead. In Table 5.3.3B two age groups and two activity groups were presented. It might of value to broaden both the teacher's age groups and the number of activities, by looking at those teachers that are early-career (under 11 years of experience (Day, Sammons & Gu, 2008)) , mid-career (11 to 20 years of experience (Day et al., 2008)) and late-career (over 20 years of experience (Day et al., 2008)). This broadening yields a 2x3 cross-classification table. The properties of this classification table are presented in Table 5.3.3C, below.

The chi-square statistics ($\chi^2=3.6970$, $p=0.1570$), reported in Table 5.3.3C show that there is insufficient evidence to reject the null hypothesis of independence of number of activities and teaching experience. The results reflect those presented earlier in Table 5.3.3B. In other words, more experienced teachers are undertaking the same or similar number of activities as their counterparts. These findings are important in as far as they point to the fact that whatever makes the workloads or time-use different may not necessarily be in the number of activities undertaken by teachers. It is worth checking whether the variable that captures the

number of activities (n_{active}) is a significant determinant of daily and weekly time use, by running OLS, SUR and IV regressions. The results of the analyses that use this suite of techniques are reported in Section 5.10.

Table 5.3.3C Number of main tasks performed by teachers in experience groups

	Early-career	Mid-career	Late-career	Totals
Activities ≤ 9	6	12	24	42
Activities > 9	9	16	14	39
Totals	15	28	38	81
Tests (Diagnostics)				
Level of significance (α)	0.05			
Chi-square critical value	9.488			
Chi-square test statistic	3.6970			
p-value	0.1570			

Notes: Early-career=under 11 years experience, mid-career=11 to 20 years experience, and Late-career=21 plus years of experience.

5.3.4 Class Size and Number of Activities Performed By Teacher

So far tests of independence of the number of activities and teacher characteristics have focused on age and stage in life career (teaching experience). In this section, the results of one test of independence of number of activities and one classroom characteristic (class size), are reported. The hunch here is that the number of activities that the teacher performs may be directly linked, and possibly influenced by the size of class being taught (Holliday, 1992;

Bonesronning, 2003; Blatchford et al., 2004; Milesi & Gamoran, 2006). The results reported in Table 5.3.4A show difference in the number of activities by class size taught. The displayed results show that a large proportion of teachers work on between 8 and 10 activities, in the difference class sizes that they teach, during a typical week. These activities are undertaken mainly while teaching classes of size III, IV and V. The results show that class sizes III and IV tend to required teachers to undertake ten activities.

Table 5.3.4A Class size and number of activities performed by teachers

Activities	Class Size							Total
	I	II	III	IV	V	VI	VII	
6	0	0	1	2	0	0	0	3
7	0	1	1	1	1	0	0	4
8	0	3	6	4	2	0	0	15
9	0	0	2	8	1	0	2	13
10	1	1	10	8	4	0	0	24
11	0	0	3	4	1	0	0	8
12	0	1	1	3	2	0	0	7
Total	1	6	24	30	11	0	2	74

Note:

I: less than 17 students; II: 17-20 students; III: 21-24 students;
 IV: 25-27 students V: 28-30 students; VI: 31-34 students;
 VII: over 34 students

One can therefore test the statistical dependence between class size and the number of activities. The research question is: Are there any significant differences between time allocations of teachers undertaking 9 or more activities and/or teaching classes of at most size

III or at least size IV? The results of a cross-classification analysis using activity categories 9 or less, and 10 or more, for number of activities; and, categories I-III or IV-VII for class sizes are shown below in Table 5.3.4B.

Table 5.3.4B Common class size and activities performed by teacher

	Class Size \leq III	Class Size $>$ III	Totals
Activities \leq 9	14	21	35
Activities $>$ 9	17	22	39
Totals	31	43	74
Tests (Diagnostics)			
Level of significance	$\alpha=0.05$		
Chi-square critical value	3.8415		
Chi-square test statistic	0.0976†		
p-value	0.7547		

† statistically significant at 10 percent level, *statistically significant at 5 percent level,

The cross classification analysis yields a chi-square test statistics ($\chi=0.0976$, $p=0.7547$), suggesting that the number of activities undertaken by a teacher is independent of the size of the class taught. The results suggest that class size (as defined above) and teachers' undertaking the modal set of activities are unrelated. In short, the activity levels of teachers in schools are independent of the class size they teach.

5.3.5 Number of Activities and Other Teacher and School Characteristics

This far tests of independence of the number of activities and teacher characteristics have focused on age and stage in life career (teaching experience), and one classroom characteristic (class size). Clearly, from the data used in this thesis and the categorical definitions presented (see Appendices D and E, for example), there is scope to conduct a multitude of tests of independence based on the theoretical literature. Several other tests of significant independence, that are similar to those presented in Tables 5.3.3B, 5.3.3C and 5.3.4B, also have been conducted. In order to contain the number of tables used in the thesis,

a series of tests of independence have been conducted and are all reported in one Table, Table 5.3.5A.

Table 5.3.5A Test of independence of teacher and school variables, across number of activities performed

Teacher and School Variables	Chi-square	p-value
Early Career (under 11 years), {0=No, 1=Yes}	1.0097	0.3150
Mid-career (11-20 years), {0=No, 1=Yes}	1.3268	0.2490
Late career (21 years plus), {0=No, 1=Yes}	3.5727	0.059†
Over 40 years old, {0=No, 1=Yes}	0.4793	0.4890
Fulltime employment, {0=No, 1=Yes}	2.0158	0.1560
Primary only, {0=No, 1=Yes}	1.3417	0.2470
Kindergarten only, {0=No, 1=Yes}	0.0174	0.8950
Teaching out of area of expertise, {0=No, 1=Yes}	0.0162	0.8990
School location, {0=No, 1=Yes}	0.3848	0.5350
Small school, {0=No, 1=Yes}	0.4914	0.4830
Overloaded: 35 hour base, {0=No, 1=Yes}	0.4901	0.4840
Overloaded: 40 hour base, {0=No, 1=Yes}	2.0158	0.1560
Overloaded: 43 hour base, {0=No, 1=Yes}	0.8522	0.3560
Overloaded: 45.25 hour base, {0=No, 1=Yes}	0.2679	0.6050
Overloaded: 50 hour base, {0=No, 1=Yes}	0.0773	0.7810
Taking more than median break time, {0=No, 1=Yes}	0.9954	0.3180

†Significant at 10% level

So far, an attempt has been made to find dependence between the number of activities performed by teachers and various school and teacher characteristics. The search for significant tests of independence is quite important given the centrality of the sets of activities, in the conceptual framework of teachers' time use. The results, so far, have yielded

only one nearly significant result – that for late career teachers. This nearly significant result, albeit at a higher level of significance than would have been preferred, points out that teachers in their late career tend to undertake more activities, generally, than their counterparts.

5.4 Teachers' School Activities and their Time Budgets and Time Shares

Given the observation that there is little evidence of difference in the number of activities undertaken by teachers across selected teacher and school variables, it is important therefore to examine the differences in the actual time allocated to the teachers' activities during a typical week. This examination involves describing teachers' time-use by calculating time budgets and time shares for all the activities undertaken by teachers. The results for the time budgets and time shares are reported in Table 5.4.1A.

Results reported in Table 5.4.1A show that on average, 12.33 hours are spent on teaching alone (tt1) over a typical teaching week. Similarly, 11.22 hours are on average spent on planning and preparation (tt3) over a typical week. Approximately 3.35 hours per week are spent on administration (tt10). The three activities, tt1, tt3 and tt10 are thus ranked first, second and third, respectively, in terms of their relative claim on teachers' weekly time allocation. The remaining activities, tt4 through tt13 claim between 0.42647 (for tt8) hours and 2.7735 hours (for tt12), on average per typical week. Therefore, planning and preparation for lessons, and teaching (either alone or with others) comprise the largest share of primary teachers' workloads. Table 5.4.1A shows that most teachers' time is spent on teaching alone (tt1), with 12.33 hours expended on activity teaching alone during a typical week. The second most time-thirsty activity is planning and preparation (tt3). This type of activity has an expenditure of 11.22 hours on a typical week. The activity that is allocated the least amount of time is staff supervision (tt8), with 0.426 hours allocated to this activity over a typical

week. This result shows that, on average, less the 30 minutes of a teachers' time is allocated to staff supervision. The average weekly time expenditure is 43.97 hours and 23.5 hours are allocated to teaching alone (tt1) and preparation (tt3).

Table 5.4.1A: Mean time budget (in hours) and mean time shares (%) for each activity during a typical week

Activity undertaken by teachers	Time Budget (hours) ^(a)			Time Share (%) ^(b)		
	Mean	L95	U95	Mean	L95	U95
Teaching alone (tt1)	12.33	11.04	13.62	28.70	25.73	31.67
Teaching with others (tt2)	2.99	1.97	4.00	7.16	4.59	9.72
Planning and preparation (tt3)	11.22	10.04	12.41	25.49	23.30	27.69
Duty (tt4)	2.21	1.95	2.48	5.01	4.48	5.53
Professional discussion with colleagues (tt5)	1.88	1.46	2.30	4.27	3.34	5.20
Formal communication with parents and students (tt6)	1.15	0.67	1.63	2.58	1.58	3.57
Informal communication with parents and students (tt7)	1.03	0.84	1.22	2.35	1.93	2.78
Staff supervision (tt8)	0.43	0.22	0.63	0.92	0.50	1.35
Student supervision (tt9)	1.40	0.97	1.83	3.35	2.32	4.39
Administration (tt10)	3.35	2.49	4.21	7.42	5.71	9.13
Meetings (tt11)	2.21	1.77	2.65	4.96	4.02	5.90
Professional learning (tt12)	2.77	1.54	4.01	5.73	3.39	8.07
Extra school expectations (tt13)	1.00	0.31	1.68	2.06	0.81	3.31
Total time over all tasks (tt1 through tt13)	43.97	41.65	46.29			

Notes:

(a) These are the results for time budgets tt1 through tt13

(b) these are the time shares for the variables tt01_s through tt12_s

L95= lower confidence limit for the 95% confidence interval

U95= lower confidence limit for the 95% confidence interval

In terms of time-shares, Table 5.4.1A shows that the bulk of teachers' time is spent on teaching alone (tt01_s), with 28.70 percent of weekly time expended on teaching alone. The second most time-thirsty activity is planning and preparation (tt03). This type of activity has an expenditure of 25.52 percent hours of the hours recorded over a typical teaching week.

The activity that is allocated the least amount of time is staff supervision (tt08), with 0.92 percent of the time allocated to this activity over a typical week. This result shows that, a very small amount of a teachers' time is allocated to staff supervision.

Recall from the results reported earlier (see Table 5.3.1A) – that the average weekly time expenditure on 13 activities (tt1 through tt13), during the period Monday to Sunday, is 43.97 hours. These results show that, of the 43.97 hours of teachers' work, 61.36 percent of the time is allocated to teaching alone (tt1), teaching with others (tt2), and preparation (tt3). It is worth reflecting here that most teachers argue that there is very little time for preparation during school time. With this conjecture or argument in mind, it is likely therefore that the 25.50 percent of time allocated to planning and preparation is for work that is done outside the school time, during evenings and weekends. Having looked at the results of time allocation among activities, the next research problem is to investigate whether there are any differences in how time is allocated by teachers across days of a typical week. The results of this kind of investigation are reported in the next Section 5.5. The two main premises of Section 5.5 are that not all days are the same to the teacher, and that time budgets and time shares may yield complementary results.

5.5 Differences Between Daily Time Allocations (Budget and Shares)

The key research question is: What are the determinants of time allocation by Tasmanian primary teachers. The key research sub-questions are: Do teachers allocate time differently across the days of the week? Are there any observable statistical differences in daily time allocation behaviours, using time budgets and time shares? If so, what policy issues emanate from these findings? It is important to investigate, therefore, whether the daily allocation of time between any two days is the same. In Table 5.5.1A all pair-wise combinations of daily time allocation behaviour are considered and the statistical significance of the pair-wise

differences in time allocation are examined using a t-test of difference between two means or proportions. The results reported are for all teachers (fulltime and part-time teachers). A comparison of time behaviours across different fulltime equivalence status of teachers is deferred to Table 5.5.2. The interpretation of the results reported in Table 5.5.1A requires examining the difference (gap) in average time allocation. For example, the difference between the average time budgets of Mondays and Tuesdays is 0.04. This difference is not significant at the 5 percent level as evident from the p-value ($p=0.4299$). The gap between Monday and Thursday average times is 0.54 hours and significant, ($p=0.0499$).

There is no difference between time shares of Tuesday and Wednesday ($p=0.1862$). In Table 5.5.1A, the first column shows the day that is assumed to have the longer hours of work. As a result, the sign of the gap in hours shown in the third column gives an indication of which of the two days has a smaller mean allocation of actual or relative time. The negative result in Table 5.5.1A occurs only for Friday/Weekend time budget comparisons, and both time budget and time share comparisons for Saturday/Sunday. The negative results for the time budgets are insignificant. The negative sign for the Saturday/Sunday time shares shows that the proportion of Saturday time use is lower than that of Sunday time use by 0.98 percent. This difference – which is strikingly small, is statistically significant at the 10 percent level.

Table 5.5.1A Differences in daily time budgets and time shares of all teachers

Day		Time Budgets			Time Shares		
Compare	With	Gap	sig.	p-value	Gap	sig.	p-value
Monday	Tuesday	0.04		0.4299	-0.34		0.3035
Monday	Wednesday	0.20		0.2091	0.36		0.2845
Monday	Thursday	0.54	*	0.0499	1.47	†	0.0614
Monday	Friday	2.51	***	0.0000	6.21	***	0.0000
Monday	Saturday	7.49	***	0.0000	17.34	***	0.0000
Monday	Sunday	7.04	***	0.0000	16.35	***	0.0000
Monday	Weekend	2.22	***	0.0009	13.49	***	0.0000
Tuesday	Wednesday	0.16		0.2563	0.71	***	0.1862
Tuesday	Thursday	0.50	†	0.0537	1.81	**	0.0369
Tuesday	Friday	2.47	***	0.0000	6.55	***	0.0000
Tuesday	Saturday	7.45	***	0.0000	17.68	***	0.0000
Tuesday	Sunday	7.00	***	0.0000	16.70	***	0.0000
Tuesday	Weekend	2.19	***	0.0000	13.83	***	0.0000
Wednesday	Thursday	0.34		0.1093	1.10	†	0.0751
Wednesday	Friday	2.31	***	0.0000	5.85	***	0.0000
Wednesday	Saturday	7.29	***	0.0000	16.97	***	0.0000
Wednesday	Sunday	6.83	***	0.0000	15.99	***	0.0000
Wednesday	Weekend	2.02	***	0.0004	13.13	***	0.0000
Thursday	Friday	1.97	***	0.0000	4.75	***	0.0000
Thursday	Saturday	6.95	***	0.0000	15.87	***	0.0000
Thursday	Sunday	6.48	***	0.0000	14.89	***	0.0000
Thursday	Weekend	1.68	***	0.0044	12.02	***	0.0000
Friday	Saturday	4.98	***	0.0000	11.12	***	0.0000
Friday	Sunday	4.52	***	0.0000	7.28	***	0.0000
Friday	Weekend	-0.32		0.6885	10.14	***	0.0000
Saturday	Sunday	-0.45		0.9528	-0.98	†	0.0515

Statistical significance: (*** at 0.1 %), (** at 1%), (* at 5%), and († at 10%).

The general picture from these t-test results is that time allocations are generally higher at the start of the week, particularly with Tuesday allocations. The results suggest that larger values are for the earlier days of the week, and then tapering off or out down the week and the lowest number of hours reported for Saturday and Sundays. Sunday time allocations are generally higher than Saturday time allocation – bring into picture a likely idea of the teacher's weekend being Saturday only, and the weekly shift starting on Sundays with a spike on Sundays, a Spike on Tuesdays and then a gradual decline to Fridays. It is important to examine later whether the spike for Sundays, Mondays, and Tuesdays; and, the general decline for Fridays is typical of teachers of different employment status, age groups, level of teaching experience and location of schools.

The results displayed in Table 5.5.1A are for all primary teachers and do not take into account, therefore, the employment status of teachers. This is particularly important because part-time teachers are likely to have different relative time expenditures compared to full-time teachers. It is imperative, to test, therefore, the differences in daily time budgets and time shares of fractional appointment teachers (part-time: 0.50 and part-time 0.8), and full time teachers.

The results displayed in Table 5.5.1A show that, in this case, both time budget method and the time share method yield similar results with respect to the differences in time allocations across teaching and non-teaching days of the week. For example, the average Monday time allocations exceed the weekend average time allocations by 2.22 hours (Monday/Weekend: time gap=2.22, $p < 0.05$). In terms of time shares, the difference between Monday and weekend time shares is 13.49 percent and is significant at the 5 percent level. One area of significant difference is in the comparison of Friday and weekend times. The time budget model shows no significant difference in time allocations for Friday and weekend times (Friday/Weekend: time gap=-0.32, $p > 0.10$), whereas the time method shows that Friday

time shares are generally higher than weekend time shares by up to 10.14 percent (Friday/Weekend: time gap=10.14%, $p < 0.01$).

Table 5.5.2A shows the results of these tests of differences of time allocation behaviour of teachers in the various fulltime equivalence employment status. Using time budgets and time shares, there is clearly no significant differences between time allocations of Monday and any other day of the teaching week for the 0.5 FTE teachers. Teachers employed at 0.8 of fulltime show insignificant Friday comparisons, as expected.

Part-time teachers employed at 50 percent spend 5.46 hours more on Mondays than they do on Saturdays (Monday/Saturday: gap=5.46, $p < 0.05$). Similarly, teachers employed 80 percent of the time have a sizeable gap of 5.64 hours. The time gap for Monday and Saturday is 8.23 hours for teachers employed on a full-time basis. Teachers in full-time employment show an interesting pattern of time allocations on Mondays. Clearly the difference in time allocation increases for Tuesday through to Saturday. For example, the Monday/Tuesday average time gap is 0.39 hours, the Monday/Wednesday average time gap is 0.53 hours. The Monday/Thursday average time gap is 0.58 hours and the Monday Friday average time gap is 1.975. The weekend average time gap is 8.33 hours for Monday/Saturday and 7.63 hours for Monday/Sunday suggesting that less time is allocated to school work on Saturdays. These results are similar to those reported for time shares.

The result reported earlier show clearly that there are differences in teachers' daily time allocation behaviour. These differences exist for full-time and part-time teachers (and the fractional appointments, thereof). It is prudent, therefore to investigate whether these differences in daily time allocation behaviour vary across other teacher characteristics. The next section presents an empirical analysis of differences in time allocation behaviour across several teacher attributes (characteristics).

Table 5.5.2A Differences in time budgets and time shares for different FTE teachers

		Time Budgets				Time Shares		
Compare	To	0.5	0.8	1.0		0.5	0.8	1.0
Monday	Tuesday	-1.83	-0.44	0.39*		-1.33	-0.78	1.84*
Monday	Wednesday	0.33	-0.72	0.53*		0.65	-0.39	2.81*
Monday	Thursday	2.29	-0.64	0.58*		0.95	-0.35	3.38*
Monday	Friday	2.71	5.47*	1.97*		0.61	3.09*	7.46*
Monday	Saturday	5.46*	5.64*	8.23*		3.89*	2.70*	29.56*
Monday	Sunday	4.46	6.47*	7.63*		4.12*	6.83*	30.51*
Monday	Weekend					3.72	2.39*	18.21*
Tuesday	Wednesday	2.17	-2.78	0.14		1.53	-0.02	0.93
Tuesday	Thursday	4.13	-0.19	0.19		1.95†	0.07	1.40
Tuesday	Friday	4.54*	5.92*	1.58*		2.51*	3.15*	6.30*
Tuesday	Saturday	7.29*	6.08*	7.83*		10.06*	2.78*	29.65*
Tuesday	Sunday	6.29*	6.92*	7.24*		6.13*	6.11*	27.88*
Tuesday	Weekend					6.60*	2.43*	17.11*
Wednesday	Thursday	1.96	0.08	0.05		0.99	0.09	0.50
Wednesday	Friday	2.38	6.19*	1.44*		0.50	3.57*	5.99*
Wednesday	Saturday	5.13*	6.36*	7.70*		4.08*	4.19*	30.28*
Wednesday	Sunday	4.15*	7.19*	7.10*		4.16*	8.45*	29.63*
Wednesday	Weekend					3.67*	3.87*	17.60*
Thursday	Friday	0.42	6.11*	1.39*		-0.04	6.46*	5.74*
Thursday	Saturday	3.17*	6.28*	7.65*		2.02*	4.70*	30.58*
Thursday	Sunday	2.17	7.11*	7.06*		1.40	7.98*	32.48*
Thursday	Weekend					1.30	3.84*	18.18*
Friday	Saturday	2.75	0.17	6.26*		1.60†	0.23	22.11*
Friday	Sunday					0.94	0.65	20.26*
Friday	Weekend					0.93	-0.62	12.30*
Saturday	Sunday	-1.00*		-0.59*		-2.11*	0.42	-2.24*

† greater than 5% level, but not greater than 10%, * significant at the 5% level or lower levels.

5.6 Teacher Characteristics and Time Allocation

The main teacher characteristics that are considered in the examination of differences in time budgets and time shares are: age, employment (fulltime) status, kindergarten teaching, primary teaching, length of teaching experience, and teaching out of area of expertise. The fundamental question that is being addressed is: Does time allocation behaviour, expressed in terms of time budgets and time

shares of teachers, differ across selected teacher characteristics? Answers to this question are presented in Sections 5.6.1 through 5.6.6.

5.6.1 Teacher's Age Group and Time Allocation

Table 5.6.1A shows the results for the time budgets across days Monday through Friday, weekends (Saturday and Sunday), and the entire week (Sunday to Saturday). The results suggest that there are no significant differences between the time allocations (time budget) of teachers in the two age groups. Teachers aged (41-50) allocated 8.60 hours on Mondays, and their counterparts (teachers aged over 50 years or teachers aged less than 41 years) allocated 9.02 hours. Similarly, 40.31 hours were allocated to Monday-to-Fridays activities by teachers outside the 40-51 year age group. Their counterparts allocated 41.29 hours. The results of time budgets analysis do not show any significant difference in the time allocation behaviour of teachers aged 41-50 and their counterparts.

However, when using time shares teachers aged 41 to 50 seems to allocate less time to school activities on Tuesdays than their counterparts. Their counterparts allocated 22.15 percent of their time to Tuesday activities, whereas the 41-50 year old allocated 19.21 percent of their time to Tuesday activities. The exact p-value of this test of difference is highly significant (p-value=0.0065). This is indeed a striking result – and the only significant results in the comparison of time budgets and time shares. What is even more fascinating is that the time allocation behaviour difference is on Tuesdays – a day that has shown some significant difference in teacher activity patterns. The results reported in the table also show that teachers aged 41-50 allocate more time to Sunday work, than their counterparts. The results are, however, significant at the weaker 10 percent level (p-value =0.0983).

Table 5.6.1A: Age differences in time budgets and time shares of teachers

	Time Budget				Time Share			
Period or day of week		Other Age		41-50 years		Other Age		41-50 years
Monday		8.60		9.02		20.04		20.33
Tuesday		9.17		8.46		22.15	*	19.21
Wednesday		8.41		8.80		19.62		20.02
Thursday		8.04		8.50		18.41		19.00
Friday		6.10		6.50		13.92		14.04
Saturday		1.19		1.46		2.50		3.16
Sunday		1.61		1.95		3.37	†	4.24
Monday-To-Friday		40.31		41.29		94.13		92.60
Saturday-And-Sunday		2.80		3.41		5.88		7.40
Sunday-To_Saturday		43.12		44.70				

Notes: *significant at the 5% level, † significant at the 10% level.

It is concluded, therefore, from the table above, that the Tuesday time allocations by the teachers in the two age groups are not identical. The Tuesday allocation of proportioned time by teachers aged 41-50 is significantly lower than that of teachers in other age groups. The Sunday allocation of time shares is marginally higher for teachers aged 41-50. It is important to emphasise that the results reported for the other days of the week, using time budgets are consistent with those reported using time shares, with the exception of the dominant Tuesday effect, and the marginal Sunday effect. The differences in the Tuesday and Sunday effects that have emerged from this analysis are fundamental. They highlight two things: first, the

use of time budgets gives a reasonable profile of time-use among teachers; second, the use of time shares also gives a reasonable profile of time-use among teachers; and third, and possibly most significant, is that the joint use of time budgets and time shares captures more information about time allocation behaviour of teachers than using one of the indicators on its own. Such information is useful for policy – especially with respect to length of teaching day and significant breaks in teaching. The use of time shares is novel in this thesis, and clearly the results presented above have highlighted what could have been missed out had it not been for implementing the simple, and novel, idea of using time shares in analysing time allocation behaviour.

5.6.2 Teacher's Employment Status and Time Share Allocation

The results displayed on Table 5.6.2A show that teachers of the two employment groups, (full-time and part-time), have statistically significant differences in time budgets and time shares on Tuesdays, Wednesdays and Fridays. Teachers in full-time employment seem to allocate a lower share of total week time to Tuesday and Wednesdays, than their counterparts (that is teachers in part-time employment). On Tuesdays full-time teachers allocate 19.46 percent of their budget, whereas their counterparts allocate 21.63 percent of their time. The difference is statistically significant at the 5 percent level and the exact p-value is 0.0018. This p-value is for the test against the alternative hypothesis that part-time teachers spend a larger share of their weekly time on Tuesdays, than their counterparts (full-time teachers). This result indicates that there are significant differences in Tuesday time share allocations between part-time and full-time teachers. In fact, the Tuesday allocation of time by part-time teachers is the largest share (23.41 percent) of time allocated to any day of the typical teaching week. In other words, on a typical Tuesday, teachers in the two employment groups allocate time shares differently. In addition, part-time teachers allocate a larger share of their time to Wednesday activities, compared to full-time teachers. It is noteworthy that the

difference in the allocation between the two employment groups is generally less than 3 percent. The difference between time shares for the two groups is 2.95 percent on Tuesdays (i.e., 23.41% - 19.46%) and 2.56 percent for Wednesdays (i.e., 21.63% - 19.07%).

The differences in time shares on Fridays are rather striking. It is clear from the results reported in Table 5.6.2A that on a typical Friday part-time teachers allocate a significantly lower time share than their counterparts. The allocations are 15.68 percent for full-time teachers, and 9.34 percent for part-time teachers in employment status. The difference of 6.34 percent (i.e., 15.68% - 9.34%) is certainly much higher than that found for the Tuesday and Wednesday allocations.

Table 5.6.2A Employment differences in time budgets and time shares allocation

		Time Budgets			Time Shares		
Period of the week		Full-time		Part-time	Full-time		Part-time
Monday		9.56	*	6.89	20.23		20.17
Tuesday		9.17	*	7.77	19.46	*	23.41
Wednesday		9.03	*	7.53	19.07	*	21.63
Thursday		8.98	*	6.42	18.92		18.28
Friday		7.59	*	2.88	15.68	*	9.34
Saturday		1.34		1.36	2.58		3.70
Sunday		1.92		1.43	4.06		3.48
Monday-To-Friday		44.32	*	31.47	93.36		92.83
Saturday-And-Sunday		3.25		2.79	6.64		7.17

*significant at the 5 percent level

These results suggest that for extended modelling of time-use by teachers it should be of paramount importance to include employment status as a dummy variable. The result may also point to a general reluctance of teachers to pursue part-time work on Fridays, or the generally availability of part-time work on Fridays, or the tendency for most part-time teachers to prefer Fridays as a day off school. However, the preference for Fridays has not been tested empirically, and therefore is a topic to consider in future, further directions of this thesis. The results also show that there is no significant difference in weekend time-budgets or weekend time shares. Similarly, there are no differences in time shares for Monday-to-Friday allocations – compare 93.36 percent to 92.83 percent. Again, this result of difference in time allocations shows the additional information that time share analysis has uncovered. In this instance for example, full-time teachers have allocated 44.32 hours to weekly work, whereas their counterparts allocated only 31.47 hours. Surely, there is a difference as shown by the significant difference of these time budgets. However, if one looks at the relative use of time – relative of course to the time endowment – it becomes clear that the 44.32 hours expended by full-time teachers represents 93.36 percent of the average available time, and that the 31.47 hours expended by part-time teachers represents 92.83 percent of the time available to part-time teachers. The result of no significant difference in time shares combined with the result of significant difference in time budgets should indeed reflect that part-time teachers are likely to be overloaded. This conjecture is pursued and tested empirically in Section 5.11.

5.6.3 Kindergarten Teachers and Time Share Allocation

Primary school teachers can be classified more specifically as kindergarten teachers only, primary only, or kindergarten and primary. In Table 5.6.3A a dummy variable is used to represent those teachers who teach in kindergarten only. The results reported in Table 5.6.3A show, therefore, the time budgets and time shares of kindergarten teachers and their counterparts. In Table 5.6.3A results for the shares are reported only for those primary teachers that are only kindergarten teachers. Kindergarten teachers spend up to 23.13 percent of their weekly time on Tuesdays, 18.20 percent on Wednesdays, and 16.46 percent on Thursdays, and 17.38 percent on Fridays. Kindergarten teachers' time shares for Tuesdays through Fridays are significantly different from the time shares of other primary school teachers, although at a weaker level of significance. The differences in time shares for Monday-to-Friday and weekends are not statistically significant. It is noteworthy that the time budget analysis does not show any significant difference in time expenditures of kindergarten and primary only teachers. The results from the time share analysis show kindergarten teachers using a larger share of their time on Tuesday and Friday, than their counterparts (primary only teachers). Both time budgets and time shares indicate that primary and kindergarten teachers have no significant differences in time allocation behaviours over the working week (Monday to Friday) or over the weekend (Saturday and Sunday). Again, without looking at both time budgets and time shares, time-use modellers and practitioners focusing only on time expenditure (time budgets) for the entire week may have mistakenly argued that there are no inter-day and weekly differences in time expenditure patterns. The results, using the approach adopted in the thesis, shows clearly that the absence of differences in weekly time expenditure may hide the salient differences in inter-day expenditures which only time share analysis has uncovered in this instance.

Table 5.6.3A Differences in time shares for kindergarten (kinder) and other teachers

Days of the week	Time Budgets			Time Shares		
	Other		Kinder	Other		Kinder
Monday	8.96		8.04	20.46		18.63
Tuesday	8.73		9.15	20.11	*	23.13
Wednesday	8.72		8.06	20.11	*	18.20
Thursday	8.39		7.67	19.11	*	16.46
Friday	6.22		6.92	13.42	*	17.38
Saturday	1.41		0.92	3.00		2.06
Sunday	1.78		1.88	3.79		4.14
Saturday-And-Sunday	3.18		2.79	6.79		6.20
Monday-To-Friday	41.01		39.83	93.21		93.80

*significant at the 5 percent level

5.6.4 Primary Teachers and Time Share Allocation (Time Budgets and Time Shares)

In Table 5.6.4A the time shares of primary schools teaching primary only (and no kindergarten) are compared to time shares of primary teachers teaching kindergarten and/or primary teaching only. The results in Table 5.6.4A do not show any statistically significant differences in budget share as for any day of the week, including weekend time allocation. One would have expected results reported in Table 5.6.4A to be similar to those reported in Table 5.6.3A.

Table 5.6.4A Primary teachers and differences in time budgets and time shares

Days or Period of the week	Time Budgets			Time Shares		
	Other		Primary	Other		Primary
Monday	8.86		8.75	20.31		19.93
Tuesday	8.87		8.61	20.86		19.79
Wednesday	8.51		8.88	19.59		20.42
Thursday	8.24		8.39	18.54		19.18
Friday	6.22		6.53	14.02		13.91
Saturday	1.31		1.39	2.87		2.85
Sunday	1.73		1.93	3.81		3.92
Saturday-And-Sunday	3.04		3.23	6.68		6.78
Monday-To-Friday	40.70		41.15	93.32		93.22

Table 5.6.4A reports some intriguing and puzzling results. Earlier in Table 5.6.3A a comparison was made of the time-use patterns of kindergarten-only teachers against other primary school teachers. In this table (Table 5.6.4A) the distinction in time-use behaviour of primary-only teachers and other teachers is considered. The results suggest that there is no significant difference in time budget or time share allocation behaviour of the two groups of teachers.

The results emphasise the importance of using kindergarten and primary dummies in subsequent analyses designed to explain the number of activities as well as the time allocation across days of the week. The differences in results from Tables 5.6.3A and 5.6.4A suggest a need to explore these groups further. It may be significant to look at kindergarten only (see Table 5.6.3A), primary teachers only (see Table 5.6.4A), and also consider the

kindergarten and primary group as well. In the latter case (both kindergarten and primary), one examines the time allocation of those teachers that teach both kindergarten and primary, and compare their results to those of their counterparts (who are primary only or kindergarten only). This distinction is a direction for further, future, research on teachers' time allocation behaviour.

5.6.5 Teacher's Length of Teaching Experience and Time Share Allocation

Length of teaching experience is often considered a significant determinant of the allocation of time to tasks by teachers. It is generally posited that more experienced workers are more likely to have established routines that accord them the flexibility to allocate a lower proportion of time to tasks and routines while producing output more efficiently. Alternatively, this efficient use of time could also mean that workers – in this case teachers - are more likely to allocate their time to additional activities – thus making their time shares larger than that of the less experienced teachers. A research question to consider, therefore, is whether there is any significant variation in the total hours spent or the share of work hours for teachers of different lengths of teaching experience. The results of the analyses of actual daily time budgets and time shares over a typical week of teachers of different lengths of teaching experience are reported in Table 5.6.5A. The results suggest that more experienced teachers spend on average 43.13 hours on Monday to Friday. The allocation of time during the week is significantly higher for the more experienced teachers. Less experienced teachers spend 39.81 hours per week over a similar time period Monday to Friday. These allocations are statistically significant at the 5 percent level.

Table 5.6.5A Teaching experience and differences in time budgets and time shares

	Time Budgets				Time Shares		
	Teaching Experience				Teaching Experience		
Period or Day of the week	Under 21 years		Over 21 years		Under 21 years		Over 21 years
Monday	8.55	†	9.38		19.99		20.32
Tuesday	8.67		9.07		20.82		19.87
Wednesday	8.53		8.97		20.06		19.51
Thursday	8.07		8.78		18.72		18.75
Friday	5.99	†	6.92		13.91		14.30
Saturday	1.22		1.56		2.71		3.17
Sunday	1.68		2.04		3.80		4.09
Saturday-And-Sunday	6.50		7.25		6.50		7.25
Monday-To-Friday	39.81	*	43.13		93.50		92.75

*significant at the 5% level, † significant at the 10% level.

Results in Table 5.6.5A show that when compared to their counterparts, more experienced primary teachers tend to spend more hours on Mondays, and Fridays; and, Mondays-to-Fridays. The Monday-to-Friday time budgets for the more experienced teachers are significantly higher (statistically) than those of less experienced teachers. The results reported in Table 5.6.5A suggest that experienced teachers expended more time than less experienced teachers. The time budget differences are weak, however. It is important, therefore, to explore experienced versus less experienced teachers' time expenditures using time budgets and time shares when conducting the suite of models that include OLS, SUR, MVREG and IVREG.

The results reported in Table 5.6.5A do not show any significant differences in the time shares of primary school teachers. In other words, teachers with less than 21 years of teaching experience have statistically similar average time shares to those of teachers with over 21 years of teaching experience, over all days of the teaching week and weekends. Since the results of time shares do not show any significant differences in the proportion of hours allocated over a normal week of a primary teacher's work life, it is important to reflect on why there are no significant differences in the share of hours allocated over a typical week reported in Table 5.6.5A.

5.6.6 Teaching Out of Area of Expertise and Teacher's Time Allocation

The results reported in Table 5.6.6A show differences in time allocations between teachers teaching out of area of expertise and their counterparts. The results show that there are no significant differences in time budgets for days except Wednesday, Sunday and weekend. The results for Wednesday allocation show an average allocation of 7.97 hours by teachers teaching out of area of expertise, and an allocation of 8.91 hours for teachers that are not teaching out of area of expertise. Teachers who teach out of area of expertise spend an hour or so (on average) during Sundays compared to two hours expended by teachers that are not teaching out of area of expertise. Teachers teaching out of area of expertise have a mean of 2.07 weekend hours, and their counterparts spend on average 3.49 hours over the weekend. The weekend time budget of 3.49 hours is significantly different to the 2.07 hours, at the 5 percent level.

In terms of time shares, the proportioned allocation of time is lower on Thursdays for teachers teaching out of area of expertise (compare 18.29 percent to 20.15 percent). However, teachers teaching out of area of expertise spend a significantly larger proportion of their time on Friday activities (compare 17.28 percent to 13.36 percent). This result is certainly new evidence of the difference in time allocation shares of Tasmanian primary teachers that self-

identify as teaching out of area of expertise. The proportion of time spent by teachers that teach out of area of expertise is lower on weekends (see 4.21 percent and 7.46 percent) in comparison to what is proportioned by teachers that are not teaching out of area of expertise.

Table 5.6.6A Teaching out-of-area of expertise and teachers' time allocation behaviour

Period or day of the week	Time Budgets			Time Shares		
	Teaching Out-of-Area			Teaching Out-of-Area		
	No		Yes	No		Yes
Monday	9.07		8.33	20.79		19.51
Tuesday	8.86		8.85	20.01		21.97
Wednesday	8.91	*	7.97	20.15	†	18.29
Thursday	8.47		8.13	18.73		18.73
Friday	6.32		6.88	13.36	*	17.28
Saturday	1.45		1.07	3.10		2.14
Sunday	2.04	*	1.00	4.36		2.07
Monday-To-Friday	41.64		40.17			
Saturday-And-Sunday	3.49	*	2.07	7.46	*	4.21
Sunday-To-Saturday						

In terms of time shares, the proportioned allocation of time is lower on Wednesdays for teachers teaching out of area of expertise (compare 18.29 percent to 20.15 percent). However, teachers teaching out of area expertise spend a significantly larger proportion of their time on Friday activities (compare 17.28 percent to 13.36 percent). This result is certainly new evidence of the difference in time allocation shares of Tasmanian primary teachers that self-identify as teaching out of area of expertise. The proportion of time spent by teachers that teach out of area of expertise is lower on weekends (see 4.21 percent and 7.46 percent) in comparison to what is proportioned by teachers that are not teaching out of area of expertise.

5.7 School Characteristics and Teacher's Time Allocation

In the previous section, Section 5.6, attention was focused on examining differences in time allocation behaviour across teacher characteristics. It has been stressed in the conceptual model that teacher characteristics and school characteristics are central to an understanding of the dynamics of time-use. It is imperative therefore, that attention be focused now on examining the differences in time allocation behaviour of teachers across selected school characteristics. The school characteristics that have been selected are school size and location. In a manner similar to that presented in Section 5.6, results of tests of the differences daily time use using time budgets and time shares are reported. These results are important in as far as they unveil the set of variables that are suitable for use as independent variables in subsequent estimations using OLS, SUR, MVREG and IVREG estimations.

5.7.1 School Size and Teachers' Time Allocation

Results reported in Table 5.7.1A show average school hours for schools of different sizes. The sizes considered are 2 through 9. A school of size 2 (51-100 students) is the smallest and school size 8 (more than 600 students) is the largest. A case of a school size of 9 represents cases where the school size was not specified. The results suggest that teachers in smaller schools tend to report, on average, longer working hours than teachers working in larger schools. For example, the hours expended by teachers on Monday-to-Fridays for school size 2 (51-100 students) is 53.25 compared to 35.95 hours for schools of size 8 (more than 600 students). However, it is important to note that the average time-use values seem to suggest some form of clustering of school size. For example, in schools of size 2 (51-100 students) and 3 (101-200 students) seem to cluster (means of 53.25 and 46.39, respectively). Similarly, school size 4 (201-300 students) and size 5 (301-400 students) are also closer (means of 39.25 and 39.02, respectively). During a typical week, teachers in schools of sizes 6 (401-500 students) and size 7 (501-600 students) are allocating on average, around 42.44 and 42.73

hours, respectively. Finally, school sizes 8 (more than 600 students) and 9 (number not mentioned) also seemingly cluster and have means at 35.95 hours and 35.91 hours of weekly time use by teachers.

It is worth stressing that there are only two schools with 51-100 students (size 2), 9 schools with 101-200 students (size 3). In 21 schools the student body is between 201 and 300 students (size 4), and in 13 schools the student body is between 301 and 400 students (size 5). Of the large schools, 16 have a student body of between 401 and 500 (size 6), 11 have a student body of between 501 and 600 (size 7). In 5 of the schools, the student body is in excess of 600 students (size 8). There are, as usual, cases where there is missing data: in 9 schools the number of students in the school has not been provided, these schools are by default classed as size 9 schools.

The statistical difference of mean hours of time allocated by teachers working in schools of various sizes are examined also using ANOVA and post-hoc estimation techniques for the presence of heteroscedastic variance in work hours. The posthoc test is the Breusch-Pagan/Cook-Weiseberg test (BP/CW), implemented using STATA 9, and the results of this test are reported alongside the ANOVA results in Table 5.7.1B. Since the null hypothesis for the Breusch-Pagan / Cook-Weisberg test is that all variances are constant (homoscedastic), the significant chi-square values reported in Table 5.7.1B suggest that the variances of time budgets and time shares are not homogenous across schools. These significant results suggest the presence of heteroscedasticity - and the high level of heteroscedasticity indicates that the time allocation behaviour of teachers in schools of various sizes is heterogeneous. The variations in time allocations are significant, such that working conditions in different size schools will dictate that teachers allocate time differently.

The ANOVA results show that school size effects are significant in Wednesday and Thursday time budget allocations. In other words, in schools of different size, time seems to be allocated differently by primary teachers on Wednesdays and Thursdays. A similar result, although weaker, is reported for Thursday time share allocations. The time share ANOVA result for Thursday ($F=2.01$, $p=0.065$) suggests a marginal school size effect, even in the face of very larger variations BP/CW diagnostics ($\chi^2=23.71$, $p=0.000$).

Table 5.7.1B School size effects on time budgets and time shares of teachers: ANOVA

	Time Budgets				Time Shares			
	ANOVA		BP/CW test		ANOVA		BP/CW test	
	F ratio	p-value	χ^2	p-value	F ratio	p-value	χ^2	p-value
Monday	1.16	0.334	10.35*	0.001	1.46	0.196	0.06	0.801
Tuesday	1.52	0.173	26.39*	0.000	0.50	0.834	3.63†	0.057
Wednesday	2.26*	0.048	19.24*	0.000	1.36	0.233	4.02*	0.045
Thursday	2.16*	0.048	17.50*	0.000	2.01†	0.065	23.71*	0.000
Friday	1.26	0.283	2.68	0.101	0.88	0.525	0.87	0.350
Saturday	0.96	0.464	106.46*	0.000	0.97	0.457	135.99*	0.000
Sunday	1.05	0.407	4.25*	0.039	1.11	0.366	1.45	0.228
Saturday-And-Sunday	0.33	0.937	3.58†	0.059	0.31	0.946	14.20*	0.000
Monday-To-Friday	1.82†	0.095	6.90*	0.009	0.31	0.946	14.20*	0.000
Monday-to-Sunday	1.63	0.140	1.63*	0.055				

Notes: † significant at the 10 percent level; * significant at the 5 percent level

5.7.2 Teacher's Time Allocation in Small and Large Schools

Small schools are defined here as being schools of sizes 1, 2, 3 and 4; that is, all schools with less than 300 students. This demarcation is not based on any literature review. It is purely based on statistical convenience. It is the demarcation that allows for a preservation of reasonable degrees of freedom in the analysis of teacher time allocation behaviour in Tasmanian primary schools. The results obtained, thereof, are thus purely outcomes of data mining that might yield new information about partitioning of school size. It is clear therefore that the results presented below have not tested for sensitivity to different types of demarcations.

Noting the likely loss of degrees of freedom when all school sizes are used, it is imperative to enhance these degrees of freedom. As a rule of thumb, in order to preserve significant degree of freedom (dfs), the school sizes are recoded to small and larger. Smaller schools are recoded as those schools with less than 300 students, and larger schools are recoded as those schools with at least 300 students. The results for small and large schools are reported in Table 5.7.2A. The results from recoding school size and re-examining the differences in mean hours allocated over the typical day of the week are shown in Table 5.7.2A. On Mondays smaller schools spend, on average, 8.98 hours on Monday and larger schools spend 8.58 hours. The differences in time allocation are not statistically significant at the 5 percent level of significance, as evident from p-values of 0.7462, 0.5076 and 0.2538. Statistically significant results are obtained for Friday, Sunday, and Saturday and Sunday. On Fridays and Sundays, larger schools seem to be allocating longer hours than smaller schools. The results are significance at the 5 percent level of significance. What also is evident is that for smaller schools, the daily allocations decreases from Monday through Saturday, and then picks up on Sunday. The decline in daily allocations by teachers in larger schools starts on Tuesdays and has a spike on Sunday.

Table 5.7.2A Teachers' time budgets and time shares of teachers in small and large schools

		Time Budgets				Time Shares	
		Size of School				Size of School	
Period or days of the week		Small		Large		Small	Large
Monday		8.98		8.58		18.47	*
Tuesday		8.77		8.81		19.91	
Wednesday		8.61		8.64		18.99	†
Thursday		8.02		8.73		19.28	
Friday		5.68	*	7.38		16.46	*
Saturday		1.47		1.13		2.34	
Sunday		1.53	*	2.23		4.54	†
Monday-To-Friday		42.13		40.06		93.12	
Saturday-And-Sunday		3.35		3.00		6.88	
Monday To Sunday		45.48		43.06			

† significant at 10% level; * significant at the 5% level.

The results in Table 5.7.2.A show that teachers in smaller schools generally expend more hours (45.48) compared to 43.06 hours for teachers in larger schools. Although weekly allocations are larger for smaller schools, Sunday time budgets are on average higher for larger schools than for smaller schools. Teachers in smaller schools allocated 1.53 hours of their time on Sundays while teachers in larger schools allocated 2.23 hours to Sunday activities. To test the null hypothesis that there is no difference between the time budgets of teachers in small or larger schools, t-test results are reported in Table 5.7.2A. The significant p-values for Friday and Sunday time budgets are highlighted (* and †), for the alternative hypothesis that the time budgets are not the same. There is, therefore, statistically valid

evidence that allocations for Fridays and Sundays for teachers in smaller schools are significantly lower than those of teachers in larger schools. Time budgets of teachers in smaller schools are significantly lower than those of teachers in larger schools, for Fridays and Sundays. In the case of time share analysis, allocations for Monday are lower for teachers in smaller schools, compared to the time allocations for teachers in larger schools. Friday time allocations are higher for teachers in smaller schools than they are for teachers in larger schools. Differences in time share allocations for Wednesdays and Sundays are marginally significant at the 5 percent level.

5.7.3 School Location and Teachers' Time Budget and Time Share Allocation

Data on daily allocation of time by teachers in schools in five locations are analysed and reported in Table 5.7.3A. The five locations are urban, rural, city central, other, and the unknown (representing cases where no location information was provided). Data on time allocation across days and locations shows show higher hours for Mondays, and a gradual decline over days Tuesday through Sunday. The Sunday spike in hours expended is not as pronounced as reported earlier in other tables (See Table 5.7.2A). The results are also interesting in that there are no significant differences in the daily allocations for schools in the five locations. The results suggest that there is no significant difference in the time budgets of teachers in schools at five locations. Since the effects of school location on time budgets seems insignificant, it is likely, therefore, that school location may not be a significant predictor of the number of teacher activities, time allocation to activities and general time expenditure patterns of teachers. The results reported in Table 5.7.3A show that the average time allocations based on time budgets overlap considerably. Similarly, the means for time shares do not suggest significant differences in time allocation behaviour across location of school. It is important here to point out that data for school location variable are not of best quality. Of the 78 responses provided, 6 schools are set in urban areas,

19 are in rural areas, 3 in the city central, and 51 in other locations. The literature tends to make a distinction between rural and urban schools (Woofter, 1917; Arubayi, 1985). Clearly, in this case, it is a little bit difficult to place the school in specific locations and conduct statistically valid analysis of the location effects of schools on teacher time allocation behaviour. Therefore, in addition, to the results reported in Table 5.7.3A, ANOVA results of tests of differences in time allocation by teachers in schools across four locations are reported. The results, report therefore, the differences observable from the rural, urban, city and other locations, as collected during the interviews. The ANOVA results, for the time budgets and time shares, are reported in Table 5.7.3C.

Table 5.7.3C school location effects on teachers' time budgets and time shares: ANOVA

	Time Budgets				Time Shares			
	ANOVA		BP/CW test		ANOVA		BP/CW test	
	F ratio	p-value	χ^2	p-value	F ratio	p-value	χ^2	p-value
Period or days of the week								
Monday	0.09	0.963	6.20*	0.013	0.07	0.977	0.66	0.417
Tuesday	0.73	0.540	4.29*	0.038	0.10	0.962	0.00	0.993
Wednesday	0.37	0.773	7.01*	0.008	0.14	0.938	0.94	0.331
Thursday	0.04	0.989	1.21	0.272	0.19	0.901	0.39	0.534
Friday	0.12	0.946	0.70	0.403	0.06	0.980	0.42	0.517
Saturday	0.26	0.852	1.16	0.282	0.32	0.814	1.32	0.251
Sunday	0.13	0.940	0.01	0.927	0.38	0.768	0.02	0.883
Saturday-And-Sunday	0.33	0.803	0.00	0.951	0.60	0.616	0.28	0.595
Monday-To-Friday	0.35	0.791	1.23	0.268	0.60	0.616	0.28	0.595
Monday-to-Sunday	0.28	0.837	1.81	0.179				

Notes: † significant at 10% level; * significant at the 5% level.

The results reported above indicate that the variances of time allocation in various locations are generally homogenous, with the exception of allocations made by teachers on Mondays, Tuesdays and Wednesdays. The highly significant values of the BP/CW test indicate significant heterogeneity in time budgets for Mondays, Tuesdays and Wednesdays. The BP/CW test for location effects using time shares, does not report any considerable heterogeneity in time allocation behaviour. Overall, the results suggest that the pattern of time allocation by teachers, working in schools in various locations, may generally be exhibiting a consistent allocation pattern. So, in this case time budgets and time shares have yielded results that are almost similar, except for the additional qualification provided by the time budget results in which significant differences in location effects are observed for Monday, Tuesday and Wednesday time allocations.

5.8 Correlation Analyses in Teacher's Time Use

5.8.1 Correlating Number of Activities with Time Budgets and Time Shares

Table 5.8.1A reports the correlation between daily time budgets as well as correlations of daily time budgets with the number of activities undertaken by teachers. The null hypothesis is that there is no association between daily time budgets and daily time shares with the number of activities undertaken by teachers. The alternative hypothesis is that daily time budgets and time shares are related to the number of activities undertaken by the teacher. The null hypothesis is tested at the 5 percent level, and significant coefficients are highlighted by an asterisk (*). It is posited that larger time budgets and/or time shares are likely to be required by teachers if the number of activities increases. The null hypothesis is that the number of activities is not related to teachers' time budgets and/or time shares. The results reported in Table 5.8.1A suggest that the number of activities is positively related to time budgets from Mondays through Fridays. These correlation coefficients are significant at the 5 percent level as shown by the asterisk (*).

Table 5.8.1A Number of Activities Undertaken and Teachers' Daily Time Allocation

Period or days of the week	Time Budgets		Time Shares	
	correlation (r)	p-value	Correlation (r)	p-value
Monday	0.4226*	0.0001	0.1540	0.1620
Tuesday	0.4006*	0.0001	-0.0690	0.5329
Wednesday	0.4045*	0.0001	0.0229	0.8363
Thursday	0.2805*	0.0093	-0.0751	0.4972
Friday	0.2379*	0.0284	0.0310	0.7794
Saturday	-0.0244	0.8247	-0.0943	0.3936
Sunday	0.1452	0.1848	0.0096	0.9311
Saturday-Sunday	0.0649	0.5549	-0.0726	0.5115
Monday-Friday	0.4683*	0.0000	0.0726	0.5115
Monday-Sunday	0.4308*	0.0000		

*significant at 5 percent level

It is important to note that all the correlations between the number of activities and time budgets are significant (except for Saturday and Sunday time expenditure). The smallest correlation is 0.2379 (≈ 24 percent) for Friday time expenditure and the highest is approximately 47 percent for the entire week time expenditure (Monday to Friday). The range of correlations (0.2379 to 0.4683) is extremely important because it reflects the counter-proposition that time expenditure and the number of activities are not related in a one-to-one basis. In other words, the number of activities is not a direct proxy for time allocation expenditure. This result has major policy implications – mainly that the factors that determine the number of activities that teachers perform may actually be completely different from those factors that determine the amount of time spent on activities.

Having presented the correlations between actual time budgets for the days of the week, it is important to examine the correlation of allocations based on time shares. This is important in identifying any information gain or loss attributable to the use or choice of technique that is used to describe teachers' activity patterns. Table 5.8.1A also reports the correlation between the number of a teacher's activities and daily time shares. The differences in results reported in Table 5.8.1A are quite strikingly.

The first and foremost significant observation is that none of the time shares for Monday through Sunday are correlated with the number of activities undertaken by teachers. This is really a stark contrast to the results from time budgets where only Saturday, Sunday and weekend time budgets are not correlated with the number of activities undertaken by teachers. Second, the correlations get weaker as the week progresses (see values of R and the corresponding p-values, for Monday to Friday time budgets).

At this point, it is important to recall that the results reported in Table 5.8.1A showed a positive correlation between the number of activities undertaken by teachers and the time budgets for all the days of the week but Saturdays and Sundays. First, in contrast to the results for time budgets, the results for time shares in Table 8.5.1A show that there is no significant correlation between the number of activities undertaken by teachers and their time shares for any of the days of the week. This result highlights the importance of choosing an appropriate indicator of teacher work patterns. In other words, based on the time budgets, time allocated to activities in a day is related to the number of activities performed in a typical week. On the basis of time shares – it is clear that activities performed within a typical week seen unrelated to the relative use of time during that particular week. This suggests that the number of activities performed by teachers is unlikely to be significant determinants of teachers' time shares in linear OLS, MVREG, SUREG and IVREG modelling of teachers'

time-use patterns. More-so, the set of determinants of time budgets may be different from the sets of determinants of time shares of teachers' pattern of time use.

5.8.2 Correlating Daily Time Budgets

The results reported in Section 5.8.1 indicated very strong relationships between the number of activities undertaken by teachers and the time budgets for daily work in schools. Interestingly, the results for correlations of time shares and teacher activity did not yield any significant results. Five things become important here. First, it must be the case then that time shares carry quite a different type of information compared to budget shares. Second, if time budgets are related to the number of activities undertaken by teachers during a typical week, then it follows that the time budgets must be related in one way or another. Third, if the time shares are not related to number of activities, it is possible that time shares are strongly related to each other – in such a manner that reflects what would be expected from tradeoffs that teachers face in time-use. Fourth, and most significant, these results beg the question: *are time budgets related to time shares?* To address these research issues results of correlations between time budgets are presented in this section, Section 5.8.2. In the next section, Section 5.8.3, correlations between time shares are examined and reported. The relationship between time shares and time budgets is deferred to Section 5.8.4.

Table 5.8.2A Correlations of Daily Time Budgets and Correlations of Time Shares

		Correlating daily time shares						
		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Correlating daily time budgets	Correlation coefficient							
Monday	R	1.000	0.3732*	0.3080*	-0.3091*	-0.6221*	-0.5153	0.0315
	p-value		0.0005	0.0044	0.0042	0.0000	0.0000	0.7762
Tuesday	R	0.6800*	1.000	-0.0541	-0.4527*	-0.2532*	-0.5025*	-0.1845†
	p-value	0.0000		0.6250	0.0000	0.0201	0.0000	0.0930
Wednesday	R	0.5712*	0.4553*	1.000	-0.0285	-0.2532*	-0.5025*	-0.1845†
	p-value	0.0000	0.0000		0.7967	0.0201	0.0000	0.0930
Thursday	R	0.3816*	0.3427*	0.5013*	1.000	-0.0507	-0.0192	-0.1718
	p-value	0.0003	0.0013	0.0000		0.6470	0.8621	0.1181
Friday	R	0.2070†	0.1918†	0.2552*	0.5757*	1.000	0.1595	-0.1815
	p-value	0.0573	0.0787	0.0184	0.0000		0.1473	0.0984
Saturday	R	-0.1834†	-0.2129†	0.2087†	0.1964†	0.2614*	1.000	0.0105
	p-value	0.0930	0.0504	0.0553	0.0716	0.0157		0.9246
Sunday	R	0.4008*	0.3329*	0.4237*	0.3393*	0.2219*	0.1096	1.000
	p-value	0.0001	0.0018	0.0001	0.0015	0.0412	0.3180	

Notes: Time Budgets (Lower Triangular) and Time Shares (Upper Triangular)

* significant at 5 percent level, † significant at the 10 percent level

All daily time budgets for the teaching week (Monday to Friday) are positively related except for Mondays/Fridays and Tuesday/Fridays correlations. Relative to the other reported p-values, the p-values for Monday/Friday and Tuesday/Friday correlations are fairly weak at 0.0573 and 0.0787, respectively. This suggests that increases in activity times early in the week have little bearing on time activities at the very end of the end of the teaching week.

The allocations for Saturdays are not related to allocations for any of the days but Fridays. The relationship shows a correlation coefficient of 0.2614 which is significant at the 5 percent level ($p=0.0157$). The results suggest that an increase in time allocation from Fridays

is likely to increase the allocation for Saturday. The allocations for Sundays are all significantly associated with increases in allocations to all the days of the working week. It is important to note that Saturday and Sunday allocations are not related – perhaps reinforcing the earlier view that the teacher's weekend may essentially be only on Saturdays. The hours allocated to Sunday is positively related to the time budgets of all the days of the week except Saturday ($r=0.1096$, $p=0.3180$). The significant correlation between Sunday time budgets and those of days Mondays through Fridays suggests that any increases in time budgets for any of the days of the week will certainly affect the time allocated to Sunday school-work. From a policy perspective, it is of interest to establish whether increases in time use during days of the teaching week are related to changes in Sunday time-use. The results reported so far show positive association suggesting that intensification of work in any working day has significant repercussions for the time allocations in other days of the week, including weekend. What is missing, however, from the results reported in Section 5.8.2 is an explicit view of the tradeoff that teachers face in trying to allocate finite time to activities over a typical week. In order to search for these tradeoff (as reflected by correlation coefficients), correlations of time shares are analysed in Section 5.8.3.

5.8.3 Correlating Daily Time Shares

The results reported in Table 5.8.3A are aimed at shedding light on the relationship between daily time shares. Results show that the Monday share is positively related to Tuesday and Wednesday time shares; and, negatively related to Thursday, Friday and Saturday allocations. The Tuesday daily time share is negatively related to Thursday, Friday and Saturday time shares. The Wednesday time share is negatively related to the Friday time share ($r=-0.6906$, $p=0.0000$).

Table 5.8.3A Correlations of Daily Time Shares (Coefficient of correlation (R) and p-values)

		Day of week					
Day of week		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Tuesday	R	0.3732*	1.0000				
	p-value	0.0005					
Wednesday	R	0.3080*	-0.0541	1.0000			
	p-value	0.0044	0.6250				
Thursday	R	-0.3091*	-0.4527*	-0.0285	1.0000		
	p-value	0.0042	0.0000	0.7967			
Friday	R	-0.6221*	-0.2532*	-0.6906*	-0.0507	1.0000	
	p-value	0.0000	0.0201	0.0000	0.6470		
Saturday	R	-0.5153*	-0.5025*	-0.0509	-0.0192	0.1595	1.0000
	p-value	0.0000	0.0000	0.6459	0.8621	0.1473	
Sunday	R	0.0315	-0.1845	0.0159	-0.1718	-0.1815	0.0105
	p-value	0.7762	0.0930	0.8860	0.1181	0.0984	0.9246

Results shown on Table 5.8.3A indicate a positive correlation between the time share of Mondays and Tuesdays ($r=0.3732$); and between Mondays and Wednesdays ($r=0.308$). The Monday share of total week time is negatively related to the shares for Thursdays through Saturday, as well as the time share of the weekend (Saturday and Sunday - dss_s). In other words if primary teachers increase share of allocation of time on Mondays, then they tend to increase their allocation for Tuesdays and Wednesdays, and reduce the share of Thursdays, Fridays and Saturdays.

The results in Table 5.8.3A are significant in two respects. First, they show the tradeoff in daily time allocations that is expected as teachers allocate time to their various activities. This result is not evident in the analysis that uses daily time budgets presented in Section 5.8.2. In that regard, the use of time shares yields additional information in terms of the inherent tradeoff in teachers' time use, and represents a significant contribution in terms of the

methodology developed in this thesis. Second, although the correlations are significant at the 5 percent level, the values of the correlation coefficients are generally between 30% and 70% - the higher being for Wednesday/Friday correlation ($r=-0.6906$, $p=0.0000$). The significant results obviously show that the daily time shares are related. The absence of a one-to-one relationship also points out to the fact that the daily time shares are not identical. The significant correlations also highlight that these time shares can be used as dependent variables in a system of simultaneous equations. There is no econometric danger – of multicollinearity then when these time shares or time budgets are used in regressions equations. The correlation coefficients of the daily time shares can be used, therefore, to guide the choice of regressors and regressands in the OLS, MVREG, SUREG, IVREG, and EIVREG model specification of teachers' time-use.

In this context, how can one explain the observed association between time shares? First, the positive associations suggest that increases in time shares on any particular day will most likely increase time shares in the corresponding days in the correlation matrix. This, in the view of the current research, shows the extent to which a particular time share may dominate the resource intensity of teacher activities throughout the week. As seen from the results the Monday shares are positively linked with the Tuesday and Wednesday shares. The coefficient of correlation and their corresponding p-values are ($r=0.3732$, $p=0.005$) and ($r=0.3080$, $p=0.0044$), respectively. The correlation coefficients reported in Table 5.8.2 are interesting in many respects. The negative correlation for time shares show that an increase in the time use for one day is likely to have a negative impact on the use of time in another day. For example, it looks like an increase in teachers' time shares on Monday is related to an increase in time shares for Tuesday and Wednesday; and then, a decrease in time shares for Thursday, Friday and Saturday. This suggests that time shares cannot be increased across all days - there

is a limit on the teacher's week time. Therefore, increases in time shares on one day should be met by decreases in time shares elsewhere.

Second; and this is indeed a striking result, in contrast to the results in Table 5.8.1 where Sunday time budgets are positively related to time budgets for Mondays through Fridays, Table 8.5.2A shows that when using time shares the Sunday time share effects are insignificant. On the contrary, Saturday effects seem fairly pronounced; for example, the time share for Saturday is negatively related to the Monday time share ($r=-0.5153$, $p=0.000$). The time share for Saturday also is positively related to the Tuesday time share ($r=0.5025$, $p=0.0001$). In short, the analysis of teachers' time expenditure using time budgets and time shares gives completely different stories of various degrees of complexity. These findings are fascinating in that they point to the strength of the thesis – showcasing a new, unique approach to understanding teacher time use and workloads that inspires a different (unique) type of modelling in order to explain teachers' time use using OLS, MVREG, SUREG and IVREG.

5.8.4 Correlating Time Budgets and Time Shares

Having examined the association between time budgets on their own in Table 5.8.2A, and the association between time-shares on their own in Table 5.8.3A, it is prudent to examine any likely association between time budgets and time shares. The question that is being addressed is whether the patterns of teachers' time-use described using time budgets is any different from the pattern of time-use described using time shares. If time budgets carry the same information as time shares, then the two measurements can be used interchangeably in any advanced modelling of time use patterns by teachers. An investigation of this type of association is motivated by the null hypothesis that time budgets and time shares are equivalent ways of representing (describing) the pattern of teachers' time-use. The alternative hypothesis is that time budgets and time shares are not equivalent as indicators or measures

of teachers' time-use patterns. In other words, a different amount (type) of information is gained by assessing time budgets and time shares independently. The distinction between time shares and time budgets, and the use of any analysis on time expenditure by teachers using these two measures (indicators) is crucial for workload policy planning. The question of the equivalence of time shares and time budgets is, therefore, addressed by examining at the correlations between time budgets and time shares. These correlations are reported in Table 5.8.4A.

Table: 5.8.4A Correlation Coefficients of Daily Time Budgets and Daily Time Shares

	Daily time budgets						
	Mon (dmo)	Tue (dtu)	Wed (dwe)	Thu (dth)	Fri (dfr)	Sat (dsa)	Sun (dsu)
Daily time shares							
Mon (dmo_s)	0.67*	0.31*	0.06	-0.31*	-0.49*	-0.48*	-0.04
Tue (dtu_s)	0.04	0.46*	-0.41*	-0.58*	-0.50*	-0.50*	-0.25*
Wed (dwe_s)	-0.02	-0.19	0.51*	-0.26*	-0.59*	-0.08	-0.10
Thu (dth_s)	-0.17	-0.22*	-0.00	0.71*	0.08	-0.01	-0.11
Fri (dfr_s)	-0.22*	-0.12	-0.23*	0.19†	0.84*	0.15	-0.06
Sat (dsa_s)	-0.32*	-0.37*	0.13	0.11	0.21	0.99*	0.04
Sun (dsu_s)	0.26*	0.16	0.28*	0.11	0.00	0.04	0.94*

*significant at the 5 percent level; Part of this table is also presented in Ngwenya (2009b).

The results reported in Table 5.8.4A show that there is a significant association between Monday time budgets (dmo) and Monday time shares (dmo_s) – ($r=0.6709$, $p=0.0000$). For Tuesdays time allocations (dtu/dtu_s) comparisons, $r=0.4564$ and $p=0.000$. The results on the main diagonal of the correlation matrix displayed in Table 5.8.4 are statistically significant at

the 1 percent level. These results shows the correlation of time shares and time budgets for a particular day of the week (that is, dmo/dmo_s , dtu/dtu_s , ... , up to dsu/dsu_s). The correlations for Saturdays time budgets and shares are quite high ($r=0.9858$, $p=0.0000$) and the correlations for Sunday are also high ($r=0.9378$, $p=0.0000$). The high significant correlations coefficients for dsa/dsa_s and dsu/dsu_s suggest that weekend time budgets and time shares can be used interchangeably in a regression equation system such as OLS, MVREG, SUREG and IVREG.

The correlations displayed in the off-diagonal elements of the correlation matrix shown in Table 5.8.4A are consistent with theory (*a priori* expectations). Take the case of Tuesday time share for example. This time share is not related to the Monday time budget (dmo) but is related to the other time budgets (Tuesday (dtu) through Sunday (dsu)). The Tuesday time share is positively related to the Tuesday time budget as expected – but what is striking indeed is that any decrease in the time budgets of all the other days of the week (but Tuesday) will increase the time share of Tuesday. That is, if a teacher allocates less time to the other days of the week (except Tuesday), then the proportion of Tuesday time expenditure will obviously increase. So why is this obvious result worth reiterating over and over again? Well, these correlations shown as off diagonal elements of the matrix (Table 5.8.4A) carry different types of information (messages). For example, an increase in Monday and Tuesday time budgets is negatively related to Saturday time shares. Interestingly, increased workloads (time budgets for Monday (dmo) and Wednesday (dwe) tend to be positively related to the Sunday time share (dsu_s). Perhaps this result could be interpreted as suggesting that when teachers experience heavy workloads through Monday, Tuesday and Wednesday, they then tend to reduce their time share for Saturdays, and then increase their workloads substantially on Sundays. Saturdays then becomes the only resting day of the week. This speculation is

consistent with earlier observations reported in Table 5.8.2A and evidence of spikes in Sunday teachers' time use (Section 5.3).

It can be argued that using actual time (time budget) does not yield results that are any different from those obtained using time shares. The results reported in Table 5.8.7A show that the correlation between time budgets and shares for Monday (dmo/dmo_s: $r=0.6709$); Tuesdays (dtu/dtu_s: $r=0.4564$), Wednesdays (dwe/dwe_s: $r=0.5038$), Thursdays (dth/dth_s: $r=0.7097$), Fridays (dfr/dfr_s: $r=0.8408$), Saturdays (dsa/dsa_s: $r=0.9858$), and Sundays (dsu/dsu_s: $r=0.9378$). All shares are positively related to actual values. The range of coefficient is nonetheless large (with smallest being between Tuesdays (0.4564) and the largest being for Saturdays (0.9858)). The results show that these eight (8) correlations are significantly different from zero.

In general, the results displayed in Table 5.8.4A suggest that although time budgets and time shares seem to carry different types of information, using time budgets and time shares in the same equation specifications may introduce significant econometric problems such as multicollinearity. A great benefit will accrue if time shares are used in their own system, and the results – thereof, compared with those obtained from using time shares in a similar system of equations. As will be reported later in Section 5.10, the OLS, MVREG and SUREG and IVREG specification using the time budgets and time share equations in two systems, and the results of these model specifications are compared. The results, thereof, are used to further reinforce the fact that the use of time budget in this thesis is novel. The use of time shares also is unique; and, enhances the use of time budgets to describe or characterise teachers' time-use. An even more significant embellishment of this novel approach of using time shares is the use of a suite of competing models (OLS, MVREG, SUREG and IVREG) to examine the key determinants of teachers' daily time-use.

5.8.5 Correlating Time Budgets and Selected Activity Variables

Now that the nature of the relationship between time shares and time budgets has been established, it is then prudent to find out other school and teacher characteristics that are also related to time shares. This is also important in guiding the choice of explanatory variables in subsequent modelling involving systems of linear regression equations. It is worth noting that in order to obtain additional depth to any time-use explanations, from the data and support the concepts captured by the data, several dummy variables were created using the original data. The creating of several dummy variables (binary variables) creates a problem when it comes to the reliability of the traditional Pearsons' coefficient of correlation. To overcome that limitation, tetrachronic correlations are used instead; these were implemented in Stata 9 and solve the problem of having a large proportion of limited dependent variables in a correlation matrix (StatCorp, 2005). For ease of exposition, and better tractability of significance of relationships, only the correlations that are significant at the 5 percent level are reported. Table 5.8.5A reports only those tetrachronic correlations that are significant at the 5 percent level or lower. It is worth reiterating that the tetrachronic correlations are used here, in place of normal Pearson correlations because of the presence of a significant number of dummy variables. The interpretation of the tetrachronic correlation coefficients is still the same as that of the Pearson correlation coefficients.

Table 5.8.5A Correlations of Daily Time Shares and Selected Activity Variables

	Daily time shares							
Selected variables	dmo_s	dtu_s	dwe_s	dth_s	Dfr_s	dsa_s	dsu_s	dss_s
dss_s	-0.4085	-0.5176				0.8324	0.5629	1
num_mts							0.2394	
hr_week		-0.3713	-0.2333		0.2304			
tweek		-0.4729	-0.2368		0.2223		0.3489	0.3465
num_sug							0.2458	
num_dm							0.2337	
log_ttt		-0.5023					0.3013	0.3192
overload		-0.4729	-0.2368		0.2223		0.3489	0.3465
d_oload	-0.3402	-0.6157	-0.4502		0.5243	0.3528		0.3542
active09						-0.2213		
active11							-0.2431	
active13		-0.2235				0.276		
ln_t07s							-0.2816	
ln_t09s					0.2749			

Increasing time spent in Tuesday is negatively related to decreasing time on participation in extra school expectations (active13). An increase in Saturday times (dsa_s) is likely to be related to an increase in overload dummy variable (d_oload), and increase in participation in extra school activities (active13); and, a decreases in participation in student supervision (active09). The correlation coefficients are 0.3528, 0.2760 and -0.2213, respectively. These three correlations suggest the following: Teachers who are overloaded (d_oload=1) are more likely to increase their share of their Saturday times compared to their counterparts (teachers who are not overloaded (d_oload=0)). Similarly teachers who increase their participation in extra school activities (active13=1) are more likely to increase their Saturday time shares. On the other hand, teachers who devote a significant amount of time to student supervision (active09=1) are more likely to reduce their Saturday time shares.

Time allocated to Sundays (dsu_s) is positively related to num_mts, num_sug, num_dm, and overload, and negatively related to active11 (attending meetings). Similarly, (dss_s) is

positively related to (overload) and (d_oload). The tetrachronic correlation coefficients are 0.3465 and 0.3542, respectively. An increase in the Saturday time share is more likely to be related to a decrease in the Monday time share ($r=-0.5153$) and a decrease in the Tuesday time share ($r=-0.5025$). It may be teachers who allocate a larger share of their time to Mondays and Tuesdays are more likely to reduce their Saturday time shares. Alternatively, it could also be the case that to reduce the amount of time spent on school activities on Mondays and Tuesdays, teachers have to allocate a significant proportion of their time to weekend. Indeed the correlation coefficients of the relationship between weekend time shares (dss_s) and Mondays (dmo_s) and Tuesday time shares (dtu_s) are ($r=-0.4085$) and ($r=-0.5176$), respectively. Similarly, significant negative correlation between teacher overload status (d_oload) and time shares of Monday (dmo_s), Tuesdays (dtu_s) and Wednesdays (dwe_s), as shown by the coefficients -0.3402, -0.6157 and -0.4505, respectively. The largest negative correlation, between overload status (d_oload) and daily time shares, is reported for Tuesdays (see, $r=-0.6157$).

The last column of Table 5.8.5A shows the level of correlation between the weekend time shares (dss_s) and the variables such as Monday time shares (dmo_s), Tuesday time shares (dtu_s), time shares for the teaching week – Monday to Friday ((Tweek), and the number of hours a teacher is overloaded (overload), and the teacher's overload status dummy (d_oload). The results displayed on the last column tell an interesting story about teachers' use of the typical weekend. First, it is clear that an increase in the time shares on Monday and Tuesday is related to the decrease in the share of time allocated to weekend work. The correlations between dss_s and dmo_s ($r=-0.4085$); and, that between dss_s and dtu_s ($r=-0.5176$) are statistically significant at the 5 percent level. The results imply that heavy teaching loads during the week are associated with a reduction in time spent on school activities during the weekend. If it is assumed that the reduction of time expenditure on school is a proxy of the

rest or leisure time – then by implication heavier work hours during the week are associated with generally larger resting periods during the weekend. Similarly, the extent to which a teacher is overloaded tends to increase the time share of weekends. The correlation coefficient for the association of *dss_s* and *overload*, and the association of *dss_s* and the *overload* dummy (*d_oload*) are $r=0.3465$ and $r=0.3542$, respectively. Both coefficients of correlation are significant at the 5 percent level.

What really happens on Sundays? The time share of Sundays is positively correlated to the number of meetings attended by a teacher (*num_mts*), time spent during the week (*tweek*), the number of suggestions made by the teacher (*num_sug*), the level of participation in decision making (*num-dm*), and the extent to which the teacher is overloaded (*overload*). Simply put, an increase in the extent of overload, increased participation in decision making, the tendency to make suggestion for school improvement, and participation in meetings are likely to be related to an increase in the share of Sunday time share. Later, in this Chapter, OLS, MVREG, SUR and IVREG, the direction of the extent to which some of these factors affect the Sunday time share will be investigated and interpreted. The Sunday time share is negatively related to participation in meetings (activity #11, *active 11*) and time spent on informal communication with parents and students (activity #7, or *ln_t07s*).

5.8.6 Correlation Time Shares and Selected Perception and School Variables

Table 5.8.6A shows additional correlation coefficient of time shares and selected perception and school variables. It is important to emphasise that only those coefficients statistically significant at the 5 per cent level are reported. The striking results shown in Table 5.8.6A include the negative correlation between Monday time shares and hindrance factor (*hf8-computers*, IT support and computer problems). A higher level of the incidence of this hindering factor (*hf8-computer* and IT support) is likely to be associated with a reduction in

the time share for Mondays. Of the list of variables presented in Table 5.8.6A, hf8 is the only variable related to the Monday time share. The hindrance factors are of consistent sign in terms of how they relate to the time shares. For example, for the time shares for Mondays (hf8, $r=0.2482$), Tuesdays (hf10 - non-core requirements - *administrivia* $r=-0.2181$) and Thursdays (hinfac, $r=-0.2942$).

Assistance factors tend to be related to a decrease in the Wednesday and Thursday time shares as seen from the correlation coefficients -0.2373 and -0.2356 , respectively. This result is expected from theory and education policy applications. However, assistance factors are not as consistent in the direction of association, compared to hindrance factors. For example, assistance factor (af8 – professional development) tends to be associated with an increase in the Tuesday time share ($r=0.2389$). For some reason, the assistance factor (af8) is related to increases in time allocation for Tuesdays. The Tuesday time share is the only one of the week time shares that is related negatively to an assistance factors. This might point out to the unique nature of Tuesday workloads among primary school teachers. This incidence of spikes was identified and presented in earlier tables (Table 5.3.3A). The spikes in heavier workload activity were observed for Tuesday spikes as well as Sunday. Note, surprisingly, it also appears that one of the assistance factors (af5 - “students assist my work”) is positively associated with increases in Sunday time shares (see $r=0.2786$).

Table 5.8.6A: Correlations of Time Shares and Selected School and Activity Variables

	Daily time shares and weekend time shares							
Factors	dmo_s	dtu_s	dwe_s	dth_s	dfr_s	dsa_s	dsu_s	dss_s
Gen						-0.2819		
Empst		0.2337	0.2455		-0.2903			
Fte		-0.4144	-0.2463	0.2333	0.3042			
Ooa							0.2924	0.23
c17			-0.2302					
c18			-0.2181		0.2378			
Stscl			0.2607					
mt3		-0.2182						
mt10						-0.235		
mt11							0.3471	
mt9						0.2688		
cf7		-0.22						
cf8							0.2414	
af5							0.2786	
af8		0.2359	-0.2373	-0.2356				
Hinfac				-0.2942				
hf8	-0.2482							
hf10		-0.2181						
dm3							0.3199	
sgmp1							0.2364	0.2182
sgmp5							0.2853	
sgmp7							0.2175	
sgmp9			-0.2258					
sgmp10		-0.2895						
Dwtot		-0.4729	-0.2368		0.2223		0.3489	0.3465
tt4							0.2257	
tt11		-0.292				0.4096		0.2597
tt9					0.2444			
tt13		-0.2256				0.2175	0.2284	0.3063
Ttt		-0.4729	-0.2368		0.2223		0.3489	0.3465
__brk								
Wehrs	-0.3893	-0.5246				0.7739	0.5702	0.9557
out_area							-0.2924	-0.23
hinfac1				0.2817				
t01share					-0.2242			
t09share			-0.291	-0.2295	0.3675			
t11share		-0.2294				0.3913	-0.2252	
t13share		-0.2686				0.2607	0.2186	0.3367

Teachers who view ‘students as assisting their work’ seem to have larger Sunday time shares – the tendency to work on unsociable hours in order to accomplish school-related tasks or meet any well-intentioned school activities after school – during private time is quite pronounced. It is also noteworthy that the share of weekend hours (dss_s) is positively correlated to teaching out of area of expertise (ooa) and suggestions for time for official expectation in order to improve worklives (sgmp1); whereas, the share of Sunday (dsu_s) is positively related to teaching out of area of expertise (ooa), performing operational planning as main task (mt11), time teaching and on duty as change factor (cf8), how students are an assisting factors in teacher’s work (af5), satisfaction with role (dm3), allocating time for official expectations (sgmp1), perceived changes in class sizes (sgmp5), and the balancing of time and needs (sgmp7).

The share of Tuesday time allocation (dtu_s) is positively related to employment status (empst), professional development as assisting teacher work (af8), and negatively related to committee work being main task (mt3), professional learning as a change factor (cf7), non-core *administrivia* as hindering factor (hf10) and appropriateness of curriculum (sgmp10). The Wednesday time share is particularly interesting because, of all the time shares, the Wednesday time share (dwe_s) has a very large proportion of negative coefficients of correlation. For example, increases in Grade 2 involvement (c18), professional development as assistance factor (af8), and better support by the Department of Education (Tasmania) (sgmp9) are likely to be associated with a decrease in Wednesday time shares (dwe_s). Some of these associations can be explained easily using the previous theoretical proposition, for example, an increase in the incidence of assistance factors such as professional development (af8) is likely to reduce the amount of the share of the time allocation to any particular day. Simply put – an assistance factor should do just that – assisting by lowering the time burden.

What is also pertinent for education policy is that these correlations do not suggest that all assistance and hindrance factors have an impact on time shares.

What other results on school variables reported on Table 5.8.6A are of policy interest? The variable that is also of significant interest in terms of analysing teachers' work patterns is the variable ooa - teaching out of area of expertise. This variable is not significantly related to the time shares for Mondays through Fridays. However, it is clear from the correlation coefficient ($r=0.2924$) that teaching out of area of expertise is associated with a larger share of time expenditure on Sundays (see $r=0.2924$ for dsu_s). Although the correlation between teaching out of areas of expertise (ooa) and Saturday time shares is insignificant, the result for the correlation of weekend time shares (dss_s) and teaching out of area of expertise (ooa) is significant at the 5 percent level ($r=0.23$). However, this result is certainly lower than $r=0.2924$ which was reported for Sunday time shares. This difference in the value of the correlation coefficients may suggest therefore some support for the notion that teachers may indeed use Saturday as their resting day – the only weekend day they have for rest. Also of interest is the association between Sunday time shares (dsu_s) and main task Operational planning - (mt11)), change factors - time teaching or on duty (cf8), assistance factor-professional development (af8), decision making involvement and (satisfied with role - dm3), and the likelihood of making the following suggestions (time for official expectations - sgmp1, class size and teaching - sgmp5, balance between times and needs - sgmp7; and, better Department of Education support (Tasmania) - sgmp9).

The correlation coefficients, although significantly difference from zero, are not perfect correlations ($r = \pm 1$). The larger correlation coefficients are that closer to $r = \pm 1$ are those for Saturday and Sunday time budgets/shares. This suggests that Saturday and Sunday time budgets and time shares can be used interchangeably in any model using dsa, dsa_s, dsu, dsu_s as exogenous (explanatory/independent) or endogenous (explained/dependent)

variables. Care must be exercised though – *dsa* and *dsa_s* cannot be included as independent variables in the same equation specification, for example in simple OLS, because of the high likelihood of a severe form of multicollinearity occurring. The lower values for the correlation coefficients between Tuesday time shares (*dtu_s*) and Tuesday time budgets (*dtu*) suggest that the time shares analysis for Tuesday may carry information that is significantly different from that carried by the Tuesday time budget. In other words, analysts are reminded that different results could be obtained when using Tuesday time shares or time budgets. The uniqueness of Tuesday times will be highlighted in results showing the relationship between Tuesday time shares and teachers' assistance factors at school.

The results also show that the increase in time shares of meetings and extra school expectations are related to decreasing time shares of Tuesday time allocations (*dtu_s*). For Saturdays, participation in meetings (*active11*) and time spent on extra school expectations (*active13*) is related to increases in Saturday time shares, whereas for Sunday – participation in activity meetings (*active11*) reduces the Sunday time share, and participation in extra school expectations (*active13*) increases Sunday time shares.

5.9 Determinants of Number of Activities Undertaken by Teachers

The results reported in Table 5.9.1A show some of the factors that affect the number of activities undertaken by teachers during a typical week. Several iterations of linear forms of the regression equation relating the relating the number of activities reported by a teacher and selected demographic and school factors were examined. The linear regression results reported in Table 5.9.1A are only those of the model that yielded the best results, in terms of consistency of the signs of coefficients; significance of coefficients (*t*-ratios and *p*-values), and econometric diagnostics: level of explanatory power of the model (*R*-squared and adjusted *R*-squared) and overall significance of the model (*F*-value and *p*-value), when

relating the number of activities undertaken by teachers to selected demographic and school factors; and, within the constraint of sample size. The results are presented as follows. First, factors that tend to increase the number of activities significantly are identified, and their coefficients of the factors interpreted in the context of prior expectations. Second, factors that tend to decrease the number of activities significantly are identified, and the reported coefficients of these factors are also interpreted in the context of prior expectations. Third, Table 5.9.1A reports the general diagnostics of the regression model used. These diagnostics are restricted to the F-ratio, R-squared values and the standard error of the regression model. Finally, attention is also drawn to those regression coefficients that although insignificant, still have appropriate sign (as expected prior the analysis), and also improved the adjusted R-squared value. Of the variables used to explain the number of activities performed by teachers, the following explanatory variables (factors) tend to increase the number of activities performed by the teachers:

- (i) employment status (fulltime),
- (ii) experience in current school (xcrtsc),
- (iii) teaching Grade3 only dummy (c19),
- (iv) students in class (stsc1),
- (v) total hours worked on a typical Tuesday (dtu),
- (vi) aspects of school that hinder work (hinfac),
- (vii) satisfied with involvement in decision making (dminv),
- (viii) typical weekly time spent on meetings (tt11),
- (ix) typical weekly time spent professionally with colleagues (tt5); and,

(x) typical weekly time spent on student supervision (tt9).

Table 5.9.1 Factors Affecting the Number of Activities Performed By Teachers

Definition of Variable	Variable	β	t-ratio		p-value
Weekly uninterrupted break time	mybreak	-0.0099	-0.05		0.958
Hours per week	hr_week	-0.0672	-2.41	**	0.024
Location of school	locatn1	-0.8350	-1.40		0.176
Age of teacher	age3	0.6924	1.52		0.142
Employment status	fulltime	1.6040	3.33	***	0.003
Teaching experience	exastr	-0.2993	-1.55		0.135
Number of schools taught at	noschs	0.1644	0.57		0.572
Experience in current school	xcartsc	0.2852	2.26	**	0.034
Number of students at school	nsts	0.0396	0.33		0.747
Promotion and position	promps	-0.8364	-0.50		0.622
Position held	poshld	-0.4595	-0.34		0.734
Primary school only	P	-0.6553	-1.75	*†	0.093
Grade 3 dummy	c19	1.1790	2.71	**	0.013
Grade 4 dummy	c20	-1.7816	-3.86	***	0.001
Class arrangement	clargt	0.1077	0.18		0.855
Students in class	stsc1	0.4096	1.90	*†	0.071
Total hours worked on Tuesdays	dtu	0.1782	1.98	*†	0.060
Aspects of schools assist work	assfac	0.4172	1.57		0.130
Number of factors that assist work	tot_af	0.1220	0.64		0.528
Aspects of school hinder work	hinfac	0.4851	2.36	**	0.027
Number of factors that hinder work	tot_hf	0.2718	1.47		0.156
Satisfied with decision making involvement	dminv	0.6019	2.66	**	0.014
Suggestions for improving work lives	tot_sg	0.2222	1.59		0.126
Number of satisfied decision making	tot_dm	-0.1153	-0.47		0.644
Weekly time spent on meetings	tt11	0.2594	3.55	***	0.002
Weekly time spent with colleagues	tt5	0.3041	3.99	***	0.001
Weekly time spent on student supervision	tt9	0.2630	3.24	***	0.004
	constant	4.4124	0.80		0.434
DIAGNOSTICS					
Number of observations	Sample	51			
F-ratio	F(27,23)	4.6900			
P-value for F-ratio	Prob > F	0.0002			
Coefficient of Determination	R-squared	0.8463			
Adjusted Coefficient of Determination	Adj R-squared	0.6659			
Standard Error of Regression Model	Root MSE	0.8080			

*significant at the 10%; **significant at the 5%; ***significant at the 1%; † improve diagnostics, greatly. Part of this table and text has been published in Ngwenya (2009a).

The explanatory variables (factors) that tend to have the likely significant effect of decreasing the number of activities performed by teachers are: (i) hours expended over a typical week (hr-week), (ii) primary school teaching only (P); and, (iii) teaching Grade 4 only dummy (c20). The results suggest that fulltime teachers are more likely to have a larger number of activities than their counterparts. Similarly, teachers who have been teaching in the current school for longer time periods, also tend to have a larger number of activities to perform. An increase in the number of factors perceived to hinder work tends to increase the number of activities undertaken by the teacher. The number of activities performed by the teacher is significantly increased by activities such as involvement in decision making, meetings, spending time with colleagues and student supervisions. These activities are viewed generally as events that have re-shaped the modern teacher's workload. It is important to note that the coefficients of the factors affecting the number of teacher's activities are of different magnitude and/or impact. The responsiveness of the number of activities to changes in key variables such as student supervision, spending time with colleagues and involvement in decision making are crucial for education policy or general policies relating to teacher workloads.

From a policy perspective these negative coefficients suggest, for example, that increasing the weekly school time (hr_week or equivalent) will most likely diminish the weekly workload in terms of activities. The coefficient of hr_week is -0.0672 suggesting that a unit increase in hr_week will decrease the number of activities by 0.0672 units. Therefore a 10 unit increase in hr_week should lead to 0.672 units decrease in number of activities. To put this in perspective, one can calculate the increase in hr_week required to induce a unit decrease in activities. From these results, increasing the hours expended per week by 1.67 is likely to reduce the number of a teacher's activities by one. The results also show that (i) teachers who have the responsibility of teaching Grade 3 are likely to have a higher number

of activities than their counterparts; and, (ii) teachers who have the responsibility of teaching Grade 4 are likely to have a lower number of activities than their counterparts.

Three of the independent variables reported in Table 5.9.1A are not significant at the traditional 5 percent level. They are nonetheless significant at the much weaker 10 percent level. These independent variables are the number of students in a class (stscl), the total hours worked on Tuesdays (dtu), and primary school teaching only (P). These independent variables, although not significant at the 5 percent level, do maintain their sign consistently (with theory in several OLS iterations of the model for determinants of number of activities). The variables stscl, dtu and P improve the model diagnostics considerably. In short, these three variables enhance the explanatory power of the model and support theoretical expositions about the impact of class size (stscl), day of the week effects (dtu) and job differentiation (P). The contribution of these three variables to the diagnostics may be an indication of the variation in the effects of these variables over a typical week. In other words, other regression models using daily budget and time shares (for example, Tables 5.10.1A and 5.10.2A) may show the importance of these variables for selected days of the week.

5.10 Determinants of Teachers' Time Allocation

In the previous section the key determinants of the number of activities undertaken by teachers were examined and 13 factors we found to be statistically significant. The investigation of the factors that significantly affect the number of activities performed by a teacher was on the premise that the number of activities embodies the volume of work done by teachers, and hence should reflect (represent) a time requirement. In that regards, the number of activities performed by the teacher should also reflect the teacher's time expenditure. If true, then there should be a significant positive correlation between the

number of activities performed by the teacher and the time expended on a typical day or typical week. This proposition can be examined by simply computing the correlation coefficients of the relationship between the number of activities and the respective time expenditures.

As noted earlier in Section 5.8.2, the number of activities is not a direct proxy for time allocation expenditure. This result has major policy implications – mainly that the factors that determine the number of activities that teachers perform, may actually be completely different to those factors that determine the amount of time spent on activities. To confirm or support this assertion, regressions of time expenditure and time shares as functions of the same factors (variables) are used to explain the number of activities undertaken by teachers, are performed. That is, the model inferred in Table 5.9.1A is reproduced, this time using actual daily time budgets and time shares as the dependent variable. These results are shown in Tables 5.10.1A and 5.10.2A, respectively.

5.10.1 OLS Results of Factors Affecting Daily Time Budgets

Results reported in Table 5.10.1A show the OLS determinants of time budgets for each day of the teaching week (Monday to Friday) as well as time expenditure over the weekend. The OLS results, for each time budget equation, presented in Table 5.10.1A are unrelated. In other words, the Monday time budget equation is estimated independent of the direct effects of time budgets for any other day of the week (that is, Tuesdays, Wednesdays, Thursdays or Fridays). The only inclusion made is of the Tuesday time budget in all but one of the time budget equations (see blank for the Tuesday time budget equation in Table 5.10.1A).

The general picture portrayed in Table 5.10.1A is that: few explanatory variables significantly influence time budgets. More-so, of the explanatory variables that influence some time budgets, the explanatory variables do not influence the various time budgets in the same way. The coefficients of each of the explanatory variables are different across budget

equations. For example, the explanatory variable - number of a teacher's activities (n_active) - only influences the time budgets for Friday and the whole week, significantly. The age of the teacher ($age3$) is only significant as an explanatory variable in the Tuesday budget equation. The full-time employment status of a teacher is a significant determinant only for the Monday, Thursday, Friday and whole week time budgets. Teaching Grade 4 ($c20$) is a significant determinant of time budgets only for Wednesdays and the whole week.

The number of students in the classroom ($stscl$) is a significant determinant of Wednesday ($stscl$: $\beta=1.29$, $t=2.84$, $p<0.01$) and whole week ($stscl$: $\beta=3.28$, $t=2.35$, $p<0.05$). In other words, an increase in class size tends to generally increase the time expended by teachers during a typical week. However, the effects of class size are only pronounced for Wednesday time allocations. Although the results for the entire week show the effect of increased class size on a teacher's time allocation and work patterns, it is clear that class size does not impact other time budgets to the same extent as class size affects Wednesday and whole week time allocations. This result is very important; first, the result supports the general theoretical position that larger class sizes tend to mean more work for teachers. Managing these large class sizes can be quite challenging and stressful. Second, the results also show that when it comes to the effect of class size, some teaching days are impacted differently to other teaching days. One possible explanation for the inconsistency of the impact of class size on daily time allocations may be that there are other compounding factors that should be accounted for using techniques that are more robust than the simple OLS presented in Table 5.10.1A. It is important to recall that the interdependencies between time budgets have not been accounted for. In particular, it is noteworthy that Tuesday time allocations are unique in terms of the spike of activities as well as the likely effect on time budgets of other teaching days.

Table 5.10.1A β coefficients of OLS Determinants of Teachers' Daily Time Budgets for Each Day of the Week and The Whole Week

	Period and days of the week							
Factors	MON	TUE	WED	THUR	FRI	SAT	SUN	WEEK
n_active	-0.26	0.39	-0.39	-1.28†	-1.34*	-0.48	-0.40	-3.27*
Mybreak	0.42	0.53	0.69	-0.25	-0.64	0.31	-0.71	0.23
locatn1(urban)	-0.13	0.39	-1.54	-1.31	-0.54	-1.03	-2.19†	-3.51
age3	2.53*	-2.41*	0.02	0.38	-0.43	-0.89	1.59†	2.50
Fulltime	2.58*	0.68	1.50†	3.98*	5.69*	-1.14	-0.15†	13.76*
Exastr	-0.71	0.75	-0.21	0.60	0.32	0.57	-0.04	0.00
Noschs	0.82	-0.65	-0.07	-1.43	-0.26	-1.13	-0.43	-0.94
Xcrtsc	0.17	-0.48	0.10	0.37	0.62	-0.16	0.39	1.26
Nsts	0.01	-0.21	-0.50†	0.02	-0.42	0.03	-0.03	-0.89
Promps	-8.08†	6.06	-1.98	-7.04	-0.77	4.56	-3.73	-17.87
Poshld	-4.68	4.80	-0.86	-5.49	0.65	4.64	-2.25	-10.37
P	-1.40	1.10	0.49	0.79	0.28	0.76	-0.14	0.17
c19	1.39	0.55	0.10	1.29	0.95	-0.57	-0.28	3.73
c20	-2.51	0.13	-2.94*	-1.78	-0.32	-0.03	-0.47	-7.56*
Clargt	-1.18	-0.31	-1.44	0.13	-0.18	-0.66	-0.48	-2.66
Stscl	1.04†	-0.76	1.29*	1.05	-0.11	-0.38	0.24	3.28*
Dtu	0.89*		0.05	0.14	-0.33	-0.57*	0.28†	1.74*
Assfac	0.39	0.22	-0.15	0.29	0.70	0.09	0.93†	1.22
tot_af	-0.12	0.63	0.11	-0.41	-0.30	0.31	0.33	-0.72
Hinfac	0.54	0.51	0.38	-0.09	0.85	-0.63	0.00	1.67
tot_hf	-0.09	-0.08	0.15	0.79	0.60	-0.43	-0.04	1.45
Dminv	0.07	-0.01	1.19*	0.73	0.43	-0.53	-0.13	2.41
tot_sg	0.56	0.15	0.51†	0.36	0.19	0.05	0.23	1.61†
tot_dm	-0.17	0.54	-0.38	-0.09	-0.36	0.14	0.11	-1.01
tt11	-0.15	-0.15	0.32†	0.66*	0.50*	0.61*	0.03	1.33*
tt5	-0.04	0.00	0.26	0.38	0.41	0.48*	0.06	1.02
tt9	-0.13	-0.11	0.17	0.29	0.43	0.07	0.11	0.77
tot_mts	0.17	0.04	0.55†	0.18	0.15	0.27	0.05	1.04
_cons	19.27	-12.81	8.86	27.66	12.81	0.73†	12.85	68.60†
F-ratio	1.80	1.24	1.60	1.45	2.65	1.85	1.38	4.09
p-value	0.08	0.30	0.13	0.19	0.01	0.07	0.22	0.00
R-squared (R ²)	0.70	0.59	0.67	0.65	0.77	0.70	0.64	0.84
Adj-R ²	0.31	0.12	0.25	0.20	0.48	0.32	0.17	0.63
Root MSE	2.36	2.09	1.75	2.69	2.31	2.02	1.47	5.38

*significant at the 5%; and, † significant at the 10%.

Tuesday time expenditure significantly affects Monday time budgets and Saturday time budgets. The respective parameters for the Monday time budgets (dtu: $\beta=0.89$, $t=3.77$, $p<0.01$) and Saturday time budgets (dtu: $\beta=-0.57$, $t=-2.83$, $p<0.01$). An increase in the Tuesday time budget tends to increase the Monday time budget, and decreased the Saturday time budget. Therefore, it is expected that teachers who spent a larger proportion of their time on Tuesdays are likely to allocate less time to school activities over the weekend. The size of time allocation required on Tuesday may also have the effect on increasing the teacher's time allocation on Mondays. This result and interpretation is consistent with the results observed earlier (See Table 5.3.1) that suggest that Mondays and Tuesdays tend to be the heaviest days in terms of teachers workloads.

Participation in decision making in schools (dminv) only increases the time budgets for Wednesday significantly (dminv: $\beta=1.19$, $t=2.20$, $p=0.04$). Teachers' attendance in staff meetings (tt11) increases Thursday's time budgets (tt11: $\beta=0.66$, $t=2.29$, $p<0.05$), Friday time budgets (tt11: $\beta=0.50$, $t=2.03$, $p=0.05$) and Saturday time budgets (tt11: $\beta=0.61$, $t=2.83$, $p<0.01$). The results also show that during the working week (whole week) attendance in staff meetings generally increases the time share for the week (tt11: $\beta=1.33$, $t=2.31$, $p<0.05$). The diagnostics are not exceptionally good. Only the Friday and whole week time budgets return a significant F value, and large adjusted R-squared values. It is worth re-iterating that the results reported in Table 5.10.1A are those of OLS estimation of time budgets for daily teacher activities – without cognizance being given to the interrelatedness of teaching days and weekends.

5.10.2 OLS Results of Factors Affecting Daily Time Shares

A simple way of introducing the interrelatedness in how time is allocated across teaching days is to look at the time shares which are the allocation of time to each day as a proportion of the total time expended over a typical week. The results reported in Table 5.10.2A are

based on the daily time shares being the regressands (dependent variables). The regressors (independent variables) are the same set of variables as used earlier in Table 5.10.1A. The results suggest that full-time employment status affects Thursday, Friday and weekend time shares. The relationship is positive for the weekends (Thursdays and Fridays) and negative for the weekend days (Saturdays and Sundays). Similarly, a larger class size tends to decrease time shares for Tuesday (stscl: $\beta=3.91$, $p<0.01$), and Fridays (stscl: $\beta=-4.12$, $p<0.05$), and increase the time shares for Wednesdays (stscl: $\beta=2.87$, $p<0.01$).

The share of time allocation to teachers' work on Tuesdays tends to increase the Monday time shares (dtu: $\beta=2.02$, $p<0.01$), but decrease the time shares for Friday (dtu: $\beta=-2.00$, $p<0.01$), Saturday (dtu: $\beta=-1.51$, $p<0.01$) and the weekend – Saturday and Sunday (dtu: $\beta=-1.04$, $p<0.01$). In terms of teacher involvement in school activities, attendance in staff meetings (tt11) is related to a decline in Tuesday time shares (tt11: $\beta=-1.38$, $p=0.04$), an increase in Saturday time shares (tt11: $\beta=1.25$, $p=0.01$) and an increase in weekend time shares ($\beta=1.04$, $p=0.04$). The only other activity that has an effect on the time shares is professional discussion with colleagues (tt5). Teachers undertaking professional development with colleagues are likely to have an increased time share for Saturdays. This is evident from the coefficients of parameters (tt5: $\beta=0.96$, $p<0.05$).

A few striking features of the results reported in Table 5.10.2A are worth flagging: notably, teachers' uninterrupted break time (mybreak), school location (urban: location1=1), attending staff meetings (tt1) and teachers' age (age3: 41-50years). First, an increase in uninterrupted break time (mybreak) tends to lead to a decrease in Sunday time allocations (mybreak: $\beta = -1.49$, $p < 0.05$). This result suggests that teachers who enjoy longer breaks during the week (mybreak) are likely to experience a reduction in their Sunday time shares. The parameters (mybreak: $\beta=-1.49$, $p=0.03$) suggest that increasing break time by one unit of time will reduce the Sunday time share by 1.49 units. Therefore, a unit increase in break time during the week

reduces Sunday time share by more than one unit. This significant result suggests that teachers that enjoy reasonable break times at schools are less likely to work long hours during the weekend (and possibly after school hours in general). This impact of teachers' uninterrupted break time is of policy significance – increasing the incidence and length of breaks may lead to reduced workloads, and also alter the complexion of the school work and weekend work for teachers. Second, teachers in schools located in urban areas ($\text{location1}=1$) are more likely to allocate significantly less time to Sunday work than teachers who do teach in rural schools. Third, attending staff meetings (tt11) is negatively related to time allocations for Mondays ($\text{tt1: } \beta = -1.42, p < 0.05$), and Tuesday ($\text{tt11: } \beta = -1.38, p < 0.05$), and positively related to Saturday time-use ($\text{tt1: } \beta = 1.25, p < 0.05$) and teaching week time allocation in general ($\text{tt11: } \beta = 1.04, p < 0.05$). The results suggest that any increase in time spent on staff meetings is likely to lead to a general increase in time allocation over a typical teaching week, but lead to an observable decrease in time share allocations for Mondays and Tuesdays. In other words, increasing time allocated or spent on meetings will certainly stretch the length of time spent on the teaching week considerably, and in addition, lead to a decrease in time allocated to Monday and Tuesdays. The implications of this type of shift in time allocation is significant given the prominence of the Tuesday effect of teachers' time allocation. Finally, there is a positive impact of teacher's age (age3) on Sunday time shares. These are teachers in the 41 to 50 year age group.

The diagnostics for the time shares are reported in Table 5.10.2A are stronger than those reported for time budgets (earlier in Table 5.10.1A). In fact, for the time shares the Wednesday, Saturday and whole week models are all statistically significant. The time share F ratios and p-values for Wednesday, Saturday and the week models are: ($F=2.43, p < 0.05$), ($F=2.43, p < 0.05$), and ($F=2.02, p < 0.05$), respectively; whereas, the time budget F ratios and p-values for Wednesday, Saturday and the whole week are ($F=1.60, p > 0.10$), ($F=1.85, p <$

0.10), and ($F=4.09$, $p < 0.01$), respectively.. The adjusted R-squared values for Wednesday, Saturday and weekends are moderate: 0.44, 0.44 and 0.36, respectively.

Table 5.10.2A β coefficients of OLS Determinants of Teachers' Daily Time Shares for Each Day of the Week and The Whole Week

	Period or days of the week							
Factors	MON	TUE	WED	THUR	FRI	SAT	SUN	WEEK
n_active	1.70	2.41†	1.18	-1.30	-2.36	-0.76	-0.10	-0.86
Mybreak	0.45	1.01	1.23	-0.12	-0.68	0.64	-1.49*	-0.86
locatn1	3.22	4.49	-0.72	-0.70	0.89	-2.22	-4.21*	-6.43†
age3	6.73†	-5.37	0.20	-2.01	-5.55	-2.37	3.66*	1.29
Fulltime	-0.31	-5.69	-2.44	5.89*	9.21*	-3.36†	-1.99	-5.34*
Exastr	-2.69†	0.38	-0.95	2.04	1.29	1.48	-0.08	1.40
Noschs	4.24†	1.33	1.43	-3.96*	-0.81	-2.62†	-0.87	-3.49*
Xcrtsc	-0.27	-1.36	-0.68	0.11	1.23	-0.49	0.52	0.04
Nsts	0.40	0.24	-0.88†	0.35	-0.49	0.09	-0.14	-0.06
Promps	-17.05	19.43†	-3.24	-8.17	17.17	12.31	-8.60	3.71
Poshld	-10.75	13.79	-2.53	-10.80	13.09	11.56	-4.98	6.59
P	-4.13	0.35	0.89	3.24	0.53	1.84	-0.57	1.27
c19	1.57	0.94	-1.86	1.28	2.11	-1.79	-1.18	-2.96
c20	-3.90	4.01	-4.15†	-0.92	4.50	1.12	-0.41	0.71
Clargt	-2.91	1.47	-2.45	3.07	3.19	-1.23	-1.75	-2.98
Stscl	2.33	-3.91*	2.87*	1.82	-4.12*	-1.11	0.65	-0.46
Dtu	2.02*		-0.37	-0.57	-2.00*	-1.51*	0.47†	-1.04*
Assfac	-0.22	0.33	-1.32	-1.01	1.34	-0.12	1.41	1.29
tot_af	-0.35	1.64	0.24	-1.20	-0.29	0.67	0.53	1.20
Hinfac	0.05	1.06	-0.14	-0.81	2.81	-1.48	-0.50	-1.98
tot_hf	-1.50	-1.04	-0.42	2.11	2.00	-0.85	-0.46	-1.31
Dminv	-1.28	-1.52	1.77	1.90	0.87	-1.21	-0.54	-1.75
tot_sg	0.87	-0.68	0.59	0.15	-0.96	-0.04	0.36	0.32
tot_dm	-0.37	1.04	-0.54	0.23	-0.29	0.40	0.59	1.00
tt11	-1.42*	-1.38*	-0.26	1.01†	0.71	1.25*	-0.20	1.04*
tt5	-1.06	-0.68	-0.35	0.43	0.91	0.96	-0.22	0.74
tt9	-1.22†	-0.56	-0.44	0.39	1.45	0.13	0.02	0.16
tot_mts	-0.21	-0.67	0.72	-0.17	-0.23	0.57	0.07	0.64
_cons	40.59	-41.30	19.47	41.99	-14.20	-3.18	31.59	28.41
F-ratio	1.37	1.22	2.43	1.29	1.61	2.43	1.53	2.02
p-value	0.22	0.31	0.02	0.27	0.13	0.02	0.15	0.05
R-squared	0.64	0.59	0.75	0.62	0.67	0.76	0.66	0.72
Adj R2	0.17	0.11	0.44	0.14	0.26	0.44	0.23	0.36
RMSE	5.95	5.96	3.42	5.44	7.12	4.04	2.69	4.57

*significant at the 5%; and, † significant at the 10%.

5.10.3 MVREG Results of Factors Affecting Daily Time Budgets

Teachers, employed full time, tend to have generally higher time expenditures for these days of the week. The number of activities that teachers undertake (n_active) is a significant determinant of the time use by teachers on Thursdays and Fridays. The respective coefficients of the variable n_active (representing the number of activities undertaken) are negative, suggesting that any increase in the number of activities undertaken by teachers will lead to a decrease in teachers' time allocation on Thursdays and Fridays. The age of the teacher is only a significant influence on Tuesday time-use patterns of teachers. Generally, teachers in the 41-50 year age group are less likely to allocate longer hours to Tuesday work (age3: $\beta = -2.41$, $p < 0.05$). The result is consistent with that found earlier in Table 5.10.1A using OLS determinants of time budgets. The results for the MVREG estimation of coefficient for the determinants of daily time budgets reported in Table 5.10.3A suggest that fulltime status of teachers has a significant positive effect on time allocation for Monday ($\beta = 3.18$, $p < 0.05$), Wednesday ($\beta = 1.54$, $p < 0.10$), Thursday ($\beta = 4.08$, $p < 0.05$) and Fridays ($\beta = 5.47$, $p < 0.05$).

Increased class size (stsc1: $\beta = 1.25$, $p < 0.05$) tends to increase time budget allocations for Wednesdays. Similarly, teachers' involvement in decision making (dminv: $\beta = 1.19$, $p < 0.05$) tends to increase teachers' time budget allocation for Wednesdays. Interestingly, although involvement in decision making tends to increase Wednesday daily time budgets, the actual attendance of meetings (tt11: $\beta = 0.31$, $p < 0.10$) and the total number of meetings attended (tot_mts: $\beta = 0.31$, $p < 0.10$) affect the Wednesday time budget, marginally. Attending meetings has a positive dominant effect on time budgets for Thursdays (tt11: $\beta = 0.63$, $p < 0.05$) and Friday (tt11: $\beta = 0.55$, $p < 0.05$) time allocations.

Table 5.10.3A MVREG Determinants of Teachers' Daily Time Budgets

		Period or days of the week						
Factors		MON	TUE	WED	THUR	FRI	SAT	SUN
n_active		0.09	0.39	-0.37	-1.22*	-1.47*	-0.29	-0.29
mybreak		0.89	0.53	0.72 †	-0.18	-0.81	-0.56	-0.56
locatn1		0.21	0.39	-1.52	-1.26	-0.67	-2.08†	-2.08†
age3		0.39	-2.41*	-0.11	0.05	0.37	0.92	0.92
fulltime		3.18*	0.68	1.54†	4.08*	5.47*	0.03	0.03
Exastr		-0.04	0.75	-0.17	0.71	0.07	0.17	0.17
Noschs		0.25	-0.65	-0.10	-1.52†	-0.05	-0.61	-0.61
Xcrtsc		-0.26	-0.48	0.07	0.30	0.78†	0.26	0.26
Nsts		-0.18	-0.21	-0.51*	-0.01	-0.35	-0.09	-0.09
promps		-2.69	6.06	-1.66	-6.22	-2.78	-2.06	-2.06
Poshld		-0.41	4.80	-0.61	-4.83	-0.94	-0.93	-0.93
P		-0.42	1.10	0.55	0.94	-0.08	0.16	0.16
c19		1.87	0.55	0.13	1.36	0.77	-0.13	-0.13
c20		-2.40	0.13	-2.93*	-1.76	-0.36	-0.43	-0.43
Clargt		-1.46	-0.31	-1.45	0.09	-0.08	-0.56	-0.56
Stscl		0.37	-0.76	1.25*	0.95	0.15	0.03	0.03
Assfac		0.59	0.22	-0.14	0.32	0.63	0.99†	0.99†
tot_af		0.44	0.63	0.15	-0.33	-0.51	0.51	0.51
Hinfac		0.99	0.51	0.40	-0.02	0.68	0.14	0.14
tot_hf		-0.16	-0.08	0.14	0.78	0.62	-0.07	-0.07
Dminv		0.06	-0.01	1.19*	0.73	0.43	-0.13	-0.13
tot_sg		0.69	0.15	0.52†	0.38	0.14	0.28	0.28
tot_dm		0.31	0.54	-0.36	-0.01	-0.54	0.26	0.26
tt11		-0.28	-0.15	0.31†	0.63*	0.55*	-0.01	-0.01
tt5		-0.04	0.00	0.26	0.38	0.41	0.06	0.06
tt9		-0.23	-0.11	0.17	0.27	0.47†	0.08	0.08
tot_mts		0.21	0.04	0.55†	0.18	0.13	0.06	0.06
_cons		7.90	-12.81	8.19	25.91	17.06	9.32	9.32
RMSE		2.96	2.09	1.71	2.64	2.36	1.55	1.55
R-squared		0.50	0.59	0.67	0.64	0.75	0.58	0.58
F-ratio		0.85	1.24	1.73†	1.54	2.55*	1.17	1.17
p-value		0.66	0.30	0.09	0.15	0.01	0.36	0.36
BP_chi squared								

*significant at the 5%; and, † significant at the 10%.

Other results of interest include the following: Wednesday teachers' time use tend to increase with an increase in the number of students in a class (stsc1: $\beta=1.25$, $t=2.94$), total number of meetings attended (tot_mts: $\beta =0.55$, $t=1.78$); and, Wednesday time-use decreases with participation in teaching Grade 4 students (c20: $\beta =1.19$; $t=2.25$). Attending staff meetings tends to increase Thursday and Friday time-budgets (see tt11: $\beta =0.63$, and tt1: $\beta =0.55$ for Thursday and Friday time-use, respectively).

An interesting result is that reported for Sunday time-use. When using time budgets, assistance factors found in the school (assfac: $\beta=0.99$, $t=1.87$), and the urban location of the school (location1: $\beta = -2.08$, $t=1.77$) tends to be related to lower Saturday and Sunday time-use. Teachers who believe a host of assistance factors are available at school tend to allocate a larger share of their week time to Sunday work, compared to their counterparts. Similarly, teachers in urban schools are likely to have lower Sunday time budgets compared to their counterparts (teachers in other school locations). The rural-urban dichotomy that results from the nature of activities undertaken by teachers in the respect locations features in the literature (Hornberger, 2002). When using the MVREG estimation the general effects of selected variables on Sunday time allocations, for example, are similar to those observed for the OLS determinants of time budgets displayed in Table 5.10.1A.

5.10.4 MVREG Results of Factors Affecting Daily Time Shares

The time shares results reported in Table 5.10.4A provide additional evidence on the determinants of teachers' time use. From these results, the effect of the number of activities undertaken by teachers (n_active) is marginal. The effect of teachers' uninterrupted breaks is marginal, and so is the effect of school location (school being in urban setting). The effect of teacher's age on time share allocation is insignificant. The number of students in a class (stsc1) is negatively related to teachers' time use (stsc1: $\beta =-3.91$, $p<0.05$), and positively related to Wednesday time use (stsc1: $\beta =3.15$, $p<0.05$). These significant results for class size

(stsc1) are different from those obtained from MVREG estimation using time budgets. As reiterated earlier, such differences in results point to the need for practitioners in this research field to use the two techniques (time budgets and time shares) in a complementing fashion and pay particular attention to the results of various techniques. In addition attendance in staff meetings (tt11) is related to decreases in Monday time-use (tt11: $\beta = -1.72$, $p < 0.05$), and Tuesday time-use (tt11: $\beta = -1.38$, $p < 0.05$). The results also suggest that full-time teacher status is likely to be related to a decrease in Tuesday time shares (fulltime: $\beta = -5.69$, $p < 0.05$), and an increase in Thursday (fulltime: $\beta = 5.50$, $p < 0.05$) and Friday (fulltime: $\beta = 7.86$, $p < 0.05$) time shares.

The results obtained from MVREG determinants of daily time shares and reported in Table 5.10.4A are obviously significantly different from those results obtained for an MVREG of the time budgets and reported in Table 5.10.3A. For example, the MVREG time budgets coefficients show that attending staff meetings (tt11) tends to increase Friday time-use; whereas the MVREG time shares show that student supervision (tt09) tends to increase Friday time allocations. This means that while more time is generally allocated to student supervision (tt09) and meetings (tt11) on Fridays, according to time budgets; the proportion of time allocated to student supervision (tt09) is generally large, according to the results of time share analysis, and the result is particularly significant for teachers' Friday time-use.

The use of time budgets and the time shares seems to capture different results when using any of the techniques (OLS and MVREG) reported so far. This suggests that attention needs to be given, therefore, to the simultaneous use of time budgets and time shares as useful metrics for measuring the allocation of time. Of greater importance is also isolating the key determinants of time-use using either metric. The results reported earlier have been focused on OLS and MVREG estimation of time allocation behaviour using time budgets and time share metrics. The assumptions that underlie the OLS and MVREG implementations (estimations) are

different – particularly with respect to the treatment of interdependency of equations and also the assumptions regarding the error structures and accompanying econometric problems. In spite of the differences in outcomes (results as displayed, reported and commented on) the diagnostics for the OLS and MVREG are important, and suggest that these two techniques can add new knowledge to a suite of techniques for modelling time-use in this thesis. This suite of techniques would, however, be incomplete if results of SUREG and IVREG are not included. The results presented in Section 5.10.5 and Section 5.10.6 display the key determinants of SUREG time use using time budgets and time share metrics, respectively. Similarly, results for IVREG are reported in Sections 5.10.7 and 5.10.8.

Table 5.10.4A MVREG Determinants of Teachers' Daily Time Shares

	Day of the week					
Factors	MON	TUE	WED	THUR	FRI	SUN
n_active	2.49	2.41†	1.04	-1.52	-3.15†	0.09
Mybreak	1.52	1.01	1.04	-0.42	-1.74	-1.25†
locatn1	4.01	4.49	-0.86	-0.92	0.12	-4.03†
age3	1.86	-5.37	1.09	-0.64	-0.74	2.53
Fulltime	1.06	-5.69*	-2.69	5.50*	7.86*	-1.67
Exastr	-1.17	0.38	-1.23	1.61	-0.21	0.27
Noschs	2.94	1.33	1.66	-3.59†	0.48	-1.17
Xcrtsc	-1.25	-1.36	-0.50	0.38	2.19	0.30
Nsts	-0.03	0.24	-0.80	0.48	-0.06	-0.24
Promps	-4.80	19.43†	-5.48	-11.62	5.06	-5.77
Poshld	-1.04	13.79	-4.30	-13.54	3.49	-2.73
P	-1.91	0.35	0.48	2.62	-1.67	-0.06
c19	2.67	0.94	-2.06	0.97	1.01	-0.92
c20	-3.65	4.01	-4.20†	-0.99	4.25	-0.35
Clargt	-3.53	1.47	-2.33	3.24	3.81	-1.89
Stscl	0.80	-3.91*	3.15*	2.25†	-2.61	0.29
Assfac	0.22	0.33	-1.40	-1.14	0.91	1.52
tot_af	0.93	1.64	0.00	-1.56	-1.56	0.83
Hinfac	1.07	1.06	-0.33	-1.10	1.80	-0.26
tot_hf	-1.66	-1.04	-0.39	2.15	2.16	-0.50
Dminv	-1.30	-1.52	1.77†	1.91	0.89	-0.54
tot_sg	1.18	-0.68	0.53	0.07	-1.26	0.43
tot_dm	0.73	1.04	-0.74	-0.08	-1.37	0.85
tt11	-1.72*	-1.38*	-0.20	1.09†	1.01	-0.27
tt5	-1.06	-0.68	-0.35	0.43	0.91	-0.22
tt9	-1.46†	-0.56	-0.39	0.45	1.68†	-0.03
tot_mts	-0.12	-0.67	0.71	-0.19	-0.31	0.09
_cons	14.70	-41.30	24.19	49.27	11.39	25.61
RMSE	7.20	5.96	3.43	5.45	8.13	2.80
R-squared	0.44	0.59	0.74	0.60	0.55	0.61
F-ratio	0.68	1.22	2.45*	1.30	1.06	1.36
p-value	0.83	0.31	0.02	0.27	0.45	0.23

*significant at the 5% level; and, † significant at the 10% level.

5.10.5 SUREG Results of Factors Affecting Daily Time Budgets

Results reported in Table 5.10.5A are those for the seemingly unrelated regressions (SUR) determinants of daily time budgets of teachers' time allocation behaviour. The determinants are reported for all the teaching days of the week, and for Sunday. The explanatory variables used are similar to those used earlier in the OLS and MVREG estimation, with the exception of a few adjustments that were required in order to preserve the required degrees of freedom. Results reported in Table 5.10.5A show the coefficients of the key determinants of teachers' daily time budget allocations. The results are obtained from implementing a Seemingly Unrelated Regressions routine in Stata 9, and are presented here to offer an alternative (but complementing way of modelling time-use). These results must be compared to similar results obtained using time shares – as reported in Table 5.10.6A.

The results reported in Table 5.10.5A suggest that, in terms of time allocation to various days, clearly Monday time budgets are influenced positively by Tuesday (dmo: $\beta = 0.71$, $p < 0.05$), Wednesday (dwe: $\beta = 0.44$, $p < 0.05$), Sunday (dsu: $\beta = 0.49$, $p < 0.05$) time budgets, and teachers' full-time employment status (fulltime: $\beta = 2.75$, $p < 0.05$). Monday time budgets are influenced, negatively, by Friday time budgets (dfr: $\beta = -0.26$, $p < 0.05$). Increasing Monday time budgets tends to have an effect of increasing time budgets for Tuesday (dmo: $\beta = 0.63$, $t = 6.58$, $p < 0.01$), Wednesday (dmo: $\beta = 0.40$, $t = 3.66$, $p < 0.01$) and Sunday (dmo: $\beta = 0.29$, $t = 4.60$, $p < 0.01$) time budgets. Increasing Monday time budgets positively affects Tuesday (dmo: $\beta = 0.63$, $p < 0.01$), Wednesday (dmo: $\beta = 0.40$, $p < 0.01$) and Sunday (dmo: $\beta = 0.29$, $p < 0.01$) time budgets, but negatively affects Friday ($\beta = -0.47$, $p < 0.05$) time budgets.

Table 5.10.5A SUREG Determinants of Teachers' Daily Time Budgets

Factors	Days of the week					
	MON	TUE	WED	THUR	FRI	SUN
_cons	-4.85*	8.61*	3.03	-3.79	6.61*	11.10*
dmo		0.63*	0.40*	-0.22	-0.47*	0.29*
dtu	0.71*		-0.13	0.27†	-0.20	0.08
dwe	0.44*	-0.13		0.59*	0.03	0.05
dth	-0.17	0.17†	0.39*		0.59*	0.17*
dfr	-0.26*	-0.10	0.03	0.49*		
dsu	0.49*	-0.11	0.27†	0.32	0.21	
fulltime	2.75*	-0.19	-1.01	0.14	4.25*	-0.82*
age3(41-50)	0.72	-1.38*	-0.14	0.83	-0.95	0.00
noschs	0.46	-0.45	0.09	-0.48	0.31	0.15
exastr	-0.05	0.27	-0.27	0.22	0.21	-0.06
stscl	0.31	-0.56*	0.00	0.60*	-0.58*	-0.18
locatn1	-0.02	0.35	0.52	0.54	-0.42	-0.80*
tt9	-0.15	0.09	-0.03	-0.20	0.11	0.17*
tt11	0.00	-0.07	0.03	0.18	-0.12	-0.19*
tot_af	-0.10	0.12	0.04	-0.14	-0.03	0.00
tot_hf	0.00	-0.03	-0.24	0.20	0.06	0.22*
mybreak	0.52†	-0.44†	0.12	0.34	-0.26	-0.55*
n_active	0.01	-0.09	0.17	-0.06	-0.20	0.01
dmf_s						-0.13*
RMSE	1.57	1.43	1.44	1.81	1.97	0.83
R-squared	0.65	0.52	0.43	0.56	0.64	0.73
Chi- squared	203.7	106.8*	79.1*	134.3*	149.5*	186.8
p-value	0.000	0.000	0.000	0.000	0.000	0.000

*significant at the 5% level ; and, † significant at the 10% level.

Full-time teachers tend to spend longer hours to Mondays (fulltime: $\beta = 2.75$, $p < 0.05$) and Fridays (fulltime: $\beta = 4.25$, $p < 0.05$), but spend less time on Sundays (fulltime: $\beta = -0.82$, $p < 0.05$). The mix of positive and negative SUR coefficients shown in Table 5.10.5A implies significant trade-offs in time use by teachers. These results are quite unique – compared to those obtained from ordinary least squares (and errors in variables), reported earlier in Table 5.10.1A.

The results show that increasing time expenditure on Monday decreases time expenditure on Fridays, but increases Tuesday, Wednesday and Sunday time expenditures. Teachers in the 41-50 year age group (age3=1) tend to spend less time on Tuesdays (age3: $\beta = -1.38$, $p < 0.05$). This result (age3: $\beta = -1.38$, $p < 0.05$) is similar to that obtained from the MVREG results reported in Table 5.10.3A. The results for time budgets are predominantly interesting especially when it comes to school variables. The variables location1 (representing urban location) through n_active (representing number of activities undertaken by teachers) are not statistically significant at the 5 percent level, for the days Monday through Friday. Some of these variables are significant, for example (location1 (urban): $\beta = -0.80$, $p < 0.05$, student supervision (tt9: $\beta = 0.17$, $p < 0.05$), attending meetings (tt11: $\beta = -0.19$, $p < 0.05$), total hindrance factors (tot_hf: $\beta = 0.22$, $p < 0.05$), and level of uninterrupted break-time in schools (mybreak: $\beta = -0.55$, $p < 0.05$), as determinants of teachers' Sunday work time budgets.

Teachers who work in urban schools (location1=1), teachers who attend meetings (tt11=1) and teachers who have higher levels of uninterrupted break time (mybreak) are likely to work less hours on Sundays, compared to their counterparts. Similarly, teachers who are actively involved in student supervision (tt9) or have a larger share of factors hindering their work (tot_hf) are more likely to increase their Sunday time budgets than their counterparts (teachers who do not have student supervision or teachers who do not report a large number of hindering factors). Interesting and similar to the results obtained from MVREG estimations, an increase in the number of assisting factors (tot_af) do not have a significant effect on day of the week – including weekend time-use.

5.10.6 SUREG Results of Factors Affecting Daily Time Shares

Results reported in Table 5.10.6A are those for the seemingly unrelated regressions (SUR) determinants of daily time shares of teachers' time allocation behaviour. The determinants are reported for all the teaching days of the week, and for Sunday. The explanatory variables used are similar to those used earlier in the OLS, MVREG estimation and SUREG for time budgets (see Section 5.10.5, and Table 5.10.5A). Results reported in Table 5.10.6A show the coefficients of the key determinants of teachers' daily time share allocations. The results are obtained from implementing a Seemingly Unrelated Regressions routine in Stata 9, and are presented here to offer an alternative (but complementing way of modelling time-use). These results are comparable to those presented in Table 5.10.5A.

The results reported in Table 5.10.6A show a different and unique effect of time allocations across different days of the week. Contrary to the observations in Table 5.10.5A, most of the coefficients of all the daily time shares (dmo_s through dsu_s) are negative. These significant negative coefficients suggest that an increase in time share allocations for any particular day will lead to decreases in time allocations for all the other days. For example, increasing the Monday time share (dmo_s) will lead to a marginal decrease in Tuesday time share (dmo_s: $\beta = -0.25$, $p < 0.10$), a significant decrease in Wednesday through Friday time shares as seen from the respective parameters (dwe_s: $\beta = -0.35$, $p < 0.05$; dth_s: $\beta = -0.91$, $p < 0.05$, and dfr_s: $\beta = -0.81$, $p < 0.05$); and, a significant increase in Sunday time shares (dsu_s: $\beta = 0.28$, $p < 0.05$). This tradeoff in time-use reflects the realities of teachers' time allocation behaviour. The allocation must reflect the idea that during the week teaching time is a scarce and finite resource. This result certainly reflects the sentiment that teachers can only do so much with the time available.

In terms of the daily time shares, two striking results displayed in Table 5.10.6A are those for the Monday time share effect on Sunday time-use (dsu_s: $\beta = 0.28$, $p < 0.05$), and the Thursday

time share effect on Sunday time-use (dth_s: $\beta=0.11$, $p<0.10$). These two coefficients and their related diagnostics suggest that a unit increase in the Monday time share (%) is likely to lead to a 0.28 unit increase (%) in the Sunday time allocations. Similarly, a unit increase in the Thursday time share will lead to a 0.11 unit increase in Sunday time share. Clearly, the impact of expected adjustments in teachers' time allocation for Monday is far more significant or influential on Sunday time use, than adjustment to Thursday time-use. Since these positive coefficients have been interpreted in the context of expected adjustments on Monday and Thursday time shares, it is pertinent to consider what the expected adjustment on Sunday time shares would be like on the other days of the week. A look at the β coefficients of the Sunday time share (dsu_s) across the days of the teaching week reveals the following. All positive adjustments on Sunday time shares will have negative effects on time shares from Monday through Friday. This result was not obtained in the analysis of time budgets (whose results are displayed in Table 5.10.5A), suggesting therefore that the time share analysis implemented using SUR has produced additional useful knowledge.

Clearly from Table 5.10.6A increasing time teachers spend on school work on Sunday will decrease the proportion of time allocated to Mondays (dsu_s: $\beta=-0.65$, $p<0.05$), Tuesdays (dsu_s: $\beta=-1.42$, $p<0.05$), Wednesdays (dsu_s: $\beta=-0.95$, $p<0.05$), Thursdays (dthu_s: $\beta=-1.39$, $p<0.05$), and Fridays (dsu_s: $\beta=-1.18$, $p<0.05$). The largest effect of increasing teachers' Sunday time-use is reported for Tuesday (dsu_s: $\beta=-1.42$, $p<0.05$) and the smallest effect is reported for Monday (dsu_s: $\beta=-0.65$, $p<0.05$).

Table 5.10.6A SUREG Determinants of Teachers' Daily Time Shares

Factors	Days of the week					
	MON	TUE	WED	THUR	FRI	SUN
dmo_s		-0.25†	-0.35*	-0.91*	-0.81*	0.28*
dtu_s	-0.18†		-0.62*	-0.75*	-0.60*	0.10
dwe_s	-0.51*	-1.27*		-1.13*	-1.02*	-0.09
dth_s	-0.64*	-0.75*	-0.54*		-0.79*	0.11†
dfr_s	-0.83*	-0.86*	-0.71*	-1.16*		
dsu_s	-0.65*	-1.42*	-0.95*	-1.39*	-1.18*	
Fulltime	4.83*	-1.01	0.14	3.26*	2.76	0.66
age3	0.76	-0.84	-0.25	0.14	0.25†	-0.06
Noschs	1.19†	0.49	0.68	1.06	1.10	0.41
Exastr	-0.38	-0.31	-0.38	-0.40	-0.46	-0.17
Stscl	0.19	-0.63	-0.27	-0.19	-0.13	-0.30
locatn1	-0.27	-0.81	-0.39	-0.77	-0.69	-1.12
tt9	-0.06	0.39†	0.20	0.20	0.15*	0.25†
tt11	-0.67*	-0.90*	-0.67*	-1.04*	-0.91	-0.61*
tot_af	-0.31	-0.29	-0.26	-0.45	-0.37*	-0.24
tot_hf	0.53	0.85*	0.58*	1.02*	0.80†	0.69*
Mybreak	-0.08	-1.45	-0.83*	-1.00†	-0.80	-0.99*
n_active	0.36	0.26	0.28	0.38	0.40	0.17
dmf_s						-0.60*
_cons	50.97*	86.86*	63.81*	92.47*	78.03*	53.23*
RMSE	2.63	3.32	2.34	3.44	2.93	2.00
R-squared	0.81	0.68	0.70	0.61	0.87	0.57
Chi- squared	378.8*	304.5*	332.9*	300.8	949.4	225.5*
p-value	0.000	0.000	0.000	0.000	0.000	0.000
N	62	62	62	62	62	62

*significant at the 5% level ; and, † significant at the 10% level.

Earlier in Table 5.10.5A, the time budget analysis showed that variables location1 (urban) through n_active did not produce any significant results. The results from time share analysis displayed in Table 5.10.6A tell a completely different story for variables student supervision (tt9) through the number of activities undertaken by teachers (n_active). First, the only general similarity so far is with respect to location of school (location1=1, for urban). The urban location effect on daily time shares is insignificant. Second, student supervision (tt9) tends to marginally increase the time share allocations for Tuesday (tt9: $\beta=0.39$, $p<0.10$) and

Sunday (tt9: $\beta=0.25$, $p<0.10$), and greatly influences Friday time allocations (tt9: $\beta=0.15$, $p<0.05$). Attending staff meetings (tt11) tends to decrease the time shares for all days of the week (Saturday excluded), and the largest decrease is for Thursday (tt11: $\beta=-1.04$, $p<0.05$). Third, increasing the number of assistance factors (tot_af: $\beta=-0.37$, $p<0.05$) tends to decrease the time share allocated to Fridays. Similarly, an increased number of hindrance factors that a teacher experiences (tot_hf) is related to an increase in time share allocations for Tuesday (tot_hf: $\beta=0.85$, $p<0.05$), Wednesday (tot_hf: $\beta=0.58$, $p<0.05$), Thursday (tot_hf: $\beta=1.02$, $p<0.05$) and Sundays (tot_hf: $\beta=0.69$, $p<0.05$). In terms of increasing the level of uninterrupted break time (mybreak), the effect is likely to be a decrease in time shares for Wednesday (mybreak: $\beta=-0.83$, $p<0.05$), Thursday (mybreak: $\beta=-1.00$, $p<0.10$), and Sunday (mybreak: $\beta=-0.99$, $p<0.05$). The diagnostics for the SUREG for time shares are quite encouraging as seen from the low root mean square errors (RMSE), high R^2 values and the significant chi-square tests. The next section reports the results of estimating the coefficients of the determinants of teachers' time use using the method of instrumental variables regression (IVREG).

5.10.7 IVREG Determinants of Factors Affecting Daily Time Budgets

The results reported in this section are from the instrumental variable regression (IVREG) estimation of teachers' time allocation behaviour proxied on the basis of time budgets. For the analysis of time budgets using IVREG, the instrumental variables are the time shares for the respective days of the week, but Saturdays. The instrumented variables, therefore, are the time shares of the respective days of the teaching week and the Sunday time-use patterns. Omitting one of the equations is a necessary condition for estimating IVREG. This process of instrumentation and omitting one equation will be repeated for time shares (see Section 5.10.8). The motivation to use time shares as instruments is derived from the results reported in Sections 5.3 through 5.9.

The results reported in Table 5.10.7A show how time shares are related positively to their respective time budgets. For example, the Monday time budget will generally increase with increases in Monday time shares (dmo_s: $\beta = 0.43$, $p < 0.05$). A tradeoff between Wednesday time budgets and Thursday time shares (dth_s: $\beta = -0.19$, $p < 0.05$), and that between Thursday time budgets and Wednesday time shares (dwe: $\beta = -0.54$, $p < 0.10$), is observed. The interpretation of these tradeoffs is quite simple. For example, consider the determinants of the Wednesday time budget and look at the effects of the Thursday time share (dth_s: $\beta = -0.19$, $p < 0.05$). This value suggests that an expectation of a 1 percent increase in Thursday time allocation will likely decrease the Wednesday time allocation by 0.19 hours. Similarly increasing the time shares of Wednesday by 1 percent will lead to a 0.54 hour drop in time allocation for Wednesdays.

Most of the key school variables and teacher demographic variables are not significant in the IVREG results for teachers' time budgets except for the over40s dummy variable. The results show that teachers aged over 40 years are likely to increase their time budgets on Mondays (over40s: $\beta = 0.78$, $p < 0.05$), and Thursdays (over40s: $\beta = 0.62$, $p < 0.05$), and decrease their time budget expenditure profiles for Wednesdays (over40s: $\beta = -0.41$, $p < 0.10$). Interestingly, and rather counterintuitive, the share of time spent participating in administrative tasks (tt10_s) tends to marginally decrease only the time budget allocation for Wednesdays (tt10_s: $\beta = -0.03$, $p < 0.10$). The share of time spent on school administration (tt10_s) is traditionally a big concern in the qualitative studies on teachers' stress, effectiveness, and workloads.

The diagnostics reported for the IVREG results are extremely healthy and encouraging. For example, the R-squared (R^2) values and adjusted R^2 values do not differ by much except for Tuesday time allocation behaviour equations. The RMSE values for the six equations displayed in Table 5.10.7A are consistently in the 0.400 – 0.67 range, except for the Tuesday

time budget equation that is sitting on 1.172, suggesting possibly a different set of time allocation dynamics that may dominate teachers' time allocation to Tuesday activities.

One question that is worth addressing is: what is the impact of the share of time allocated to any particular day of teaching, on the actual hours expended on that selected day of the week? In other words, how does the Monday time share (dmo_s) influence the Monday time budget (dmo)?

To answer this question, one must have a close inspection of the coefficients of the IVREG estimations for the daily time budget equations. These coefficients are extracted from Table 5.10.7A and reported in Table 5.10.7B. The coefficients of interest are Monday (dmo_s : $\beta = 0.43$, $p < 0.05$), Tuesday (dtu_s : $\beta = 0.02$, $p < 0.10$), Wednesday (dwe_s : $\beta = 0.40$, $p < 0.05$), Thursday (dth_s : $\beta = 0.38$, $p < 0.05$), Friday (dfr_s : $\beta = 0.47$, $p < 0.05$), and Sunday (dsu_s : $\beta = 0.48$, $p < 0.05$). These coefficients are all positive showing direct work intensification. For example, increasing Monday time shares by 1 percent will lead to a 0.43 hours (≈ 25 minutes) increase in Monday time budget. Increasing the Tuesday time share by 1 percent will not substantially alter the actual time currently allocated to Tuesday work activities. Increasing the Wednesday time share by 1 percent will lead to a 0.40 hour (≈ 24 minutes) increase. Similarly increasing Sunday time shares by 1 percent will lead to a 0.48 hour increase in Sunday time budgets.

Table 5.10.7A IVREG Determinants of Teachers' Daily Time Budgets

	Day of the week										
Factor	Mon		Tue		Wed		Thu		Fri		Sun
dmo_s	0.43	*	0.05		-0.22		0.26		0.36	*	-0.02
dtu_s	-0.06		0.02	†	-0.02		0.02		-0.39	*	-0.05
dwe_s	-0.47		-0.49		0.40	*	-0.54	†	0.06		0.05
dth_s	0.28		-0.15		-0.19	*	0.38	*	-0.22	*	0.01
dfr_s	0.12		-0.26		-0.02		0.07		0.47	*	0.08
dsu_s	0.09		-0.41		0.05		0.02		0.05		0.48*
skoolsize	-0.03		-0.25		0.08		-0.08		0.00		0.03
c19	0.28		-1.26		0.27		-0.04		0.12		0.29
c20	-0.37		0.75		0.06		-0.32		-0.39		-0.35
hinfac	0.05		0.21		-0.04		-0.02		-0.03		0.03
stsc1	0.00		-0.10		-0.01		0.07		0.20		-0.04
p	-0.03		-0.34		0.11		-0.10		0.29		0.10
xcrtsc	-0.24		0.29		0.06		-0.15		-0.13		0.04
fulltime	-0.81		0.74		0.53		-0.97		-0.88		-0.74
over40s	0.78	†	-0.46		-0.41	*	0.62	†	0.07		-0.11
dmo			-0.03	*	0.41		-0.46		-0.68	*	
dtu	0.34				0.12		0.01		1.03	*	0.13
dwe	1.32	*	0.60				1.43	*			0.25
dth	-0.70		0.21		0.48	*			0.62	*	0.03
tt01_s	0.01		0.03		-0.01		0.02		0.00		0.00
tt03_s	-0.03		0.07		0.00		-0.01		-0.02		0.00
tt05_s	-0.06		0.05		0.02		-0.05		-0.04		0.00
tt07_s	0.01		-0.10		0.03		-0.02		-0.03		-0.07
tt08_s	0.11		-0.10		-0.04		0.08		0.00		0.00
tt09_s	-0.07		0.09		0.02		-0.06		-0.05		-0.01
tt10_s	0.03		0.03		-0.03	†	0.03		0.01		0.00
tt11_s	-0.01		-0.08		0.01		0.01		0.01		0.00
dminv	0.07		0.55		-0.15		0.08		-0.13		-0.12
mybreak	0.23		-0.52		0.05		-0.01		0.08		0.01
n_active	-0.03		0.32		-0.06		0.05		0.03		-0.02
_cons	-3.85		12.84		1.16		-2.72		-4.05		-3.65
Diagnostics											
F	32.51		4.77		39.21		32.19		75.34		27.11
Prob > F	0.00		0.00		0.00		0.00		0.00		0.00
R ²	0.969		0.819		0.974		0.967		0.985		0.965
Adj R ²	0.944		0.623		0.954		0.940		0.974		0.937
RMSE	0.618		1.172		0.462		0.674		0.502		0.400

*significant at the 5% level; and, † significant at the 10% level.

Clearly, from this interpretation a 1 percent increase in time share implies a completely different actual time allocation for each day of the week. In order to obtain an effective one hour increase in teachers' time, the time share must increase by 3 units – that is, a 3 percent increase in a teachers' time share will lead to a 1 hour gain in teachers' time budget.

Table 5.10.7B Change in Time Budgets From Increasing Time Shares By 1 Percent

Time Share Factor on Time Budget	Effects of 1 percent increase
Monday Share (dmo_s) on Monday Budget (dmo)	$\beta = 0.40^*$, $p < 0.05$
Tuesday Share (dtu_s) on Tuesday Budget (dtu)	$\beta = 0.02^\dagger$, $p < 0.10$
Wednesday Share (dwe_s) on Wednesday Budget (dwe)	$\beta = 0.40^*$, $p < 0.05$
Thursday Share (dth_s) on Thursday Budget (dth)	$\beta = 0.38^*$, $p < 0.05$
Friday Share (dfr_s) on Friday Budget (dfr)	$\beta = 0.47^*$, $p < 0.05$
Sunday Share (dsu_s) on Sunday Budget (dsu)	$\beta = 0.48^*$, $p < 0.05$

*significant at the 5% level; and, † significant at the 10% level.

5.10.8 IVREG Factors Affecting Daily Time Shares

Similar to the estimation of IVREG in Table 5.10.7A, and Table 5.10.7B, the time budgets are used as instrumental variables in running the IVREG of time shares reported in Table 5.10.8A. Again, as emphasised earlier in Section 5.10.7, omitting one of the equations is a necessary condition for estimating IVREG. The results reported in Table 5.10.8A show that only the variables Wednesday time shares (dwe_s: $\beta = 1.30$, $p < 0.10$), and participation in administrative tasks (tt10_s: $\beta = -0.12$, $p < 0.10$) influence Monday time budget allocations, marginally. None of the variables used in this system affect Tuesday time share allocations.

The time shares of Wednesdays are influenced significantly by Wednesday time budget (dwe: $\beta = 1.94$, $p < 0.05$), as expected; and, marginally affected by school size (skoolsize: $\beta = -0.33$, $p < 0.10$), and the time share of teaching only (tt01_s: $\beta = 0.05$, $p < 0.10$). The Thursday time budgets tend to decrease Wednesday time budget (dwe: $\beta = -2.96$, $p < 0.05$) and Friday time

budget (d_fr : $\beta = -0.72$, $p < 0.10$), whereas the Thursday time budgets tend to increase Thursday time share (dth : $\beta = 2.27$, $p < 0.05$). The Thursday time shares tend to decrease for teachers aged 40 years and over ($over40s$: $\beta = -1.44$, $p < 0.05$).

The significant determinants of the Friday time share allocation are Monday time budgets (dmo : $\beta = 1.79$, $p < 0.05$), Friday time budgets (dfr : $\beta = -1.44$, $p < 0.05$), teacher full time status ($fulltime$: $\beta = 2.75$, $p < 0.05$), Tuesday time shares (dtu_s : $\beta = -0.98$, $p < 0.05$), and Wednesday time share (dwe_s : $\beta = 0.83$, $p < 0.10$). The only significant determinant of the Sunday time share is the Sunday time budget (dsu : $\beta = 1.79$, $p < 0.05$).

The results for the determinants of time shares are quite different to those reported earlier in Tables 5.10.7A and 5.10.7B. Here is an example: consider the results reported in Table 5.10.8B – these results are similar in design, setup and interpretation as those results presented in Table 5.10.7B, but carry different type of information.

These results show clearly that whatever happens to changes in time budgets for Mondays and Tuesdays will have very little impact on the Monday and Tuesday time share allocation behaviour of kindergarten and primary school teachers in Tasmania. For example, a unit (one hour) increase in Wednesday time budget will occasion a 1.94 percent increase in the time share of Wednesday. Similarly, increasing the Thursday time budget by one hour will increase the Thursday time share by 2.27 percent.

Table 5.10.8A IVREG Determinants of Teachers' Daily Time Shares

	Day of the week									
Factors	Mon		Tue		Wed		Thu		Fri	Sun
dmo	1.36		-1.52		-0.60		0.87		1.79	* -0.46
dtu	0.41		0.42		-0.43		0.54		-2.28	* 0.02
dwe	-2.87		1.01		1.94	*	-2.96	*	-0.60	-0.32
dth	0.40		0.93		-0.46		2.27	*	-0.88	0.50
dfr	-0.01		-0.63		-0.32		-0.72	†	1.86	* -0.43
dsu	1.53		-1.80		-0.78		-0.27		-0.08	1.79*
skoolsz	0.46		-0.47		-0.33	†	0.10		-0.01	-0.08
c19	2.00		-0.72		-1.32		-0.05		-0.37	-0.64
c20	-0.35		0.20		0.02		0.52		0.89	0.57
hinfac	-0.47		0.78		0.22		-0.03		0.06	0.01
stscl	0.33		-0.49		0.14		0.12		-0.22	0.06
p	0.68		-0.59		-0.03		0.60		-0.32	-0.12
xcertsc	-0.51		0.73		0.09		0.28		0.27	-0.01
fulltime	3.01		-1.31		-0.99		2.00		2.75	* 1.00
over40s	-0.19		-1.83		0.40		-1.44	*	-0.42	-0.04
dtu_s	0.21		0.83		0.36		-0.56		-0.98	* 0.15
dwe_s	1.30	†	-0.88		-0.06		-0.34		0.83	† -0.17
dth_s	-0.20		-0.61		0.14		0.96		0.27	-0.26
tt01_s	-0.09		0.08		0.05	†	-0.03		0.00	-0.01
tt03_s	-0.10		0.11		0.03		-0.01		0.03	0.01
tt05_s	-0.04		0.06		-0.03		0.05		0.08	0.00
tt07_s	0.34		-0.39		-0.16		0.04		0.09	0.08
tt08_s	0.01		-0.19		-0.01		-0.18		-0.05	-0.05
tt09_s	-0.14		0.21		-0.03		0.07		0.07	0.03
tt10_s	-0.12	†	0.09		0.06		-0.06		-0.04	0.01
tt11_s	0.04		-0.21		-0.06		-0.05		-0.02	-0.04
dminv	-1.02		0.98		0.59		-0.17		0.23	0.27
mybreak	0.67		-0.69		-0.41		-0.12		-0.20	-0.08
n_active	-0.25		0.56		0.36		0.05		0.04	0.11
_cons	2.46		24.53		6.39		16.27		13.35	9.26
Diagnostics										
F	9.99		7.04		22.73		22.42		110.86	27.76
Prob > F	0.00		0.00		0.00		0.00		0.00	0.00
R²	0.913		0.872		0.962		0.959		0.990	0.969
Adj R²	0.843		0.769		0.932		0.927		0.983	0.943
RMSE	2.33		2.78		1.222		1.489		1.026	0.723

*significant at the 5% level; and, † significant at the 10% level.

From the interpretation given earlier to the results in Table 5.10.7B, a one hour increase in time budget requires approximately a three unit increase in time share. From the results displayed in Table 5.10.8B, a one hour increase in time budgets occasions less than three unit increase in time shares.

Table 5.10.8B Change in Time Shares From A Unit Increase in Time Budget

Time Budget Factor on Time Share Factor	Effects of 1 unit increase
Monday Budget on Monday Time Share	$\beta = 1.36, p > 0.10$
Tuesday Budget on Tuesday Time Share	$\beta = 0.42, p > 0.10$
Wednesday Budget on Wednesday Time Share	$\beta = 1.94^*, p < 0.05$
Thursday Budget on Thursday Time Share	$\beta = 2.27^*, p < 0.05$
Friday Budget on Friday Time Share	$\beta = 1.86^*, p < 0.05$
Sunday Budget on Sunday Time Share	$\beta = 1.79^*, p < 0.05$

*significant at the 5% level; and, † significant at the 10% level.

The fact that none of the variables have a significant effect on Tuesday time allocations, and yet Tuesday time allocation has such impressive diagnostics is indeed a puzzling result. This is a very strange result whose comment in this thesis will indeed mark the only weakness (limitation) in the thesis. A very good conjecture, guess or hunch, has not been provided for this observed paradox: All the variables of the Tuesday time share model are insignificant. The coefficient of determination (R^2) is 0.8719 and the adjusted R^2 is 0.7686, suggesting that the model has very high explanatory power and that the extensive list of variables has not unduly inflated the R^2 value. The RMSE of 0.27839 for the Tuesday equation is the highest RMSE out of those reported from the six equations whose results are reported in Table 5.10.8A. A relatively lower RMSE is generally preferred. However, the RMSE values of the other five equations range from 0.723 to 2.33. This paradox is compounded further by the fact that the coefficients and diagnostics for Wednesday through Sunday are a lot healthier than those reported for Mondays and Tuesdays. The weakness in the thesis is in the

researcher not being able to provide a convincing theoretical argument to explain this observed Monday and Tuesday IVREG estimation result. The Monday-Tuesday paradox is actually missed when Tuesday is used as an omitted equation in IVREG estimation, instead of omitting Saturdays as has been done in this thesis. In this thesis Saturday was chosen as a day to omit because of prior results from Chapter 5, Sections 5.2 through 5.9. Interest in making Tuesday effects as transparent as possible is motivated by the dominant Tuesday effect alluded to and seen in the results reported in Section 5.2 through 5.9. As a result of a desire to make this paradox obvious – no attention has been made to treat the Tuesday time behaviour equation as the excluded equation, just for the sake of obtaining a neat result. This observed weakness, therefore, stands and remains as stated – for possible future research.

Consistent with observations made earlier in teachers' work, intensification of teacher's work involves both increasing the time shares and the time budgets. The results are reported to show the consistency in the link between time budgets and time shares. The need for such consistency was only mentioned or muted earlier in the discussion on correlation analysis (see Section 5.8), but never really reinforced empirically. The IVREG results reported here reinforce the empirical link between time shares and time budgets in the context of a modelled aimed at explaining teachers' time-use behaviour. This empirical verification, within the context of the conceptual model of the teachers' thumbprint is a unique contribution made in the thesis.

The approach to instrumentation taken in this thesis is also unique in two ways. First, it builds on the low correlations between time budgets and time shares, and uses the additional information conveyed by time shares to explain time budgets and vice versa (using the information contained in time shares to explain variations in time budgets). Second, the use of time budgets and time shares allows the reader to confirm the obvious – that is increases in time shares should be related to increases in time budget. Now, stating the obvious might not

seem like a significant assertion, but it is a significant assertion in the context of the teacher's thumbprint framework that has been built in this thesis, and the estimation thereof, using SUREG, IVREG and related techniques. Obtaining the obvious is one way of verifying that a model actually produces even the most obvious result – good models are those that, although abstract, are able to show the obvious as well being able to let the researcher build on the obvious in order to produce a better predictive model. In that regard, the contribution of the results of IVREG is significant – just like the SUREG results confirmed a Tuesday effect and Saturday rest day effect.

5.11 Errors In Variables Regression Determinants of Teacher Overloads

Earlier on, in Chapter 4, the equations developed for time-use modelling under the teacher's thumbprint framework highlighted the need to assess the work overload status of teachers.

The results reported in Table 5.11.1A show the key determinants of the extent to which teachers are overloaded. Four definitions of overload status are provided: namely 35 hours (corresponding to 7 hours of work a day over the teaching week), 40 hours (representing 8 hours of work per day over a typical week), 43 hours (representing the median weekly time allocation per week by Tasmanian primary school teachers, and 45 hours (representing the average weekly time allocation by Tasmanian primary school teachers). The results reported in Table 5.11.1A are based on estimating the errors in variables regressions (EIVREG) equations.

The results show that 55 teachers out of 85 teachers are classified as overloaded when using the 35-hour working week definition. The variables (factors) that increase the extent of teacher overload are time expenditure on Wednesdays (dwe: $\beta=1.116$, $p<0.05$), time expenditure on Thursdays (dth: $\beta = 1.1995$), and time expenditure on preparation and planning (tt3: $\beta = 0.384$, $p < 0.05$). The three factors are significant at the 5 percent level, for

all teachers. The explanatory variable (factor) that has a negative influence on the extent of overload is the status of employment (fulltime: $\beta = -12.172$, $p < 0.05$) for the 35-hour and (fulltime: $\beta = -10.48$, $p < 0.05$) for the 40-hour week definition. The negative influence suggests that teachers who are employed on a fulltime basis are less likely to be overloaded than their counterparts, over the 35-hour and 40-hour working week definition. This is a striking result in the sense that the results (fulltime: $\beta = -12.172$, $p < 0.05$ and fulltime: $\beta = -10.48$, $p < 0.05$) suggest that some part-time teachers may be working considerably longer hours than their counterparts. Could this be the case of being employed part-time, being paid part-time wages, but doing fulltime work?

The general expectation would be for fulltime teachers to have a larger amount of overload time than part-time teachers. The results (fulltime: $\beta = -12.172$, $p < 0.05$, and fulltime: $\beta = -10.48$, $p < 0.05$) are therefore counter-intuitive. Could it be that the overloaded part-time teachers are those employed 0.8 of fulltime equivalent: in which case, they have routine tasks to accomplish during their regular days in schools, and so have to prepare for the day they will be off-duty resting? These various conjectures are not explored here – the purpose of this section was simply to document the key determinants of the extent of overload. Further research – or directions of research, will involve identifying factors that influence the extent of overload for teachers in various fulltime equivalent employment status.

Table 5.11A Errors In variables (EIV) Determinants of Teachers' Extent of Overload

	Teachers employment status and length of working week				
	All Teachers	Fulltime Teachers	40-hour week	43- hour week	45-hour week
Factors	β	β	β	β	β
skoolsize	-0.329	-0.155	-0.375	-0.106	-0.162
c19	-2.464	-2.314 †	-2.241 †	-1.702	0.308
c20	1.341	0.460	-0.786	-1.010	-3.881*
hinfac	-0.025	-0.559	-0.520	-0.369	0.007
stscl	-0.690	0.409	-0.421	0.028	-0.212
p	-1.013	0.200	-1.013	0.655	0.038
xcertsc	0.360	-0.295	0.174	-0.118	-0.265
dmo	0.693	0.951*	0.733*	0.719 *	0.816*
dtu	0.726	0.378	0.601	0.708 †	0.401
dwe	1.116*	1.814*	1.779*	1.735*	2.033*
dth	1.195*	1.274*	1.027*	1.513*	1.751*
fulltime	-12.172*		-10.480*	4.020 †	1.940
over40s	0.736	2.099	1.600	1.530	2.359 †
tt1	-0.026	0.083	-0.086	-0.056	0.022
tt3	0.384*	0.301*	0.211*	0.177	0.162
tt5	0.073	0.048	-0.216	-0.251	-0.158
tt7	-0.265	0.019	-0.822	-0.680	-1.127*
tt8	0.925	1.108*	0.392	0.364	0.574
tt9	0.279	0.077	-0.096	-0.237	-0.166
tt10	0.248	0.321*	0.255*	0.277*	0.202 †
tt11	-0.045	0.209	0.020	-0.060	-0.169
dminv	0.392	0.470	0.785	0.468	0.455
constant	-12.482	-35.205	-17.426	-39.114	-40.112
Diagnostics:					
observations (n)	55	50	51	45	38
F	8.92*	15.84*	15.44*	10.50*	13.56*
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000
R-square	0.8598	0.9224	0.9238	0.9130	0.9521
Adj. R-square	0.7635	0.8642	0.8640	0.8260	0.8819
RMSE	3.2973	2.4845	2.3039	2.4286	1.9346

*significant at the 5% level. † significant at higher than 5 but less than 10 percent level

When looking at the overload of fulltime teachers only, the results suggest that three additional variables tend to increase teachers' overload status. These variables are hours of work allocated to Mondays (dmo), time spent on staff supervision (tt8) and time spent performing administrative tasks (tt10). The results reported in Table 5.11.1A suggest that an increase in time allocations for Mondays, Wednesdays and Thursdays will increase fulltime teachers' extent of being overloaded. Similarly, increasing time spent on preparation and planning (tt3), supervising staff (tt8) and performing administrative tasks will increase the extent of teacher overload.

It is important to reiterate that the results reported in the first two columns of Table 5.11.1A are based on a 35-hour definition of a typical working week. It is of significance to establish whether other definitions of a working week will yield factors that influence the extent of overload, that are similar to those given in the first two columns of Table 5.11.1A. The results reported in the last three columns of Table 5.11.1A present EIVREG estimates of factors that influence the extent of teacher overload, using a 40-, 43- and 45-hour working week definition. A total of 51 teachers are overloaded under the 40-hour working definition; 45 teachers are overloaded under the 43-hour working week definition, and 38 teachers are overloaded under the 45-hour working definition. The results for teachers working over 50 hours a week are not presented because of losses in degrees of freedom that occur when trying to use the same explanatory factors used across working-hour definitions.

The results suggest the following: The time budgets for Wednesdays and Thursdays tend to increase the extent of overload for primary teachers working over 40 hours, 43 hours or 45 hours a week. Teachers that are employed full-time are less likely to be overloaded, under the 35-hour and 40-hour definitions of overload status. Teachers aged 40, or over 40 years of age, are likely to be overloaded – although the extent of the effect of age on overload status is fairly marginal (over40s: $\beta = 2.36$, $p < 0.10$). Time spent planning and preparing (tt3) is likely

to increase the extent of overload for teachers working over 40 hours a week. Time spent planning and preparing (tt3) does not contribute significantly the overload status of teachers working over 43 hours a week or teachers working over 45 hours a week. Time spent on informal communication (tt7) tends to be associated with a reduction in the extent of overload for teachers working over 43 hours per week, or working over 45 hours per week. Time spent on administration (tt10) tends to increase the extent of teacher overload for those teaching working over 40 hours, 43 hours or 45 hours per week.

It is noteworthy that the school variables: school size (skoolsz), class size (stsc), kindergarten versus primary teaching (p), do not have any significant effect on the extent of teacher overload across all four definitions of overload status. The time allocated to Tuesday work has no significant impact on the extent of overload for teachers. Similarly, time spent on meetings has no noticeable effects on the extent of overload. These results are important in terms of filtering or identifying the kind of variables associated with the frequent complement that teaching involves long hours and a significant component of overload.

The results reported in Table 5.11.1A show that the allocation of time to Mondays, Wednesdays and Thursdays work consistently increase the extent of teacher overload. Planning and preparation (tt3) increase the extent of overload for the 40-hour week teachers but not for the other cohorts. Supervision of staff has no noticeable effects on any of the teacher cohorts (40-hour, 43-hour or 45- hour). Performing administrative duties (tt10) is significant factor for the 40- and 43-hour week teacher cohorts. There are also other variables that have significant negative effects on the extent of overloads- these are teaching Grade 4 (c20), informal communication with parents and students (tt7). Interestingly, these variables are only significant for the 45-hour week cohort. Two other variables have a marginally significant effect on the extent of overload, only for teachers in the 45-hour working week

cohort. These variables are: (over40s: $\beta=2.359$, $p<0.10$), representing all teachers aged over 40, and time expenditure on administrative duties (tt10: $\beta=0.202$, $p<0.10$).

The diagnostics of the EIVREG results reported in Table 5.11A are encouraging. The F-ratios are significant at the 1 percent level, and the R-squared (R^2) values range from 0.8598 for the over 35 hour overload cohort to 0.9521 for the over 45 hour overload cohort. The R^2 value of 0.8598 is reasonably high, and the adjusted R^2 value of 0.7635 is quite close to the R^2 value. This suggests that the presence of several insignificant values in the EIV model has not inflated the R^2 value. This is a really good result – from an EIV modelling point of view. In addition, to support the notion that the small gap between the two R^2 values reflects good model diagnostics, the root mean square error (RMSE) reported for the EIV estimation for the fulltime teachers' model is lower than that for the model of all teachers, suggesting therefore that there is considerable improvement in explanatory power.

The results reported in Tables 5.11.1A show that care must be exercised in defining the working week, when computing the extent of teacher overload. The results have led also to a discovery of the problem of the overload status of part-time teachers. It is also pertinent to suggest that future work on teachers' workload or time use should have specific variables or categorical variables clarifying the extent of overload. The OLS SUREG, MVREG and EIV results reported earlier in Chapter 5 have used only the overloaded dummy variable. This overload dummy represents only cases where the teacher is overloaded according to the 35-hour working week definition. Future research will involve a nested approach to the definition of overload, through creating dummy variables that captures the extent of teacher overload.

5.12 Effects of Uninterrupted Break Time

As identified earlier in the thesis (Chapter 1), little is known, empirically about the impacts of uninterrupted break time (UBT) on teachers' time use in schools and outside schools. In this section the results of OLS and SUR estimation are presented. These results show the extent of the effects of UBT on teachers' time allocation behaviour of Tasmanian teachers.

From the descriptive results displayed in Table 5.2.2, it is important to now find out the extent to which this distribution of UBT affects time allocation by teachers. Table 5.12.1 shows results of two OLS models: one linear and the other non-linear. These models are simple single factors models estimated as follows: linear OLS, $Y = \alpha + \beta X + \varepsilon$; and, non-linear OLS $\ln(Y) = \ln(\alpha) + \beta \ln(X) + \ln(e^{\mu})$, which is a double logarithmic model. In this two models Y is Sunday time-use of teachers, and X is the UBT variable. The results of ANOVA suggest a significant impact of UBT on linear and non-linear Sunday time expenditure. The OLS results show that the R^2 value of the non-linear model is higher than the R^2 value of the linear model. This value of the coefficient of determination ($R^2=0.1733$) suggests that the UBT factor contributes up to 17 percent of the variation observed in Sunday time-use. The low RMSE of 0.4348 of the non-linear model, relative to the RMSE of 1.51 of the linear model, points to a possibility of the nonlinear model being a better fit to the data than the linear model.

Table 5.12.1 Linear Regression of Teachers' Sunday Time-Use on Teachers' Uninterrupted Break Time (UBT) during the school week

		Model Specifications	
Parameters and Test statistics		(linear)	(nonlinear)
Number of observations		58	46
ANOVA (MSS (model), $df_1=1$)		13.796	1.743
ANOVA (MSE(residual), $df_2=56$)		2.29	0.189
F-value		6.03 ^(a)	9.22 ^(b)
Prob > F		0.017	0.004
R-squared		0.10	0.1733
Adjusted R-squared		0.80	0.1545
Root Mean Square Error (RMSE)		1.51	0.4348
Intercept (α)		2.998	1.67
	SE(α)	0.09	0.46
	t-ratio	18.03	6.47
	p-value	0.000	0.0001
	(α) Lower 95% CI	1.49	2.07
	(α) Upper 95% CI	1.86	3.93
UBT slope (β)		-0.55	-0.41
	SE(β)	0.134	0.22
	t-ratio	-3.04	-2.45
	p-value	0.004	0.017
	(β) Lower 95% CI	-0.68	-1.003
	(β) Upper 95% CI	-0.14	-0.102

Notes:

(a) The degrees of freedom for the linear model are ($df_1=1$, $df_2=56$)

(b) The degrees of freedom for the non-linear model are ($df_1=1$, $df_2=45$).

As expected from a single factor model of the type shown in Table 5.12.1, the intercepts are positive and statistically significantly different from zero. This statistical significance points to a host of crucial factors that have been excluded from the model. It is worth recalling that the key parameter targeted is the coefficient of UBT. The coefficient of UBT (β) is negative in both the linear and non-linear models. This consistent negative signs is also evident in the 95 percent confidence interval estimate for the slope coefficients of the linear and non-linear models. From this negative slope ($\beta < 0$), one can infer, with a 5 percent risk, that an increase

in UBT will lower the amount of time teachers spend on Sunday school work. The next step is to examine and interpret the magnitude of the effect of UBT.

In the case of the linear model ($\beta = -0.55, p = 0.004$), suggesting that a unit increase in UBT will lead to 0.55 unit decrease in Sunday time-use. Since the units of measurement of UBT and Sunday time use are the same (all hours), then it follows that an increase in weekly UBT by one hour (60 minutes) will lead to a reduction in Sunday times of 0.55 hours (that is, 33 minutes). A time gain of 33 minutes on Sunday certainly looks like a small figure; BUT, one has to put it in the perspective of how much school work should be done on weekends, and how much school work is actually done in Sunday. First, as seen from Table 5.12.1, some teachers do not enjoy even 33 minutes of UBT per week at school, and UBT is only expendable during the week. Second, teachers' Sunday time expenditures are typically in the magnitude of 2 to 4 hours, therefore a 33 minute saving on Sunday times is a large proportion of Sunday time. In some individual cases, the savings in teachers' Sunday times, by increasing weekly UBT, may well equate to doing enough sufficient work during the normal week in a manner such that there will be hardly much need working on school work during the weekend.

In general, the results reported in Table 5.12.1 suggest that: (i) UBT lowers Sunday time allocation of teachers, and (ii) the non-linear model is superior to the linear model. The model specification has a relatively higher explanatory, especially for a single factor model. The results reported in Table 5.12.1 indicate that (i) effect of UBT on Sunday time-use, and (ii) the relative performance of the nonlinear model. These results must be looked at in the context of results reported in Section 5.10. What has already been incorporated in Section 5.10 is the effect of the UBT variable on all days of the week, in a model that: (i) is inclusive of other variables, and (ii) has embedded contemporaneous correlation. For example, as emphasised, earlier, in Section 5.10.5 and 5.10.6 the rationale for using SUR is rooted in the

observation that how a teacher allocates time in any one given day governs and is also governed by time allocation in other days. In other words, what may seem to be an unrelated allocation of time across days may be actually related (Cochrane & Logan, 1975; Greene, 1993). The results reported in Table 5.10.5A and Table 5.10.6A on the SUR determinants of daily time budgets have already suggested that increasing break time reduces teachers' Sunday time allocation (UBT: $\beta = -0.55, p < 0.05$), and marginally affects Monday (UBT: $\beta = 0.52, p < 0.10$), and Tuesday (UBT: $\beta = -0.44, p < 0.10$) time budget allocations. That is, a minute increase in teachers' UBT is likely to lead to a 0.55 minute decrease in Sunday and Tuesday work times, and marginally increases Monday work times. Increasing UBT decreases Wednesday (UBT: $\beta = -0.83, p < 0.05$), Thursday (UBT: $\beta = -1.00, p < 0.05$), and Sunday (UBT: $\beta = -0.99, p < 0.05$), time shares. The results obtained from SUR suggest that teachers who enjoy significant UBT are less likely to allocate a significant amount of their work time to work on Sundays. The results in Table 5.12.2 support the finding in Tables 5.10.5A and Table 5.10.6A. The results reported in this section are a special result because UBT has maintained its sign, magnitude and direction; and, UBT does not affect any other time allocation significantly and to the same magnitude, in the OLS, and SUR.

5.13 Concluding Remarks

The results reported in this chapter suggest that time budgets and time shares measure different but complementing aspects of teachers' work, and thus should be used separately and together, and their respective results interpreted accordingly. The variables that affect time budgets and time shares are also different – so are the parameters that measure the extent of the influence of teacher, school and policy variables on time budgets and time shares. Tests of differences in daily time allocation behaviour of teachers also show that time in

schools is allocated differently on each day. Peaks are obvious at the start of the week, declining gradually, and eventually spiking on weekends, particularly Sundays.

Equally significant in this chapter is the use of a suite of econometric techniques to estimate time-use behaviour. The results from the use of these techniques and the results, thereof, are important in terms of contributing to an empirical understanding of how teachers allocate their time. By providing a suite of techniques (OLS, SUREG, MVREG, IVREG, EIVREG), other researchers may pursue the further research directions that are possible given the assumptions and theoretical premise of this suite of techniques. In the context of this thesis, the suite of techniques has clearly shown that time budget and time share analyses yield different results for different types of modelling pursued. An additional contribution highlighted in this chapter is the estimation of the extent of overload. This is particularly significant as workloads are the last part to the series of questions to be answered under the constructed conceptual framework. What has also been creative in the analysis of workloads has been the inclusion of various definitions of excess work. The results show that determinants of the extent of overload differ significantly across definitions of overload used. Caution in interpreting these findings is therefore required. What is striking though is the ability of the models to show clearly the impacts of UBT on teachers' time allocation.

CHAPTER 6

DISCUSSION

6.1 Introduction

The research objectives of this thesis were to: (i) review the literature on time-use in general and time-use by teachers in particular, (ii) provide a conceptual framework for the analyses of teachers' time-use, (iii) provide an empirical framework of teacher time-use, (iv) develop an empirical framework using data from an earlier study by Gardner and Williamson (2004), (v) present a profile of teachers' time-use in Tasmania, and (vi) evaluate, empirically, a model of teachers' time-use, using available quantitative and qualitative variables from the Gardner and Williamson (2004) study. The aim of the thesis was to review the literature on time-use; and, provide and test a model of teachers' time-use based on a conceptual and analytical framework of teachers' time allocation. The empirical results on Tasmanian teachers have been presented in Chapter 5 of this thesis.

In this chapter a discussion of the results is provided. The discussion focuses predominantly on the significant findings of the thesis. These significant findings are classified into three categories of results of significance. First, it is important in this chapter to discuss the extent to which the results from an earlier chapter (Chapter 5) have confirmed what has been documented previously in the contemporary literature on teachers' time-use, workloads and work lives. Second, in addition to confirming some of the stylised facts in the literature, it is important also to report the results that are strikingly different from what has been suggested in the literature. Third, it is important to present and discuss what new evidence has been found in the thesis. This third category encompasses those results that add new knowledge. In particular emphasis is placed on discussing the contribution of the new approaches to the evidence on teachers' time-use – notably, the use of the metaphor of the teacher's thumbprint, the use of time shares along traditional time budgets, and the contribution of a suite of

econometric models in the form of the OLS, SUREG, IVREG, MVREG and EIVREG methods, as implemented using Stata 9.

The discussion is presented in the following format: For each results section of Chapter 5, first stylised facts are confirmed; second, counter-intuitive results are noted; third, the addition of new knowledge is highlighted; fourth, the significance of using time shares alongside the traditional time budgets is stressed; and, finally, some crucial policy recommendations that flow from the results for the respective sections in Chapter 5 are extracted. The results reported in Chapter 5 involve quite an extensive list of tables. To make the discussion tractable, it has been necessary and important to create a section that outlines how the discussion is structured. The layout of this discussion chapter has therefore given considerable mention below.

This discussion chapter is therefore structured as follows: A general summary of the key results from Chapter 5 is presented in Chapter 6.2. This summary is important in showcasing the key findings that have come from Chapter 5, and which will guide the direction of the discussion. In addition, the summary shows the ‘three categories of significant results’. In Section 6.3 a discussion of the results of teachers’ time allocation, presented earlier in Section 5.3, is presented. Similarly, the discussion of the results of teachers’ school activities, presented in Section 5.4, is presented in Section 6.4. Section 6.5 comprises a discussion of the results from the inferential analysis on time budgets and time shares (presented earlier in Section 5.5). The results or the link between teacher characteristics and time allocation reported earlier, in Section 5.6, are discussed in Section 6.6. The results of the relationships between school characteristics and teachers’ time allocation, reported earlier in Section 5.7, are discussed in Section 6.7. Section 6.8 presents a discussion of the evidence of correlations of time shares and time budgets. This discussion is based on the unique evidence that was presented earlier in Chapter 5 (Section 5.8). Determinants of the number of activities

undertaken by teachers are discussed in Section 6.9 This section, therefore, links the results reported in Section 5.9 to what is stylised or otherwise in the literature. The results of the new techniques for analysing teacher time-use (Section 5.10) are discussed in Section 6.10. Determinants of teacher overload presented in Section 5.11 are discussed in Section 6.11. The impacts of uninterrupted break-time (UBT) presented in Section 5.12 are discussed in Section 6.12. It is clear; therefore, from the account given above that the discussion of the results presented in Section 5.3 is presented in Section 6.3. Similarly, the discussion of the results presented in Section 5.4 is presented in Section 6.4, and so forth; and, a discussion of the results in Section 5.12 is presented in Section 6.12. Concluding remarks are drawn in Section 6.13.

6.2 General Summary of Results for Discussion

Time in schools is certainly very topical for teachers and administrators. Most teachers certainly work in excess of 40 hours a week. A significant amount of weekend time is allocated to school work. Education reform has made these work pressures significant in teachers' work lives. Although teachers are working longer hours, the proportion of time allocated to teaching remains relatively low. The number of activities performed by teachers has nonetheless increased resulting in each activity having its own significant increased time-thirstiness. The time-thirstiness, time-squeeze and intensification of teachers' work also vary between and within days, and by teacher characteristics. Different days have different demands on teachers' time-use. What is clear from the results is that differences in Tuesday time allocations are dominant. The analysis of time behaviour of teachers using time budgets and time shares shows that the two approaches (metrics) give results that although different, complement each other nonetheless.

Time-use behaviour of teachers also differs considerably by selected teacher characteristics, such as age, teachers' life cycle, full-time equivalent (FTE) status, and length of teaching experience, to name a few. Time use behaviour also differs by school characteristics. Teachers in small schools tend to allocate longer work hours than teachers in larger schools. The pattern of teachers' time expenditure does not seem to differ and vary considerable across school locations.

One key contribution made in this thesis is describing teachers' work using both time budgets and time shares. Evidence presented in the thesis show that the two metrics are correlated, although not on a one-to-one basis. The relationship between the time budgets and time shares also changes across teaching days. These two metrics are related also to different teacher, school and time-use behaviour variables.

The number of activities performed by teachers varies inversely with the teachers' time endowment. Full-time teachers with several years of teaching experience are more likely to be involved in a larger proportion of school activities. The results show that teachers' work has generally intensified, even when using the number of activities undertaken as a metric. The increase in the number of activities is related also to the prevalence of the teachers' Sunday work ethic. Teachers that enjoy considerable breaks during the week are less likely to have significant time expenditures on Sundays.

Another key uniqueness in this thesis is the modelling of teachers' time-use and testing the model empirically, using a suite of econometric techniques. The results of using this suite of econometric techniques to explain teachers' time-use suggests that Seemingly Unrelated Regressions (SUREG) yield empirically robust (superior) explanations of teachers' time-use, compared to equivalent models tested in Chapter 5 of the thesis. The trade-off in time-use

across days is captured clearly, and the diagnostics show relative advantages of the SUREG compared to the OLS, MVREG, IVREG, and EIVREG.

The results for the determinants of teachers' overload status suggest a need to focus on various definitions of what constitutes normal and excessive load. The result show that increasing Monday time-use generally increases teachers' overload status. Increasing Tuesday time-use is unlikely to increase workloads significantly (possibly a signal of maximal possible adjustment to the Tuesday time allocation ethic). Clearly increasing Wednesday time allocations tends to be related to an increased overload across all definitions of teacher overload status. Planning and preparation (tt3) increase the extent of overload considerably. Equally significant is the impact of performance of administrative duties (tt10) on the extent of teachers' overload status. Teachers' time allocation to weekend school work is also influenced significantly by the extent of unencumbered time teachers enjoy in schools. The impact of UBT is of considerable policy relevance.

6.3 Descriptive Statistics on Teachers' Time Allocation

The analyses of time budgets over a typical week show that on average teachers spend between 6 and 9 hours on a typical working day (Monday-Friday) of the week. The allocation of time is definitely over 35 or 40 hours a week; excessively over 50 hours per week, and in some cases, well into 60 hours per week. This finding is consistent with the view of teachers 'working like engines ... for extremely long hours' (Perlow, 1991, p.1), and other descriptors that populate the literature (Johnson, 1990; Drago et al., 1999; Collet, Menlo & Rosenblatt, 2004; Churchill & Williamson, 2004; Gardner & Williamson, 2004; Williamson & Myhill, 2008). What has also been found in the thesis which is new evidence is the extent of weekend time allocation behaviour of teachers. A significant number of teachers allocate copious amounts of time on Sundays, to work-related activities. There is a general sense that there is

“more time at home in the evening and during the week and the weekend [for] marking, planning and preparing ...” (Galton et al., 2002, p.7), and that “weekends are ideal time to put finishing touches to lesson plans ...” (Kutcy & Schulz, 2006, p.821). A policy recommendation is indeed that these teachers’ Sunday times may not be sustainable long term and need to be curtailed significantly and adjusted to reflect the realities of work in other equally demanding occupations.

This picture of overloaded, overworked and possibly overwhelmed teachers is consistent with findings that work in schools involves considerable time pressures, long hours, and a critical shortage of time (Huberman, 1993; Hargreaves, 1994; Drago et al., 1999; Thody, Gray & Bowden, 2000; Easthope & Easthope, 2000; Collet, Menlo & Rosenblatt, 2004; Churchill & Williamson, 2004; Gardner & Williamson, 2004; Williamson & Myhill, 2008), and certainly reinforces the thought (thesis) that time is both a resource and a constraint (Ngwenya et al., 2010). The average time spent by teachers on school activities during a typical week does not seem to vary very much. The lack of variation is the kind of result that is traditionally reported in most research on teachers’ time-use that relies solely on time budgets. When the time budgets of teachers are converted to time shares in order to show the actual time expenditure power of each day at school, a unique and completely different picture takes the foreground. The results, expressed as time shares, show that close to 41 percent of the teacher’s time is actually spent on Mondays and Tuesdays, with Fridays pulling only 14 percent of the teacher’s time. Interestingly, the weekend (Saturday and Sunday) absorbs close to 7 percent of the teacher’s weekly time. This result is not obvious in the literature on teachers’ work, except from Galton et al., (2007), Williamson & Myhill, (2008, p.30), Ngwenya (2009a) and Ngwenya et al. (2010), and certainly marks a major contribution of the thesis in terms of: (i) presenting a new framework of calculating tradeoffs in time-use (using time shares); and, (ii) in being able to show the advantage of using the method of time shares

alongside the traditional method of time budgets. A critical recommendation from this result is that policy analysts should consider reporting both sets of results if sustainable and workable prescriptions on teacher workloads are to be made.

It is important for policy makers to look at the likely impact of weekend work on teachers' working lives, family lives, relationships and even teachers' view of teaching as a profession, and the likely impact of weekend work on attracting new teachers to the profession. The literature (for example, Johnstone, 1993; Marginson, 1993; Hargreaves, 1994; Seddon, 1997; Ingersoll, 2001; Kutcy & Schulz, 2006; Wotherspoon, 2008) also shows that education administrators and departments have not acted proactively in terms of addressing teachers' workloads and related stress. In some instances "administrators seem to lack an understanding of the boundaries of teachers' professional lives" (Kutcy & Schulz, 2006, p.84). Perhaps one reason for this inaction could be that the traditional use of time budgets conceals the time-squeeze and work-intensification that teachers are really under. The use of time shares, as suggested in this thesis, presents both the teachers' time-squeeze and work-intensification in a way much more pronounced than that achieved by the time budget studies. This is a unique contribution of this thesis, and one that is certainly worth reiterating.

While it is necessary to find evidence that supports the teachers' work intensification thesis (theory), it is prudent to also identify the determinants of time-use across all activities that teachers perform. In other words, now that it is clear that teachers' work has been intensified, it is then important to establish which activities have actually intensified teachers' work. The results reported in Section 5.3 show only an average of less than 16 hours of teaching in a week. Of these 16 hours just over 12 hours are spent teaching alone, and about 3 hours are spent teaching with others. In the context of a 35-, 40- or 50-hour working week, it is clearly the case that 16 hours a week represents a very low proportion of time dedicated to teaching. No wonder teachers are 'screaming' for more time to do – exactly that – TEACH (Smyth,

1995; Swain & Swain, 1999; Timms, Graham & Cottrell, 2007), instead of “spending more time as secretaries and accountants than teachers” (Goddard, 2000, p.315). Teachers are juggling a very large set of activities (Ngwenya, 2009b) and preparation time dominates teachers’ time-use. There is a “sense of uneasiness” (Collinson & Cook, 2001, p.270) with overloads, and a reality of being overwhelmed by work (Gardner & Williamson, 2004). The ‘uneasiness’ and ‘reality’ raise a significant question: What is the main dimension (domain/role) of a teacher’s work?

Most would answer that question by indicating that teaching is the main domain of teachers. The data and results reported in this thesis show that time budgets and time shares allocated to a myriad of teachers’ activities do vary significantly over time. Clearly there is a shift in emphasis when it comes to the varying domains of teaching and the kind of time-squeeze that each domain commands. From the work of Gardner and Williamson (2004) it is clear that teachers are becoming increasingly frustrated by the inordinate amount of time taken by activities other than teaching. The cry by teachers regarding *‘letting them do what they are supposed to do’* is quite loud in some of the qualitative analysis on teachers’ work lives (for example, Goodson, 1992b; Day et al., 2000; Day & Leitch, 2001; Galton & MacBeath, 2002; Galton & MacBeath, 2002; Gardner & Williamson, 2004; Day et al., 2007; Sammons et al., 2007; Huntly, 2008). The results reported in the thesis show clearly that a very low proportion of time is allocated to teaching time consistent with the observation made in other settings (see Hornberger, 1987).

From a policy point of view, this low use of time for teaching has implications for the educational goals of schools. This low use of time for teaching purposes should not be construed, however, as suggesting that other domains of teachers do not matter. On the contrary, the low use of time for teaching highlights that education reforms need to look at the shifts in focus and also appreciate how hard it would be for teachers to understand and

respect the purpose of educational reforms, especially if they view such reforms as robbing them of time that they need most (for a job – teaching – that they consider so important to be given little time).

The changes in time allocated to teaching and non-teaching work (analysed using time budgets and time shares) may indeed reflect the observation that “societal developments in several domains confront teachers ... with even more ... demands” (Clement & Vandenberghe, 2001, p.81). More-so, most teachers find that dealing with “other stuff ... besides teaching” (Kutcy & Schulz, 2006, p.83) quite challenging, and stressful; and, the reality of paperwork to the eyeballs (Gardner & Williamson, 2004), and ‘*administrivia*’ (Goddard, 2000; Williams & Gersch, 2004) is also a daunting task that has reduced teachers’ roles to that of “secretaries and accountants” (Goddard, 2000, p.315), as well as creating what is considered ‘excessive and unproductive committee work’ (Johnson, 1990), or work-invasiveness (Drago et al., 1999). The ‘other stuff’ that is shown by the time shares and time budgets used in this thesis may well reflect changes in teachers’ roles in schools particular if “schools are taking up the slack left by other institutions ... and teachers are now required to play the role abdicated by church, family and so forth” (Goddard, 2000, p.314).

6.4 Teachers’ Activity Time Budgets and Activity Time Shares

The descriptive results reported earlier in Section 6.3 highlighted the tendency for teaching times to be lower on average across teachers, schools and teaching days. This result was considered counter-intuitive. Given that the discussion was around a counter-intuitive result, it is pertinent to further explore and discuss the result further, from the point of view of inferential analysis. To accomplish that in the discussion focus/attention is drawn to the means and confidence intervals of activity time budgets and activity time shares. The 95 percent confidence intervals for teaching alone suggest that teachers spend on average

between 11 and 14 hours a week, teaching alone. This indeed, is a low volume (quantity) of time spent on teaching alone. This result confirms earlier descriptive results (section 5.3) discussed in the previous section (Section 6.3).

Clearly, the result showing a low proportion of time allocated to teaching is statistically valid. From the results of activity time shares, it is also clear that time shares tend to make the difference in allocation of time to activities less subtle. Certainly teachers find themselves using up to 26 percent of their time planning and preparing for teaching, and then spending almost a similar proportion of time, (28 percent teaching alone and 7 percent teaching with others), doing the actual teaching. These two proportions are interesting in many respects. First, the two proportions suggest that around 64 percent of the teachers' time, over a typical week, is spent on planning, preparing for teaching and actual teaching. This leaves close to 40 percent of teachers' time to do other things. These other things that teachers do **do** serve a purpose, and in some cases make learning possible. The activities are necessary activities that are required by schools, communities, teachers and reformers, but may in some cases make teaching ineffective. The ineffectiveness is a result of the relative value of the teacher's time away from the classroom compared to the teacher's time in the classroom. Certainly, administrators may view time away from the classroom as more valuable than teachers' time in the classroom, and thus split time-use between classrooms and outside classrooms according to their perspectives. It is debatable whether the balance in time-use between classroom and out of classroom work has been the right balance in terms of getting education outcomes right. Clearly, education policy is changing rapidly, and new or revised domains are ever-emerging.

It is not clear, however, what domains will be required in the future, and how teaching will be redefined as online learning, mobile learning, blended learning, and new types of schools and educational technologies take the foreground. Societal demands on schools may also

necessitate a different split in the pattern of time-use in schools and outside schools. Are future reforms likely to change this ratio to 40/60, in particular given the growing use of online learning (at school and out of school)? Do these results suggest a gradual demise or decline of the teacher in the classroom doing the ‘chalk and talk’? Is this split carving the way for the new teacher who is online for online teacher-student discussion?

These are all moot questions that are relevant but may need the data and analyses thereof to be more detailed than has been presented in Section 5.4.2 earlier in Chapter 5. What is crucial though, and indeed a strong message from this thesis is that teachers’ contact with students has actually been reduced to a 35/65 split because the planning and preparation for teaching is not necessarily a teacher-student face-to-face activity. Put in real numbers – this message is that teachers’ face-to-face work can be done in 35 percent of their 35 to 40-hour week. The maths shows 12 to 14 hours in a week. Certainly, employing teachers for 26 hours a week for face-to-face teaching looks fairly excessive. So what is the story? Well, this 35/65 split is actually too subtle and concealed in the numbers.

To clarify the 35/65 split, it is important to revisit an argument made earlier. Recall that the results show that on average 28 percent of the time is spent on teaching alone, and 7 percent of the time is spend on teaching with others. Teaching therefore takes 35 percent of the teachers, during a typical weekly time, on average. The rest, 65 percent is spent on other non-teaching activities - this is the 35/65 split. From the anecdotal evidence – the allocation of a larger share of school time to non-teaching tasks is causing the greatest anxiety among teachers, as it creates constraints or barriers to effectiveness of school reform (Clement & Vandenberghe, 2001; Gardner & Williamson, 2004; Williamson & Myhill, 2008).

What is also fascinating in this discussion is the way in which the time shares show the dichotomy in teachers' time in the classroom and out of the classroom during school time. To see the significant contribution of time share analyses, focus attention on the implications of education reform that emanate from these two expressions. The time budget policy maker's point of view is something like this:

Teachers spend 26 hours planning, preparing for teaching and teaching during a typical week. Under the assumption of a 35-hour week, that leaves only 9 hours for everything else to be done. Under a 40-hour week, that leaves only 14 hours for everything else to be done. Whether it is 9 or 14 hours, this time will be used for professional discussion with colleagues, communication with parents (formally or informally), supervising staff or students, attending meetings, spending time on duty, as well as performing extra school expectations. [Italics and indentation for emphasis only; and, the content is the author's summary and elucidation of perspective].

Yes, from this viewpoint teaching has been given a lot of time, and the other school activities have been jammed into a 9-hour or 14-hour time frame. Well, the time share policy point of view is different and it goes something like this:

Of the time available to do all the work required and accomplish all the tasks, 30 percent of the time will be allocated to teaching alone, and around 30 percent will be absorbed by planning and preparation (Ah! Most planning and preparation will be done outside school hours, so the remaining 40 percent; (no!!!, remaining 70 percent) will be spent on professional discussion with colleagues, communication with parents (formally or informally), supervising staff or students, attending meetings, spending time

on duty, as well as performing extra school expectations. [Italics and indentation for emphasis only; and, the content is the author's summary and elucidation of perspective].

Since most planning and preparation is done at home during school weeks and during the weekend and holidays then certainly the split between teaching and other school activities is indeed a 30/70 split. It is important at this juncture to point out that data presented in this thesis does not explicitly tease out the planning and preparation for teaching that is done during school hours. A cursory look at the diaries suggests, however, that little time is spent on preparation during school time (Ngwenya, 2009b). The variable 'mybreak' used in the analyses and throughout the thesis also supports that assertion (Ngwenya, 2009a; Ngwenya, 2009b). The use of cyclical or timetabled time in schools is too tight to allow for devoting school time to preparation and planning. Informal verification with a few teachers on this lack of preparation time during school time, and reading the reflections in diaries of Tasmanian primary school teachers, suggests that most planning and preparation is definitely done by teachers after hours, during weekends and during their holidays (Collinson & Cook, 2001). The literature also supports this assertion (Gardner & Williamson, 2004; Kutcy & Schulz, 2006), and points to the desire by teachers to have more time instead of the case whereby putting "teacher's hat on, it stays for twenty-four hours a day" (Kutcy & Schulz, 2006, p.84).

A third way of confirming this lack of planning and preparation time, at school, is by assumption. Assuming that teachers spend roughly equivalent proportions planning and preparing over a 5-day typical week, then the 11.22 hours expended on planning and preparation (see results in Chapter 5, Section 5.4, Table 5.4.1A) suggest an average daily allocation of 2.6 hours (that is, $11.22/5$). Therefore, around 2.6 hours are expended on planning and preparation on a typical teaching day of the week. This value is certainly lower

that weekend hours spent by teachers (compare with 3.13, Chapter 5, Section 5.3.1, and Table 5.3.1). In addition, it is important to recall that teachers tend to enjoy only 1.84 hours break time per week (see Table 5.3.1), on average.

6.5 Differences Between Teachers' Daily Time Allocations

In looking at the time-squeeze or work intensification of teachers' work, it is important to make between-day (inter-day) comparisons of teachers' time allocations. This thesis has focused mainly on inter-day time allocations, and not intraday time allocations. This has been done because of the dearth in data and the limited degrees of freedom that result from attempting an analysis of intra-day allocations, using data from only 85 primary and kindergarten teachers. It is acknowledged, though, that a study of intra-day time allocations is warranted as a future direction of this thesis. In the context of current work in this thesis, attention is focused therefore on discussing the results of the inter-day time budget/share comparisons presented earlier in Section 5.5. In addition, it is important to comment on the extent to which these inter-day comparisons differ across teachers' employment status, and other demographic variable that are significant in the literature (see for example, Holliday, 1992; Chebat & Zucarro, 1995; Williams & Gersch, 2004; Ingvarson, Meiers & Beavis, 2005; Painter, Haladyna & Hurwitz, 2007).

6.6 Teacher Characteristics and Time Allocation

Attention in this discussion is now focused on teacher characteristics and time allocation differences. Recall that the results presented in Section 5.6 show no significant differences in the time budgets of teachers aged 41-50 years and their counterparts. The time shares, however, showed that there are significant differences in time allocations for Tuesdays and Sundays between the 41-50 age group teachers and their counterparts (Giacomino & Gose, 2002; Ngwenya et al., 2010a; Ngwenya et al., 2010b). Clearly the two methods (time budgets

and time shares) yield different results. One would be comforted, therefore, by the intuitive view that not all teachers' days are likely to be similar in terms of their time-squeeze across various teacher age groups, given that teachers are generally in different life-cycles (Giacomino & Gose, 2002; Krantz-Kent, 2008). It is, therefore, conceivable and believable that the time share approach has yielded additional value to the findings in this thesis.

Clearly from the results, not all days are equivalent (Giacomino & Gose, 2002; Krantz-Kent, 2008). The Tuesday and Sunday effects are quite pronounced (Ngwenya, 2009b; Ngwenya et al., 2010a; Ngwenya et al., 2010b). Older teachers seem to work fewer hours on Tuesdays and longer hours on Sundays than their counterparts (younger teachers). Younger teachers are the opposite – spending longer hours on Tuesdays and fewer hours on weekends. The time budget result of no significant difference in the time allocation between teachers of different age groups is inconsistent with the literature on teachers' life cycles, teachers' work lives, job satisfaction, continued commitment to teaching and the literature on documented experiences of beginning teachers (for example, Kutcy & Schulz, 2006; Peralta, 2006; Painter, Haladyna & Hurwitz, 2007; Melnick & Meister, 2008).

The findings from time shares also are inconsistent with earlier studies on beginning teachers and time pressures they face. What is new from these results on the link between age and time allocation is that younger teachers do more, consistently, on a particular day of the week – Tuesday. This working day effect is quite a new result which so far has not appeared in the literature (to the best of the search conducted throughout this thesis). The fact that Tuesday is particularly unique in the Tasmanian study is also of theoretical, research and policy interest. One can only speculate on the Tuesday effect because it has not been possible to tease this issue further within the constraints the past literature on day effects (Giacomino & Gose, 2002), and the limitations of the data. Why Tuesday may be a unique day for Tasmanian teachers of different age groups is something to pursue in further studies, using the

Giacomino and Gose (2002) segments as a starting point. For the time being it might just suffice to flash the point that some of the statements and themes shown in the diaries suggest that Mondays are generally ‘ease into it’ days, and the ‘bare bones’ of work gets done on Tuesdays. More-so, Mondays are often punctuated by holidays, and; typically, Wednesdays are often allocated to sport activities, and the general tapering of work times for the rest of the week – all that leaves Tuesday as being the heaviest day in a teacher’s teaching week (Giacomino & Gose, 2002), and a day of the week in which productive work can be done.

How the younger and older teachers deal with this Tuesday effect is also of interest. It is pertinent to speculate that older teachers are likely to compensate for the hectic pace of Tuesday by planning and preparing on weekends. On the other hand, younger teachers may have a different type of socialisation on weekends, which may translate to a significant shift in workload and work-focus on Tuesday. That speculation is certainly consistent with the observed differences in time share allocations (Giacomino & Gose, 2002; Ngwenya, 2009b; Ngwenya, 2010). This observed Tuesday effect is important for policy, especially if there are any moves to shorten the length of teaching days. Certainly, cutting down on any time available on Tuesdays may have a negative impact on school effectiveness.

When looking at time shares of teachers in different fulltime equivalent status, it is clear again that other day effects, in addition to the Tuesday effect, are significant. For example, fulltime teachers spend significantly less time on Tuesday than their counterparts. This result is the opposite of what is shown in time budget results where part-time teachers spend less time on Tuesdays than their counterparts. However, the Friday effect is the reverse – fulltime teachers spend more time on Fridays than their counterparts.

The prevalence of these day effects is also evident in time shares of kindergarten and primary school teachers. From the results reported earlier (see Section 5.6.3, Table 5.6.3A),

kindergarten teachers have a strong Tuesday and Friday effect compared to their counterparts (teachers in primary schools), who have a dominant Wednesday and Thursday effect. Interestingly, the weekend (Sunday) effect is not as pronounced in this result. Anecdotal evidence, based on checking teachers' time diaries and reading comments presented therein, suggests that, in the case of kindergarten teaching, there is considerable preparation, planning, cleaning and setting up that actually occurs in the school on Friday as a requirement for the following week's teaching. Teachers spend some additional time setting up classes on Fridays and Tuesdays. The practice would suggest that very little, if any, preparation by kindergarten teachers is done over the weekends.

The observed day effects and differences in the allocation of time by primary school teachers have motivated the inclusion of fulltime employment status and primary teaching as explanatory variables in advanced modelling on time-use reported in Section 5.8 onwards in the results chapter. In addition, these day effects motivated the SUREG and IVREG calculations that are designed to show the dominance or the time-squeeze effect of each day on the teachers' time allocation.

The length of teaching experience has also been taken into account. One would have expected to see clear differences between more experienced and less experienced teachers. Yes, in general, more experienced teachers have allocated more hours than their counterparts (less experienced teachers); however, the Monday and Friday effects seem significant. It is not clear why Monday and Friday time shares are different between experienced and the less experienced teachers when using time budgets than when using time shares. It could be that these two groups conceive time differently, and hence indicate different relative time endowments using time budgets, and different relative time tradeoffs as shown using time shares. The literature is scant on this result (see Kutcy & Schulz, 2006), and this result therefore marks a unique contribution of the analysis of time-use employed in the thesis. It is

worth pointing out though that a view is held that the new generation of teachers may hold a different perspective of teaching as a profession, and as such bring a “different set of expectations ... [and] ... working at teaching seven days a week is not one of these expectations” (Kutcy & Schulz, 2006, p.84).

The use of teaching experience is useful in as far as it related to the mid-career argument presented earlier in the literature (see Sammons et al., 2007; Day et al., 2008). In the context of the literature, emphasis has been placed mainly on teacher’s age and this also correlates positively with teacher’s experience. However, in the context of older teachers entering teaching career rather late, it becomes prudent to distinguish experience effects from age effects in the analysis of teachers’ time allocation behaviour. Exploring the teaching experience effect is important for understanding teachers’ commitments (Day et al., 2008), life cycle stages, quitting and non-quitting behaviour; and, in the case of this study, also accords significant degrees of freedom than those offered by the age categories, or other studies (Easthope & Easthope, 2000).

So far, three teacher characteristics have been discussed; these characteristics are age, employment status, and length of teaching experience. The last selected characteristic being discussed is the effect of teaching out-of-area. The discussion that follows is based on the results reported earlier in Section 5.6.6. The general picture from the results presented in Table 5.6.6 of Section 5.6.6 is that teachers teaching out of area of expertise tend to spend significantly less time than their counterparts (those teachers who are not teaching out-of-area). This result is obviously counterintuitive because one would expect the work demands of teaching out-of-area to be such that an inordinate amount of time is being devoted to collecting material, familiarising oneself with the new area, reading widely, consulting widely with colleagues and mentors and the like, and also attending professional development sessions. The results suggest the contrary – less work or time on tasks is being

done by those teachers that are teaching out-of-area. There are a few possible and plausible explanations that definitely require further exploring. First, it could be that those teachers teaching out of area of expertise receive considerable help, or team-teach, to an extent that they may not find reason or cause to invest the inordinate time. Second, it could also be because those teaching out of area of expertise are teaching in areas that they have no intention of staying in long-term. As a result these teachers may, therefore, prepare the least, and aim at just surviving their time teaching out-of-area of expertise up until a time comes when they land their feet on an area that they are comfortable with. Third, it is also possible that these teachers are employed on a fractional basis or involved as relief teachers, and thus are unlikely to place a significant amount of time into preparation especially if these teachers are assigned classes arbitrarily.

6.7 School Characteristics and Teachers' Time Use

So far the discussion has attended to the descriptive analysis of teachers' time allocation (Section 6.3), teachers' budgets and time shares (Section 6.4), differences in daily time allocations (Section 6.5), and teacher characteristics and teachers' time-use (Section 6.6). In this section attention is drawn to school characteristics and teachers' time-use. It is important, also, to discuss the interaction of school characteristics and teachers' time-use. This section, Section 6.7, presents a discussion of differences in teachers' time allocation behaviour and school characteristics (school size and school location). The discussion is based on the results reported in Chapter 5 (Section 5.7, particularly, Tables 5.7.1A, 5.7.2A and 5.7.3A). It is important to recall that the results from these tables suggest that: (i) smaller schools tend to have, on average, longer hours than larger schools (Table 5.7.1A); (ii) larger schools have significantly larger Friday and Sunday time allocations (See Table 5.7.2A), and (iii) the pattern of time expenditure is consistently similar across all school locations. In other words,

no discernible differences in time allocations were observed across schools in different locations.

6.8 Correlating Activities, Time Budgets and Time Shares

The key result of correlating the number of activities performed by a teacher over a typical week, and the time budgets and time shares show the following: first, the number of activities undertaken by a teacher is positively related to the time budgets of all days of the teaching week, suggesting that an increase in teachers' activities is likely to be associated with an increase in teachers' time budgets. What is striking is that although time demands will increase overall, the share of time allocated to tasks (these are the time shares) are not related to the number of activities undertaken by the teacher. Second, and most significant; is that the correlations between time budgets and the number of activities tell a story that is different to that portrayed by the correlation between time budgets and time shares. The argument from the time budget perspective would be that increasing the number of activities that teachers undertake will be related to increases in hours spent on all the days of the week. The argument from the time share perspective is that teachers perform a defined set of tasks – therefore any increases in the number of tasks will be unrelated to the share of time allocated to activities over a typical day. Well, the two arguments, although seemingly unrelated (or different), may actually complement each other in a unique way.

This complementary role can be shown with an aid of an example. For example, the reaction of Tasmania teachers to the various educational reforms in Tasmania points to a concern that time is stretched too far already for the teachers to be able to implement the reforms or cope with the stream of changes (Easthope & Easthope, 2000; Gardner & Williamson, 2004; Mulford & Edmunds, 2009; Mulford & Edmunds, 2010). The complexity of the reforms, the frequency of reforms, and the effort required to understand these reforms has required

copious amounts of time – to the point that the activity space is saturated. The results may imply that in response to reforms teachers have increased their daily workloads, hence the increase in time budgets across the board. If the time pressures of reforms have been consistent across the teaching days and if teachers have not made any adjustments to the way they allocate time (in proportions), then the proportional allocations would have remained unchanged (constant).

The insignificant correlation between time shares and the number of activities is of significance, in a unique way, for the following reasons. First, given that time budgets are correlated to teacher activities, whereas time shares are not correlated to teacher activities, then certainly it is not a matter of a preference or choice – time budgets over time shares or vice versa. Rather, it is useful to think of the measurements being used jointly to explain teacher time allocation. This is what the SUREG and IVREG estimation results accomplished in this thesis in Section 5.10.7 and 5.7.8. Second, the correlations highlight that there are instances where time shares can mask a significant phenomenon. The caution to researchers adopting the time share approach is that they must understand clearly what the time shares are calculating, and interpret the results accordingly – just like they would do for any other technique.

An appreciation of how time budgets and time shares complement each is best understood by giving another small example, in the context of teachers' work. In this example, consider a situation in which a teacher allocates seven (7) hours a day to her school activities. Over a 5-day teaching week, a total of 35 hours are therefore expended. In terms of time budget analysis, 7 hours are spent on each day, and according to time shares one-fifth ($1/5$) of the teacher's time is spent on all the activities for a given day. This time share is 20 percent for every working day. Now, suppose the number of teachers' activities increases as a result of education reform, and the increase in the number of activities requires that teachers spend an

extra hour a day attending to the additional school activities or reform requirements. According to the time budget analysis the teacher now expends an extra hour for each day, bringing the daily total to 8 hours, and the total for the teaching week to 40 hours. Clearly, the reforms have increased the teacher's time pressure, but in terms of time share allocation, the teacher is still spending one-fifth (20 percent) of their time on school activities.

This simple illustration explains why: (i) correlation may exist between the number of teacher activities and time budgets, and (ii) such correlations may not be prevalent between time shares and the number of teacher activities, in spite of some 'untested' general view that time budgets and time shares should ideally measure the same phenomenon. In this example, the time shares do not show the intensification of work, whereas the time budgets show that time intensification clearly. However, what is worth reiterating here is that in more complex, real-life, teaching scenarios, where teachers do not allocate time uniformly across teaching days, then in that case the time shares will indeed showcase the dynamics of teacher time allocation over an entire teaching week. This is a unique contribution that this thesis makes to the literature on teacher time-use behaviour. What is particularly fascinating also is that, in cases where teachers are not allocating their time uniformly across the number of days – the correlations between number of activities and time budget will be weaker than they are under uniform allocation of time. It is vital, therefore, that one considers that with increases in the number of activities, teachers may respond by increasing their daily time budgets (hence the positive correlation) but in reality the teachers have to cope by adjusting the loads such that the time shares are preserved at their 'normal values' – however 'normal' is defined. The joint use of time shares and time budgets, therefore, enriches one's understanding of teachers' time-use and teachers' work lives. Time budgets and time shares indeed carry or convey different types of information. This unique type of information is further unveiled by the correlations between time budgets, correlations between time shares, and correlations

between time budgets and time shares. This also is another unique contribution of the thesis to the literature on teachers' time-use behaviour.

The findings reported in Section 5.8.3 have theoretical value in that they guide the choice of variables to use in modelling teacher time-use. Most significant is the fact that the results indicate that time shares and time budgets carry different types of information, and, therefore, ought to be analysed independently and also jointly. The findings reported in this section also have a practical value in that they inspire other researchers to look not only into the actual time teachers spend on activities or during a typical week, but also focus on the time-thirstiness of various activities and the way in which different days of the teaching week tax teachers differently. From a modelling point of view, the time allocation behaviour of teachers is that explainable using time budgets and time share estimates collected from diary data. This is a fairly significant accomplishment and is novel in many respects, through providing additional knowledge, filling a gap in the literature and proposing a new methodological approach that encapsulates both quantitative and qualitative research methods.

In summary, the presence of significant positive correlations between time budgets and the number of teachers' activities, and the noticeable absence of any correlation between time shares and the number of teachers' activities suggests that there is an embedded mechanism that Tasmanian teachers use to cope with the intensification of their work during the teaching week. Policy makers need to understand the way in which teachers cope with intensification of work, and provide time for teachers to recover lost teaching time and evaporated time, or take breaks to rejuvenate and improve the use of the limited time available by offsetting the onset of diminishing returns to teachers' time allocation behaviour during a typical day. The results also have already indicated a dominant Tuesday effect. As the number of activities increases the time budgets for Mondays, Tuesdays and Wednesdays become heavier than

those for Thursday and Fridays. Similarly, the correlations between the number of activities and time budgets get weaker and weaker as the week progresses. It may suffice to suggest, at this point, that any shortening of teachers' time and number of activities at school should occur on Thursdays and Fridays – thus taking away the time-squeeze that educational reform imposes. It is crucial, therefore, to reiterate that the use of both time shares and time budgets in interpreting the coefficients of correlations between time expenditure and the number of activities does indeed showcase the unique approach to understanding teacher time-use adopted in this thesis.

What is even of greater significance is the fact that time budgets are generally positively correlated. This positive correlation suggests that time intensification on one particular working day has work implications for time intensification for other days. In the context of time shares the results are fascinating in that they show that time is both a resource and a constraint. In which case, any intensification of time on one particular day should force a reduction of time on another day of the week. This intuitive result is confirmed by the negative correlations between time shares. These negative correlations in time shares reinforce the message that Tasmanian teachers are indeed juggling time amounts across days. This is another unique property that the approach undertaken in this thesis has unravelled. It is important, therefore, to preserve this property throughout further empirical analyses on time-use. The discussion on the use of MVREG, SUREG, IVREG, and EIVREG techniques, in Section 6.10 will certainly show: (i) the significance of the development of time share analysis in this thesis, (ii) how time shares showcase the trade-offs in time-use across days of the week, and (iii) how to preserve the property of teachers 'juggling time amounts across activities and days' using time share analysis.

Finally, it is important to reinforce that time budgets and time shares do not represent the same thing. This is clear from the correlations between time shares and time budgets in

Chapter 5. What warrants a little bit more discussion in this chapter is the way in which Tuesday time shares relate to the time budgets for Monday through Sunday. The results reported earlier suggest: (i) no significant relationship between Tuesday time shares and Monday time budgets; and, (i) a significant negative relationship between Tuesday time shares and time budgets for all the other days of the week (Wednesday through Sunday). The results clearly show the importance of the link between what is happening on Tuesdays in Tasmanian schools, and what then happens on any other day of the teaching and non-teaching week. In the current Tasmanian climate where teachers are already time-poor; and, several education reforms have swept the Tasmanian education landscape with results of varying degrees, it is important to analyse the Tuesday effect to considerable detail before any efforts are made to: (i) lengthen time at school, (ii) increase the number of activities undertaken by teachers in schools, or (iii) restructure school times. Any effort to alter what happens in schools on Tuesdays, and how long the Tuesday activities go for, should be approached with the greatest caution.

Traditionally, it has been possible to change teacher time-use across the whole week. Now with an increased number of teachers working part-time and some working longer weekend hours, and the relationship between Tuesday time shares and time budgets of any other day of the week, it becomes more imperative that modification of Tuesday time be operationally tactful. From the results in this thesis, as presented at the moment, it is highly recommended that the status quo of Tuesday times be preserved for the time being, until the mechanism is fully studied, and then adjustments made in the context of reducing overall teacher workloads and also having minimum negative impact through changing Tuesday times and practices. It is vital to understand fully whether this Tuesday effect is education reform driven, teacher-driven, school-driven or community-driven. This direction of research is currently outside the scope of this thesis – but will certainly be pursued as further post-thesis research. However,

for the time being, a discussion on what actually determines the number of activities performed by teachers during a typical week will be presented in the next section. From the discussion the teacher-driven and school-driven factors will be isolated. Identifying these teacher-driven factors and school-driven factors is important especially bearing in mind, that teachers have some level of control and autonomy when it comes to teacher-driven factors of time-use, but have little or no say when it comes to school-driven time-use. The literature is awash with numerous examples of the lack of autonomy and teacher freedom (effectiveness) dichotomy (Broadfoot et al., 1993; Pashiardis, 1994).

6.9 Determinants of Number of Activities Performed by Tasmanian Teachers

Searching the primary literature for empirical evidence for empirical studies on the key determinants of the number of activities performed by teachers has not yielded any direct results. The literature has, nonetheless, inferred that some school, community and personal characteristics affect the number of activities performed by teachers (Rutter et al., 1979; Heath & Clifford, 1980; Huberman, 1993; Little & McLaughlin, 1993; Biddle, Good & Goodson, 1997; Hargreaves, 1999; Clough, Smasal & Clough, 2000; Thody, Gray & Bowden, 2000; Gardner & Williamson, 2004; Williams & Gersch, 2004; Huntly, 2008; Williamson & Myhill, 2008). Evidence on the determinants of the number of activities performed by teachers is given in Ngwenya (2009b). Results presented in Section 5.9 and Ngwenya (2009b) have showcased some key determinants of the number of activities performed by Tasmanian teachers. This empirical evidence marks a significant contribution to the literature that is made, therefore, by this thesis. It is clearly the case that this thesis may represent a first attempt in the literature at teasing out and documenting the link between the number of activities undertaken by teachers and the host of factors that are school-related and

teacher-related – that is, the host of factors that the school has control over, and the factors that the teacher has control over and factors that are completely exogenous to the teacher.

The number of activities that teachers perform seem to vary negatively with teachers' time endowments suggesting that any decrease in time available to teachers (during or outside school hours) will increase the number of activities undertaken as teachers try and adjust by increasing their work hours considerably in order to cope with the requirements of their work both in schools and outside schools. It is important to note here that teachers can generally control the number of hours they allocate to tasks but do not have significant control over the type and number of tasks they perform. Most of the tasks performed by teachers are timetabled, or run on what has been referred to as a clock time or timetabled time or cyclical time, in the literature (see Chapter 2). In that regard, it is fitting to make the number of activities undertaken by Tasmanian teachers the dependent variable and then explain the variation on the number of activities using a factor such as week time endowment (Ngwenya, 2009b).

Throughout the literature, concern has been expressed about the number of activities that teachers have undertaken, particularly the amount of time required (Becker, 1965; Rutter et al., 1979; Heath & Clifford, 1980; Clough, Smasal & Clough, 2000). These aspects of teachers' work, in a way, are elements of a larger set of domains and/or roles such as those described in the literature (Kaufman, Lane & Lindquist, 1991; Biddle, Good & Goodson, 1997; Keating & Murgolo-Poore, 2001; Gardner & Williamson, 2004). The various domains of a teachers' work are characterised by a series of activities that define the respective domains. An increase in the number of teachers' activities certainly result from factors such as the number of students in a class, the type of class being taught, and teachers' experience in the current school. It is more likely that full-time teachers who have several years of experience in a school will be involved in more teacher activities than teachers who are new

to the school (Ngwenya, 2010a). It also follows that involvement in decision-making, participation in meetings, mentoring, and spending time with colleagues will inevitably lead to an increase in the number of activities. All these causalities have been highlighted and confirmed in the analysis of the data and presentation of results in the thesis. What is also encouraging from these results reported in Section 5.9 is that factors that hinder work tend to increase the number of activities performed by the teacher. This is consistent with prior expectations. It is important to note that most of the factors that are positively associated with an increase in the number of activities are factors that teachers have complained about. These factors tend to intensify teachers' work and take away from teachers from what teachers consider their main activities or tasks (Gardner & Williamson, 2004).

The results reported in Section 5.9 are consistent with what has been reported in the literature. The results point to a phenomenon that is argued quite well in the literature – the intensification of teachers' work. The direct experience of teachers points towards a stressful profession with several factors that create the various types and degrees of stress. The factors generally include the age group taught, the number of students in the class, the type of school, location of school (rural/urban), length of teaching experience and the immense amount of time spent on paperwork. These factors are statistically significant as seen from the examination of the determinants of the number of activities undertaken by teachers, as reported in Section 5.9. These factors are also well-pronounced in the literature (Huberman, 1993; Little & McLaughlin, 1993; Hargreaves, 1999; Thody, Gray & Bowden, 2000; Williams & Gersch, 2004; Gardner & Williamson, 2004; Huntly, 2008; Williamson & Myhill, 2008); although, they are not discussed in the context of an empirical model, in the primary literature, as done in Ngwenya (2009b) and in the thesis.

What is worth noting is that increasing the number of activities tends to lead to a decrease in the number of hours allocated to Thursdays and Fridays, and to the whole week. This result

may suggest high levels of stress and burnout among Tasmanian teachers. Clearly, teachers can only do so much on Mondays, Tuesdays and Wednesdays, and possibly face diminishing returns to work on Thursdays and Fridays. For those teachers that need more time to recover, it follows that they will not expend any considerable number of hours during the weekend. Most of such teachers are likely to be: (i) younger teachers in the profession, and having a significantly different off-school work ethic, as part of their life cycle in teaching compared to older teachers; or, (ii) older teachers just needing some time-out on Thursdays or Fridays to recover from the stress of the teaching week. These older teachers are possibly more likely to ‘feel the guilt’ at letting pupils down (see Ballet & Kelchtermans, 2009) and thus expend significant amounts of time during the week assisting these “children who are victims of a floundering public school system” (Kutcy & Schulz, 2006, p.78), and also spend a considerable amount of unsociable hours on the weekend in an effort to make part of the following teaching week a little bit pleasant. In this scenario, the vicious cycle of tapering productivity, long work hours (see Goddard, 2000), heavy workloads (see Williamson & Myhill, 2008), few breaks and increased weekend work (Ngwenya, 2009a) in anticipation of the heavy shifts for Monday, Tuesday and Wednesday, will continue. This might mark the realities of teaching in Tasmanian schools. A policy approach would involve reducing Monday and Friday teaching times to allow teachers more time for preparation, and using Friday times to address matters or issues that are school-related or pursue activities that can only be accomplished during normal work hours.

It is not surprising, therefore, that teachers who enjoy a considerable increase in the break times during the teaching week tend to reduce the number of hours expended on Sundays. The policy consideration from this result is that since teachers are expected to work for 7 hours per day and eventually accumulate less than a 40-hour week, then lowering Friday times may actually increase productivity considerably. Greater productivity can be gained

from (i) lowering time-use of the most unproductive days, and (ii) increasing the number of genuine breaks in school, as opposed to the token lunch break - with lunch on the run and catching up with colleagues on outstanding school matters, and 'not even having time for a sandwich' (Ngwenya, R. 2009, pers. comm., 25 December). The quantitative results on the absence of free-time and break-time as hindrance factors, reported in the thesis, therefore, support the qualitative assessment of hindrance factors reported in the literature (Gardner & Williamson, 2004; Williamson & Myhill, 2008).

The range of factors listed as determinants of the number of activities performed by teachers has included variables, covered in the literature (Becker, 1965) such as hours per week, employment status, experience in current school, and time spent in significant non-core activities. These determinants, among others, have reshaped teachers' work lives. It is crucial to mention that the number of activities considered here are those activities that are performed over a typical week. No differentiation has been made for activities performed on each typical day. Similarly, no discussion of issues regarding time-inequity (Kaff, 2004) has been presented in this thesis. What has been extremely encouraging from the results presented in the thesis is seeing how: (i) aspects of school that hinder work increases the number of teachers' activities, (ii) the Tuesday effect affects teacher time allocation behaviour, and (iii) how significant the contrast in activity loadings of Grade 3 and Grade 4 classes is. Certainly different grades, class sizes and class characteristics have their time-specific demands on the number of activities performed by teachers. In terms of Tuesday effect on teacher time allocation what is striking though is that the number of activities that a teacher performs over a typical week is quite sensitive or responsive to the quantity of time that the teacher allocates to tasks on Tuesday. It is important at this juncture to recall that this Tuesday effect has been predominant in earlier discussions (see Section 6.3 through 6.8).

Clearly, so far this discussion has focused primarily on the determinants of the number of teachers' activities without drawing much attention to how time is actually spent to accomplish these activities. Given that teachers' time expenditure in teachers' activities is a primary interest of this thesis; it is fitting, therefore, to steer the discussion towards the key determinants of teachers' time allocation to teachers' daily time allocation across all activities. Therefore, the discussion that ensues in Section 6.10 covers the determinants of time allocation on any particular or selected day of the teaching week.

The discussion, presented in Section 6.10, is an innovation in the thesis in that the number of activities performed by teachers is considered an independent variable. This reflects simultaneity in causation – where teacher time-use depends on a host of factors that include the number of activities performed by a teacher; and, the number of activities undertaken by teachers depends on time-use patterns of teachers. This simultaneity is an important development from the point of the duality in causality that links teachers' daily time allocation behaviour to number of activities performed by teachers. The number of teacher activities is influenced by time available during the entire week and simultaneously the time allocated by the teacher to each day will depend on the number of activities that teachers have to perform.

Section 6.10 is particularly unique because it presents the notion of the number of activities as a determinant (exogenous factors) for time allocation of each day of the week, and employs novel techniques such as the use of time shares, seemingly unrelated regressions (SUREG), and instrumental variable regressions (IVREG). These kinds of estimations have not been done in the past; in the literature, except may be, for parts of the analyses undertaken by Wang et al (2008) and Kan & Pudney (2008).

6.10 Determinants of Time Allocation

Similar to the style following in the previous sections (Section 6.3 through 6.9), Section 6.10 discusses the results presented in Section 5.10. The main finding in Section 5.10 is that the determinants of daily time budgets vary across the days of the week. This is consistent with the observation that days of the week are different (Giacomino & Gose, 2002). For example, time spent participating in staff meetings has an effect on time allocation across a teacher's teaching week. The effects of class size also impact teachers differently on each of the days of the teaching week. The effects of class size (stsc1) are particularly quite pronounced for Wednesday. Generally, large classes seem to require higher levels of time expenditure over the course of the week. This is an expected finding of class-size. However, what is surprising is that the impact of class-size on weekend work is insignificant – suggesting that teachers taking large classes do not seem to spend significantly larger amounts of weekend time on school work. Another important result that is evident from the determinants of teachers' time budgets is the impact of increasing the extent to which teachers enjoy uninterrupted breaks during the teaching week. Clearly increasing the frequency and/or length of uninterrupted breaks reduces Sunday time-use. Another result from the determinants of activity patterns of teachers is the number of schools that a teacher has worked in (captured by the variable: noschs). The number of schools a teacher has taught at has no significant effect on the daily time budgets, whereas the number of schools a teacher has previously taught in tends to have a significant negative effect on weekly time share use. That is, teachers who have taught in relatively more schools seem to allocate a lower proportion of their time to weekly time requirements. Similarly, teachers employed full-time tend to significantly increase their weekly time budgets, but significantly decrease their weekly time shares.

6.11 Extent of Teacher Overload – An EIVREG estimation

The general expectation would be for full-time teachers to have a larger amount of overload time than part-time teachers. The results (full-time: $\beta = -12.172$, $p < 0.05$, and fulltime: $\beta = -10.48$, $p < 0.05$) are therefore counter-intuitive. The results observed for the implied work overload status of part-time teachers may suggest a case in which teachers are employed part-time, being paid part-time wages, but doing full-time work. It can be conjectured, there that, may be overloaded part-time teachers are those employed 0.8 of fulltime equivalent: in which case, they have routine tasks to accomplish during their regular days in schools, and so have to prepare for the day they will be off-duty resting.

The results reported in Table 5.11A suggest that care must be exercised in defining the working week, when computing the extent of teacher overload. The results have led also to a discovery of the problem of the overload status of part-time teachers. It is also pertinent to suggest that future work on teachers' workload or time-use should have specific variables or categorical variables clarifying the extent of overload, or involve a nested approach to the definition of overload, through creating dummy variables that captures the extent of teacher overload.

The results of the EIVREG show that the Monday, Wednesday and Thursday time allocation behaviours tend to lead to increases the work overload status for all full-time teachers in over the 40-hour, 43-hour and 45-hour week definitions. These results are clearly consistent with the qualitative evidence that teachers are overloaded for most of the days of the teaching week. Preparing and planning certainly absorbs a considerable quantity of time available to teachers. Again, consistent with evidence in the literature (see for example, Gardner & Williamson, 2004; Ingvarson et al., 2005), it is clear that administrative tasks are also a major contributor to the extent of teacher work overload. What is new, however, is that teaching alone does not feature as a workload variable for teachers. This insignificance of time spent

teaching alone as a predictor of overload status may suggest that teaching maybe a relatively small component of teachers' time in schools; or, that among teachers there is little variation in the small amount of time allocated to teaching. Worth noting also is the insignificance of the prevalence of factors that hinder teachers' work (Hindfac), professional discussion with colleagues (tt5), student supervision (tt9), attending staff meetings (tt11), and the extent of involvement in decision-making (dminv). These insignificant results are certainly a stark contrast to the notion of teachers over-burdened by what is generally considered non-core activities.

6.12 Effects of Uninterrupted Break Time (UBT)

Break time certainly appears to be productive as argued in Carlin (1997), Dababneh, Swanson and Shell (2001). Unlike other studies that look at break time and wage differentials, the results reported in Section 5.12 have focussed on the impact of break time on time allocation over the days of the working week as well as weekend time allocation for full time teaching staff. In this thesis the effect of break time on paid work (normal working week work) is investigated through the impact of break time on unpaid (weekend) work. This research approach undertaken is novel, in that it shows clearly the impact of break time, and such an impact is latent (hidden) if research focus is directed mainly on the normal working week. The analysis of the categories of break time, and the frequency of scheduling of rest breaks have also been important in the job design studies (Dababneh, Swanson & Shell, 2001), improving comfort at work and enhancing productivity (Carlin, 1997; Dababneh, Swanson & Shell, 2001).

In the context of teachers' work, given teachers a short break certainly has implied productivity gains as seen from the results reported in this analysis. The policy shift should focus therefore on giving teachers unencumbered break time. The issue of allocating break

time during work time has been emphasised has been identified as problematic. For example, Dababneh, Swanson and Shell (2001), warn that “often management is concerned that rest breaks will reduce production. Others may be willing to invest in giving more break-time to workers but are uncertain how to divide the break-time over the work day” (p.165). In the context of this study, evidence from how break time of full time teachers affects Sunday work time is used to propose the quantum of UBT that teachers may require. This study falls short, however, in that it does not identify where that allocation of time should be. Such an exact prescription and placement of break time requires a qualitative to approach to teacher time allocation behaviour – particularly how teachers experience time breaks. This direction of research is outside the scope of this paper. What is very clear, though, from this paper is that: the notional unencumbered break time required is on average 12 to 15 minutes a day (for each working day of the week). Such a small extent in UBT will reduce Sunday work times, considerably – and may in some instances eliminate non-voluntary Sunday work times.

6.13 Concluding Remarks

Why do teachers need time? It is generally believed that more time on any unit of study will lead to substantial increases in learning (Dreeben, 1970; Lortie, 1975; Denham & Lieberman, 1980, cited in Stark, Lowther & Austin 1985; Nias, 1984; Brown & Saks, 1987; Nias, 1989a; Berliner, 1990; Nias, 1993; Nias, 1997; Nias, 1998; Nias, 1999; MacBeath et al., 2000; Drago et al., 2001; Cinamon & Rich, 2005; Ingvarson et al., 2005). However, evidence on the size of the effects of increased teacher time on student learning is inconclusive. Some studies suggest that the size of the effects is small and subject to diminishing returns (Brown & Saks, 1987) and others suggest that the effects are substantial (Cinamon & Rich, 2005). In the literature it is expected that full-time teachers are expected to be more generally time-constrained than part-time teachers (Probert, 1993; Floro & Miles, 2003), and that fully-employed beginning teachers are more likely to be especially vulnerable to experiencing

family-work conflict (Cinamon & Rich, 2005), and alter their time allocation behaviour. Early career teachers are particularly concerned with their professional survival (Huberman, 1993; Day et al., 2008) and therefore their time allocation behaviour is likely to be different from that of their counterparts. A greater 'decline in commitment among late career teachers' (Day et al., 2008) is expected. As a result of the mix of influence in these variables, time allocation behaviour of teachers then becomes a function of the individual-level independent variables such as: gender, stages of life cycle, educational attainment, such as years of teaching experience, to name a few. All these variables are dynamically and inextricably related (Alvarez & Miles, 2003; Cinamon & Rich, 2003; Floro & Miles, 2003; Day et al., 2008).

The absence of free time that can be used at the teacher's discretion is a common problem in learning (Hargreaves, 1992; Billet, 2001; Boud & Middleton, 2003; Lohman, 2006). Teachers also need free time to learn informally (Lohman, 2006), and develop professionally (Clement & Vandenberghe, 2001). Informal learning of teachers generally includes sharing ideas, reflecting on teaching practice, trialling new ideas, collaboration with other teachers, working and gathering information from outside the school (Lohman, 2006). The allocation and control or management of free time is vital for informal learning (Hargreaves, 1992; Lohman, 2006). One factor that influences engagement in formal and informal learning of teachers is the lack of time. Of the many constraints on teachers' time-use, time for learning is often rated higher than lack of sufficient time or lack of proximity to colleagues' work areas (Lohman, 2006). Teachers' coping strategies affect the "length of working hours but also the intensity of an individual's time-use" (Miles, 2003, p.3). Polyphasic behaviour has been discussed as a way of teachers coping; but, overlapped activities performed simultaneously with other activities (especially the primary activity) are likely to: (i) lead to an intensification of the work burden, decrease discretionary time (Stark, Lowther & Austin, 1985; Floro &

Miles, 2003), (ii) negatively affect a person's health and well-being (Miles, 2003), (iii) fuel personal stress (Cinamon & Rich, 2005) and, (iv) impact negatively on students' achievement and well-being (Cinamon & Rich, 2005). The negative outcomes of the impact of work on teachers' lives have included: low job satisfaction, high turnover rates, high intentions to quit, stress and burnout (Galloway et al., 1984; Johnstone, 1993; Chen & Addi, 1992; Chen & Sun, 1994; Burke & Greenglass, 1995; Ingersoll, 2001; Carmona et al., 2006; Ballet & Kelchtermans, 2008). Understanding the extent and impact of these effects is important for workloads planning, time management, and work allocation behaviour in schools.

It is also appreciated in this thesis that when it comes to time-use on a daily basis, not all teachers work in the same fashion. There are monochrons and polychrons among the teachers (Keating & Murgolo-Poore, 2001), and these monochrons and polychrons vary in their time-use. The results reported in this thesis are certainly far from the manufactured illusion of teaching as work with 'short hours and long holidays' (Rick, 2000). As mentioned earlier (see Chapter 5, Section 5.3, "most teachers still teach alone, ... , in the insulated and isolated environments of their classroom" (Hargreaves, 1994, p. 167), and are unlikely to find time to reflect on their teaching. Clearly, a considerable amount of time is being allocated to non-teaching tasks and such time expenditure may be viewed as a waste of time (Kaff, 2004); especially, given the problem of time-inequity in terms of the amount of time teachers spend on their roles compared to other teachers with similar roles and responsibilities (Kaff, 2004), and the outcomes of schooling generally observed across several countries and continents (Michaelowa & Waller, 2003).

The time-use model presented in this thesis captures time-use in terms of patterns of teacher time allocation behaviour, shows the considerably high demands placed on teachers' time (Keating & Murgolo-Poore, 2001; Rice, 2005), and suggests that teachers are having too little time to allocated to their set of roles (Kaufman, Lane & Lindquist, 1991; Keating &

Murgolo-Poore, 2001), or domains (Williamson & Myhill, 2008). How teachers cope with the day-to-day demands of their activity schedules is intricately linked to temporal and spatial time allocation behaviour. Certainly, there must be some stamina that teachers have managed to procure in order to be endowed with the cognitive and behavioural efforts to cope with demand of teaching (Carmona et al., 2006) that are created by the nature of teachers' work, and seem to go beyond the passion in teaching. Effective coping requires, however, a significant amount of leisure time – a component of public time. It is noticeable, though, that the teachers' leisure time is also becoming an ever-shrinking resource (Cotte, 1998).

Clearly, from the results presented in this thesis, Sunday work has become a norm rather than an exception (also see Bittman, 2000; Galton et al. 2007; Williamson & Myhill, 2008; Ngwenya, 2009b). Weekend times, longer hours and polyphasic behaviour are some of the strategies that have been used by teachers to adjust to their demanding time budgets (Kaufman, Lane & Lindquist, 1999; Keating & Morgolo-Poore, 2001; Waterreus & Dobbles, 2001). It is postulated, therefore, in this thesis, that Tasmanian teachers are likely also to have accumulated that arsenal of strategies with which to attempt coping with increased workloads. How the acquisition of such an arsenal of strategies, especially given the numerous educational reforms in the state, helps in the outcomes of education has not been explored in this thesis. It suffices, though, to point out that future research direction – extending from this thesis should look at the link between Tasmania educational reforms, Tasmania school achievements and Tasmanian teachers' workloads and work-lives, and teachers' coping strategies, collegiality, autonomy in teaching, inclusiveness in decision-making, and job satisfaction. The Australian evidence on reforms and teachers' work-lives (Gordon, 1955; Dinham, 1985; Dinham & Scott, 1997a; Dinham & Scott, 1997b; Dinham & Scott, 1998; Churchill, Kelly & Mulford, 1999; Gardner & Williamson, 2004; Rice, 2005; Williamson & Myhill, 2008) would make a significant springboard for the kind of future

research direction suggested above. In this future research, it is also worth examining whether polyphasic behaviour is healthy for teachers, schools and teachers, especially in situation where school time has become a significant limitation and scarce resource (Heiner, 1983; Graham & Green, 1984; Zick, McCulloch & Smith, 1986; Voydanoff, 1989; Bluedorn, Kaufman & Lane, 1992; Marini & Shelton, 1993; Benabou, 1999; Kaufman-Scarborough & Lindquist, 1999; Waller, Giambatista & Zellmer-Bruhn, 1999; Keating & Murgolo-Poore, 2001; Adler, 2002; Alvarez & Miles, 2003; Voydanoff, 2005; Eldridge & Pabilonia, 2010).

In summary, how have the research questions outlined in Chapter 1 of the thesis been addressed adequately? The data and explanation provided above suggests that the research problem, research objectives and questions and their accompanying hypotheses have been addressed adequately. The brief summary that follows highlights some of the achievements. First, a new - and useful - metaphor has been developed. Second, the metaphor also has been presented in the form of an empirical model. Third, factors influencing the time allocation behaviour of teachers have been identified, and the extent of their effects has been quantified. Fourth, a profile of the extent to which teachers are overloaded has been presented. This profile also shows impacts of differences in age and length of teaching experience on the extent of teachers overload status. Finally, the effects of uninterrupted break time (UBT) on teachers' time-use has been captured, and used to extract a significant education policy. The education policy proposed is implementable and should change the work lives of teachers through likely teacher productivity and teacher well-being.

CHAPTER 7

CONCLUSION

7.1 Introduction

The purpose of undertaking the research in this thesis was to develop a conceptual framework capable of describing teachers' use of time in a way that is consistent with evidence on teachers' work lives. It was argued in Chapter 1 that this conceptual framework must be supported by evidence from the literature and an empirical model whose estimation should yield results that can be used to describe and draw inferences on the nature of teacher's work. The literature, conceptual framework, the empirical model, and the results, thereof, are aimed at addressing the following research objectives: (i) reviewing the literature on time-use, (ii) evaluating a model of time-use using qualitative and quantitative data, and (iii) analysing the profile of time-use in Tasmanian primary schools using a suite of econometric techniques.

It is argued also that the development of the conceptual framework and its empirical support model assist researchers and education policy makers in several ways. Researchers can benefit from observing the results of using the suite of models for teacher time-use to: (i) describe teachers' work; (ii) create an appreciation of the extent to which diary data can be used to provide evidence on the realities of teachers' work, (iii) also realise the benefits of having a conceptual framework that is simple enough to capture the essence of teachers' time-use and yet complex enough to represent the dynamism in time allocation, with reasonable realism, and (iv) be consistent with other metaphors of describing teachers' work. For policy makers, the conceptual model brings into light several things. First, the distance between the locus of allocating a teacher's time and the core business of the teacher, (assumed to be teaching/engagement time), matters. Second, when it comes to teachers' time allocation across activities, the days of the teaching week are not the same: teachers allocate time in unique ways across activities and all the days of the teaching week. Third, in addition

to allocating time to school-work during the teaching week, teachers also allocate a significant proportion of their weekend time to school-related activities. Weekend work is quite a burden for teachers and it intensifies work considerably. The tendency to work on traditionally unsociable times such as weekends and evenings is definitely a policy matter that hits at the core of the workloads of teachers in schools, the nature of core activities and the ever increasing time demands on non-core activities. Fourth, time is experienced differently by individual teachers and time is used differently by teachers, to an extent that time inequity becomes an issue. Finally, teachers' tasks are not simple tasks – even the minute tasks will claim a large chunk of time. What needs recognising here is that routine tasks may tend to be accomplished less often than unscheduled, non-routine tasks whose metric is often missing completely, or if at all present, is badly construed or constructed.

In order to accomplish the objectives set in Chapter 1 of the thesis, a review of the literature on time-use was conducted. This literature was focused initially on the history of time-use research, definitions of time and measurement of time in various social science disciplines. The intention of such a broad literature was to amass as much theoretical and empirical building blocks for a conceptual framework of the allocation of time by teachers. The literature also covered the international and Australian evidence of teachers' work; and, the allocation of time to tasks as teachers face the endless streams of educational reforms. Chapter 2, therefore, lists the concepts and variables that are significant in the analyses of time-use by teachers. These concepts and variables are then compiled into a theoretical model to describe time allocation behaviour of Tasmanian primary school teachers. This review of the literature set the scene for developing a unique, novel, conceptual model of teachers' time-use, in Chapter 3.

In Chapter 3, a conceptual model of teachers' time-use is developed. This model tracks the teachers' activity patterns when the teacher is outside the school, in the school, outside the classroom and ultimately, into the core of the teachers' activities – engagement time and active learning of students. The conceptual structure of the model of teacher time-use is then enriched by defining sets of activities over which teachers have to allocate time or prioritise time allocation.

The conceptual framework is defined as the teacher's thumbprint and the journey from the outer whorls and ridges of the thumbprint represent the tradeoff in activities. The pressure that the thumbprint exerts is assumed to be dependent on school factors, system factors (educational reform), students' personal factors, as well as individual teacher factors. The metaphor of teacher's thumbprint generates a series of research questions that tie neatly with the research objectives of this thesis, and other metaphors of teachers' work that exist in the literature. These key research questions include: what are the determinants of the number of activities performed by the teacher? What are the determinants of the amount of time that is allocated to the activities undertaken by the teacher? How does allocation of time vary across days of the teaching week? How significant is weekend work on time allocation behaviour? To what extent are the teachers overloaded, and what are the key determinants of the extent of the overload?

These questions are answered by converting the conceptual framework of teacher time-use to an empirical equivalent that comprises a series of estimable equations. These estimable equations are presented in Chapter 4 of the thesis. The estimable equations are then used in a suite of models namely, OLS, SUR, MVREG, IVREG and EIVREG, to yield empirical evidence on: (i) determinants of number of activities undertaken, (ii) allocation of time across activities and days of the week; and, (iii) the extent to which teachers are overloaded.

The empirical results are presented in Chapter 5 of the thesis. The main dependent variables used throughout Chapter 5 are: (i) the number of activities undertaken by teachers, (ii) the total time expended on each activity, (iii) the total time expended on each day; (iv) the total time expended over the entire week, and (v) the extent of teacher overload. Two main units of analysis are used throughout the thesis - these are the time budgets, and time shares. The time budgets measure the actual expenditure on activities or across days of the week, and the time shares measure the proportion of time allocated to activities or across days of the week. Results of descriptive analysis, cross-classification analysis (Chi-square test of independence), inferential analyses (t-tests and ANOVA), and regression analyses for a suite of models are also presented in Chapter 5. These results reinforce the key components of the teachers' thumbprint, mirror the research questions and objectives of the thesis, as well as answering some of the sub-research questions that emerge from the use of the teachers' thumbprint as a metaphor for teachers' time allocation behaviour.

In Chapter 6, a discussion based on the results reported in Chapter 5, ensues. The discussion is narrowed down to a few set of results – notably, the outcomes from (i) using a suite of regression models to examine teacher time-use; (ii) identifying the key determinants of the extent of teacher work overload, and (iii) computing explicitly, the effects of UBT on teachers' time allocation behaviour.

This conclusion chapter is structured as follows. Following the introduction which gives an overview of the thesis, in Section 7.1; the next section, Section 7.2 presents a conclusion on the main empirical content of the thesis. In Section 7.2, reference is made to the main reasons by the study of teacher time behaviour is important. What has been made clear in the literature is outlined. The key challenges (or some unanswered questions) that have surfaced from the literature are reflected on. A brief account of the main research problems and

questions that have been answered is provided. The data that have been used to address the research problem are described briefly. A reminder of the methods used with the data is flashed – including a statement of how novel the approach used in thesis is. Finally, clear statements on what has been found and/or solved in this thesis are presented. The novel aspects of this thesis are emphasised also. Key policy recommendations are presented in Section 7.3. These policy recommendations relate mainly to availability of free time (uninterrupted free time for teachers in schools), professional learning, polyphasic behaviour and teacher coping strategies of Tasmanian teachers. The dominance of Tuesday work is reiterated. Similarly, evidence on the impact of weekend work, and particularly Sunday work on teacher time allocation behaviour is cast in added light. Directions for future research are highlighted in Section 7.4, and they include looking, in detail, at time-use patterns of older teachers, profiling the incidence of overlapped activities, acquiring more demographic variables, and moving away from cross-sectional data to panel data and ultimately to longitudinal data. Final concluding remarks are drawn in Section 7.5.

7.2 Empirical Content of Thesis

An analysis of teachers' time-use patterns is important for an understanding of teacher thinking about their work and teacher behaviour in the form of time allocation (Cinamon & Rich, 2005). This thesis uses secondary data (Gardner & Williamson, 2004) to analyse time allocation behaviour of primary school teachers in Tasmania. The secondary data are rich in diary information that is useful in estimating time spent on teacher activities. The results of the thesis show that time budgets and time shares capture a different but complementary type of information about how teachers' work is structured in terms of time-use.

The number of activities that teachers undertake is explained significantly by selected teacher, and school characteristics. The time tradeoffs and the inherent time-squeeze problem

in teaching are further investigated by looking at how time is partitioned or allocated to the various activities that teachers undertake. The results show clearly that teachers' activities have different level of time-thirstiness, and not all teachers perform these time-thirsty activities. Nonetheless, the impact of such time demands is such that the bulk of school preparation is done outside school time, thus, reducing effectively face-to-face contact with learners to around 12-14 hours a week. This level of contact time is certainly not excessive and has been reported in other studies.

In terms of allocation of time over a typical week, it is clear that the days of the week do not tax teachers equally (Giacomino & Gose, 2000), and that each day of the week taxes each teacher differently. Certainly Tuesday seems to a dominant day in terms of teacher allocation of time to tasks. Equally taxing is Sunday – a very unsocial day for work in most cultures. The fact that older teachers work more on Sundays than younger teachers is particularly of policy interest. It is also of interest that daily allocations are interrelated in significant ways. In order to capture the interrelatedness, a suite of techniques (OLS, SURE, IVREG, MVREG, EIV) has been tested. The results from applying these techniques show clearly that the respective coefficients in the models may differ somewhat, but the general information that is captured by this suite of models, used collectively, enriches one's understanding of the time-use behaviour of teachers.

7.2.1 Why is this study of time allocation by teachers so important?

The study of a teachers' allocation of time is also important because the way a teacher values and allocates the scarce learning time has subsequent effects on outcomes of schooling. In the context of this thesis, it is imperative to think of the likely impact of teachers' time-use in terms of engagement time and changes in teacher effectiveness as teacher's work intensifies. The thesis has not provided any empirical evidence on the direct impact of a teacher's work on students, school, and community. This position or conjecture is one that is understood

clearly and emphasised predominantly in the literature (Dreeben, 1970; Denham & Lieberman, 1980; Fredrick & Walberg, 1980; Stark, Lowther & Austin, 1985; Willms & Cuttance, 1985; Berliner, 1990; Nias, 1990; Huberman, 1993; Raju & Srivastava, 1994; Nias, 1997; Sammons et al., 1997; Nias, 1998; Silins & Murray-Harvey, 2000; Drago et al., 2001; Gardner & Williamson, 2004; Blekesame, 2005; Rivkin, Hanushek & Kain, 2005; Krant-Kent, 2008). However, the metaphor of the teachers' thumbprint links the teachers' time allocation behaviour to the outcomes of that time allocation behaviour, and also embodies other metaphors such as those described in Sztajn (1992), Goddard (2000), Giacomino and Gose (2002), Dwyer and Dwyer (2005), Kutcy and Schulz (2006) and Phillips (2009), to name a few.

It is important to remember that the thesis is focused on the microanalytical structure of time allocation behaviour of teachers. Linking outcomes of teachers' work to the microanalytics of teacher's time allocation would have extended the thesis way beyond what is achievable within the time given and the data available for this thesis. The purpose of the thesis is to show the empirical side of the time allocation behaviour of primary school teachers in Tasmania. The implications of this allocation behaviour on school expectations, outcomes, and community expectations are inferred and implied, therefore, through the metaphor of the teachers' thumbprint.

7.2.2 What identified research problem has been solved in this thesis?

Well, it is generally acknowledged that "the most difficult problem all time-use researchers must confront is how to record, with accuracy and completeness the pulsing dynamism of human activity" (Stinson, 1999, p.18). What is required is a "wide-ranging investigation aimed at a more holistic, nuanced understanding of teachers' work and lives" (Day, Sammons & Gu, 2008, p.330). In this thesis a conceptual model that captures the pulsing dynamism of the activities in teachers' work (time allocation behaviour) has been developed and evaluated

empirically using data on teachers' activities recorded over a typical day or week. The number of activities undertaken by the teacher is noted. The nature of activities that the teacher undertakes as well as the multi-tasking of these activities is also different. What is also of interest is the amount of time or duration, spatial locus, and timing of activity undertaken by the teacher. The teacher therefore invests time differently across activities and days of the week, during school and non-school times. Participation in activities and the number of hours allocated to any activities also are unique to a teacher's day of work. This is particularly important in highlighting that some days are more taxing – work-wise than others. Since the time spent is for all activities over a typical day, and across all days of the typical week, it follows then that polychronicity is included. This thesis therefore makes a unique contribution in that it looks at relative duration of the teacher's tasks and the share of time spent on activities. So not only are the questions of frequency (how often?), location of activity (where?) and duration (how long?) looked into, the question of share (in what proportion?) is also considered (included).

7.2.3 What methods were used to study the research problem in this thesis?

The problem of studying teacher time-use in the context of the inherent difficulties outlined above, has been solved by using a suite of econometric techniques. Several extensions of the model have been tried by adding exogenous variables, sequentially to the basic model. This is important for testing robustness of the regression results. The robustness is essentially established or tested using the consistency of sign tests and related diagnostics such as the R-squared value, and other diagnostic tests, where applicable. The models that are consistent with theory and that have yielded the best linear unbiased estimators are reported in this thesis.

7.2.4 What data have been used to solve the research problem?

The general draw back in the use of time diary information is that data tend to be collected only for a single day (Frazis & Stewart, 2004), and also tend to focus on the primary activity undertaken by the participant (Krantz-Kent, 2008), and have a single focus – notably ‘studying the frequency and duration of human activity’ (Stinson, 1999, p.12). In contrast, in this thesis, data used are collected over a typical week, and each of the days of the week also represents a typical working day. All activities of teachers are recorded, and included in the analyses – regardless of whether these activities are performed one at a time or simultaneously. In addition, the data capture time spent at work and time spent after school (after work time). The measure of teachers’ time used in this thesis does not, therefore, miss the amount of teachers’ work performed at home. In that respect the analyses on Tasmanian teachers’ time-use data has an implied method of ‘measuring and valuing unpaid but productive activities’ (Joyce & Stewart, 1999, p.3), understanding workloads implications from productive (market) work (Gardner & Williamson, 2004; Cinamon & Rich, 2005); comparing time allocation across diverse demographic variables (groups) (Booth et al., 1996; Krantz-Kent, 2005; Kutcy & Schulz, 2006), and drawing implication of the time allocation of households’ earning capacities (Becker, 1965; Waterreus & Dobbela, 2001), to name a few. Time-use data contributes, therefore, to research and policy analysis; and certainly, the way in which the time-use of Tasmanian primary school teachers’ has been explored in this thesis contributes to theory and practice. The thesis has, therefore, contributed significantly to an extended analysis of time-use data presented in the Gardner and Williamson (2004) study.

7.2.5 What has been made clear from the results of the thesis?

As seen from the results, older teachers work longer hours and also require time out on Fridays but nonetheless expend considerable hours on Sundays. This finding certainly contradicts the claim that “teachers in later phases of their career are more vulnerable to losing their sense of commitment” (Day et al., 2008, p.331), and their “time pressure is

expected to decline” (Floro & Miles, 2003, p.11). Older Tasmania primary teachers are spending more time on weekends, on school work; and, also spend more time during the teaching week. The results reported in the thesis tend to support the view that teachers aged 50 years and over, working full-time, allocated longer hours to their work than their counterparts (Krantz-Kent, 2008). Equally significant in this thesis is the result that older teachers are more likely to work on Sundays than their counterparts. The tendency to take work home has implications for teachers’ workloads and the way in which teachings hours are computed. The evidence on productivity gains from bringing work home is, however, generally inconclusive (Eldgridge & Pabilonia, 2007).

In this thesis, the results show clearly that teachers allocate time differently in schools in different locations and in schools of different school size. The results reported in Chapter 5 of this thesis show some differences in time allocation among teachers across locations, age, school experiences and related variables. In addition to showing that teachers in Tasmania work long hours during the week and weekend, the results reported in the thesis show also that full-time as well as part-time teachers work on weekends. The hours expended by full-time teachers over a typical weekend are significantly longer than those expended by part-time teachers. It is also of interest to note that older teachers tend to spend more time on school work during the weekend. There is no evidence of statistical differences in Saturday time allocations across early-career, mid-career and late-career teachers with respect to Saturday time-use. These findings have significant implications for: (i) workloads of teachers; (ii) teachers’ productivity at the workplace, and (iii) also for the image of the teaching profession to younger would-be teachers, novice teachers or newly-qualified teachers.

In the thesis, the majority of respondents are female, and therefore any significant gender differences in time allocation behaviour or reporting cannot be deciphered or extracted

conclusively. However, it is imperative to note that women are more likely to work part-time, do the bulk of domestic work and generally multitask more than men (Craig, 2007; Offer & Schneider, 2011). If it is acceptable that women are polychronic, then the analysis as presented in this thesis also describes in detail the time allocation behaviour of Tasmanian teachers who are essentially polychronic. This argument, therefore, reinforces the earlier point made – namely that the SUR approach captures polychronicity and hence allows the thesis to make a unique contribution to the contemporary literature and current empirical evidence. Also important is the fact that the SUR approach allows for overlapping activities. Clearly, an explicit analysis (modelling) of monochronic and polychronic time has not been made. However, given the complexity of analysing polychronicity quantitatively, then the attempt made in this thesis is quite novel. This attempt involves using time shares and seemingly unrelated regressions to interweave polychronicity and interdependency of daily activities of teachers. So how is this done? Well; first, time shares reflect relative use of time by teachers. Therefore, any variable that affects the time share of any one particular day automatically has a bearing on the parameters of the equations for the time share determinants of the other days. In that respect, time spent on school work over on the weekend has an immense bearing on allocations made on any day during the school week. Second, given that the time calculation for each day is based on all activities taken jointly or individually, then it follows that polychronic time is embedded in the way in which daily time-use and weekly time-use are computed. The results reported in this thesis show the many variables that affect time-use allocation of teachers.

The estimation of the extent of overload shows that determinants of the extent of overload differ significantly across definitions of overload used. School factors, personal factors and classroom factors certainly influence the extent to teacher work overload. Teachers employed full-time are less likely to be overloaded and teachers over 40 years old are marginally likely

to experience significant work overload under the 45-hour week definition. The time thirsty activities that teachers juggle in schools during a typical week have different relative impacts on the extent of teacher overload. Finally, it worth emphasising that the results reported are based on implementing the EIVREG routine in STATA 9.2, and that the choice of this technique is guided by the argument that EIVREG yields robust estimates in estimations involving data that are measured with significant errors – the kind associated with recall data of the type used in time diaries. The EIVREG results from STATA 9.2 are not different from those obtained from implementing OLS regression routine. This similarity suggests that the time diary data used in this study was measured with minimal measurement error.

The results of the likely impact of UBT on teachers' time allocation behaviour suggests that a moderate increase in UBT will lead to decreases in weekend time expenditures, and marginally change the allocation of time during the teaching week. Reducing Sunday work times of teachers has considerable welfare gain for teachers. Therefore, consistent with Bechtold, Janaro and Summers (1984), Romer (1987), Carlin (1997), and Dababneh, Swanson and Shell (2001) 'sufficient' break time has a positive effect on worker productivity and worker well-being, and "taking time off for short breaks will not necessarily cause production to drop" (Dababneh, Swanson & Shell, 2001, p.173). The results obtained from SUR suggest that teachers who enjoy significant UBT are less likely to allocate a significant amount of their work time to work on Sundays. The quantitative results support the qualitative sentiments that point to the fact that teachers are generally robbed of 'unencumbered time'. It is as if teachers are pleading: *"Just give me a break, will you?"* The statement: "Give me a break, will you?" complements, therefore, the general view of teachers being over-burdened by endless reforms as well as reinforcing the notion that meaningful break-time in workplaces enhances productivity. The results reported have significant education policy implications as well as supporting collective bargaining strategies as part of

enhanced teacher work conditions. This research study has implications for teachers' well-being as they commit their emotional labour to meet the ever-changing demands of the education process.

7.3 Policy Recommendations

Of the explanatory variables used in the OLS, SUREG, MVREG, IVREG and EIVREG one can identify policy variables. The policy variables are any independent variables that can be changed or controlled as a result of changes in education policy. For example, if the state of Tasmania mandated that class size be reduced to a certain level (size), then the class size variable becomes a policy variable. All explanatory variables are currently assumed to be predetermined – meaning that they are measured with reasonable accuracy and are exogenous – that is as explanatory variables (independent variables) they are not being explained in the model. Any simultaneity that is implied or explicit is only for the dependent variables – time allocation, time shares and number of activities. This thesis has not focused primarily on primary activities. By including all the activities that the teacher undertakes in a typical day and typical week, and allowing therefore for the inclusion of overlapping activities, rather focus has been more on the real tradeoff across days of the week and also across activities.

From a policy point of view, the longer hours that teachers expend in and out of schools may reflect one of several factors. First, it is possible that older teachers are working longer hours because they are struggling with change and the accompanying workload from the change. Second, the results could imply that older teachers have an increased commitment to their students especially if they believe that current curriculum changes do not contribute fully to a rounded academic development of students. Third, it is possible that the administrative requirements of these teachers create a situation in which less time is available for classroom activities, preparation for teaching, liaising with colleagues and participating in extra-

curriculum activities. Fourth, teachers may be investing significant amounts of time in and outside the school – hence having a “sustained commitment and a sense of efficacy despite challenging circumstances” (Day et al., 2008, p.335). Finally, it is also possible that professional development is placing considerable pressure on time available in schools. All these possible policy explanations are not being explored in the thesis because the original data were not collected with an intention to link time-use to teacher effectiveness, efforts in continuing professional developments, commitment to teaching, teaching morale and the like. The explanations are raised, nonetheless, as a way of looking at the results from the thesis and hence understanding these results within a context of the broader demands on teachers’ work. Policy-wise, the time-squeeze of Tasmanian teachers is worthy of further research consideration. As noted in Joyce and Stewart (1999, p.5) “one important form of investment for any society is the amount of time and resources spent by both children and adults in learning activities”.

Clearly the amount of time spent in classroom, on tasks, is a relatively small proportion of actual school time. The inference has so far been based on the relative use of teaching time. Efforts should be made, therefore, to increase teachers’ instruction time. This increase can be achieved by eliminating (or lessening the impact of) those factors that rob teachers of time, and also structuring classrooms in ways that promote learning and academic achievement.

It is important to reiterate that secondary data collected by Gardner and Williamson (2004) and used in this thesis were collected using a standard diary approach. However, this approach tends to “capture time both at the workplace and in the home, while excluding leisure time at work” (Drago et al., 1999, p.35). This limitation identified by Drago et al., (1999) has been addressed particularly well in this thesis because the data collected by Gardner and Williamson (2004) included evidence on teacher break time in schools. The results presented in this thesis show clearly that teachers who enjoy significant breaks during

a typical week tend to work fewer hours during the weekend, and are likely to experience lower intensification of work. This observation has significant policy implications. The ability to accord teachers a break or so during school time to recharge and avoid the downward spiral of diminishing returns to effort or a day's work is quite a significant policy alternative. A strong policy recommendation is to therefore look for options in schools and school administration to create significantly larger and effective uninterrupted break times during the normal working day.

7.4 Directions for Future Research

It is important, therefore, to briefly point out what has not been modelled explicitly in this thesis; and, what would be ideal to model in this thesis. It is important to assume that teachers make every effort to fulfil their expected family-and-work roles diligently. This thesis has only captured part of the school side of teacher's work lives, and a little bit of weekend work of teachers outside schools. This is certainly an incomplete description or characterisation of teachers' work. A study of this kind would have benefitted immensely from information on income, family background and job expectation, job satisfaction, reasons for joining the professions and job preparation. The following variables have not been incorporated because of lack of data: household composition, education level, and intra-day allocation of time within activities. One thing that is certainly missing from the study is the set of variables that describe teachers' household attributes. These attributes would include variables such as the number of household members, number of dependents, marital status (if married – whether spouse works or not), status as bread-winner, or otherwise. Why are these household attributes important? Certainly how households balance work and family commitments is an issue of major and growing concern (Craig, 2007). The set of suggested attributes are supported by the contemporary literature (Strober & Tyack, 1980; Strauss & Thomas, 1985; Brown & Saks, 1987; Aldakhil, 1997; Kan & Fu, 1997; Maassen van den Brink & Groot,

1997; Bhat & Misra, 1999; Miller & Mulvey, 2000; Tu, 2002; Anxo & Carlin, 2004; Hallerod, 2005; Goulias & Henson, 2006; Kan & Heath, 2006; Craig, 2007; Weagley, Chan & Yan, 2007; Offer & Schneider, 2011). Of particular interest would be an analysis on why other teachers do not do some of the time-thirsty activities. Such an extension would contribute to an understanding of time-inequity in schools, certainly given the level of zero values for some of the time allocation behaviour variables.

7.5 Conclusion

Teachers' work has increased or intensified in scope (Hargreaves, 1992; MacBeath et al., 2000; Williamson & Myhill, 2008) with teachers required to perform functions such as carer, counsellors, parents, and behavioural managers (Easthope & Easthope, 2000; Gardner & Williamson, 2004; Mulford & Edmunds, 2010), and also participate actively in the management and operation of the school (Alutto & Belasco, 1973). Clearly, there is a case for arguing that school time is being eroded gradually – particularly academic learning time. It is still important though to stress that student engagement matters. This student engagement is particular important for both students and teachers given that “the intrinsic rewards of teaching centred on student achievement ... still provide teachers with a greater deal of satisfaction” (Rice 2005, p.182). What is also clear is that “teachers will stay in the profession precisely because of these positive emotions ... and will preserve in spite of all the deprivations and challenges ... for reasons that have more to do with teachings' heart than its physical conditions” (Kutcy & Schulz, 2006, p.79).

In spite of that general observation, in the case of evidence from Tasmania, it is still important nonetheless, to look at those factors that are particular to the settings of Tasmanian schools. It is worth recapping a reminder from Hornberger (1987) – notably that, in schools, apart from “factors relating to teacher and pupil absence, school time tasks, and class time

tasks, it is ... clear that the factors reach far beyond the boundaries of the school in terms of both sources and their consequences” (p.211).

It is important to understand how different types of variables modify teachers’ work lives (Collet, Menlo & Rosenblatt, 2004). By describing teachers’ activity patterns using these various factors, a synoptic view of the temporal and spatial rhythm of a teacher’s life and their time allocation schedule, is obtained. The routines of teachers and the web of relations among teachers within the school system are indeed fairly complex. The thumbprint metaphor presented in earlier chapters of the thesis highlights this. It is essential, therefore, to study teachers’ time allocation in the context (or within a framework) of 24 hour diaries because work-family conflict play an important and unique part in teachers’ time allocation. Clearly, time allocation in teaching is “influenced by some of the same factors evident in studies on time allocation in many disciplines” (Stark, Lowther & Austin, 1985). Certainly, “a more informed understanding of how individuals organise their daily life can provide a better assessment of the effects of economic and social policies on labour market, consumption patterns and individual well-being” (Floro & Miles, 2003, p.20). This thesis has certainly brought these variables to the foreground.

Teachers’ work patterns involve a diversity of tasks, and the flexibility or rigidity with which teachers can perform their activities makes the study of teachers’ time allocation a fascinating exercise. As noted in Day et al., (2008, p.330), it is equally important to understand “why people behave as they do in various situations ... [and also describe; ... “what they do”. In that regard, an analysis of patterns of teachers’ work is important and makes a significant contribution to the literature, practice, and policy. Clearly, time is both a scarce resource and a significant constraint. Thus, time-use decisions of teachers are influenced by teacher, school, and education system characteristics, and several external factors.

The thesis is developed around the premise that in order to understand teachers' work patterns, workloads and allocation of time, one must develop a framework that assumes that teachers are economic agents who make optimal decisions regarding time allocation (at work and off-work). The most significant constraint in the decision making is the time constraint. In this thesis, the key determinants of time allocated to teachers' work over a typical working week were examined. In addition, the key determinants of the allocation of time to a selected set of activities were investigated. This was done because the researcher identifies that the time allocation by teachers is an important dimension (topic) that has received very little attention from the literature and policy prescriptions. Teaching is an economic activity and therefore an analysis of time allocation by teachers as part of the production of goods and services is quite critical. The use of time by teachers and work-home conflict among teachers are worth examining (Dreeben, 1970; Blasé & Pajak, 1986; Casey & Apple, 1989; Huberman, 1993; Huberman, Thompson & Weiland, 1997; Biddle, Good & Goodson, 1997; Roth, Brooks-Gunn & Linver, 2003; Churchill & Williamson, 2004) especially in cases involving female teachers (Flickinger, 1932; Cochrane & Logan, 1975; Acker, 1989; Acker, 1992; Cinamon & Rich, 2005)

An understanding of how (teachers) organise their daily work and non-work lives can "provide a better assessment of the impact of economic changes on living standards and the work burden" (Floro & Miles, 2003, p.3). There is growing understanding that unpaid non-market production is fundamental for effective market production (that is, a healthy life style outside work leads to healthier outcomes at work and vice versa (Cochrane & Logan, 1975; Eldridge & Pabilonia, 2007). To the best knowledge of the researcher the empirical study presented in this thesis differs significantly from any previous research (known so far), in the following aspects: determinants of daily time allocations of teachers are examined taking into account the interrelatedness of days of the week and the overlapping of activities

(polychronicity). The thesis provides an integration of the literature on teachers' work, a conceptual model and metaphor of teachers' time allocation behaviour, novel estimation techniques, and a unique framework (the teachers' thumbprint) within which to examine the myriad of direct and indirect effects of factors that affect the allocation of time by Tasmanian teachers. Like most metaphors that "merely cast the incomprehensible as a more understandable likeness (Moore, 1993, p.452), the metaphor of the teachers' thumbprint captures the realities of teachers' time-use behaviour and "creates a new idea that can be created in readers' minds (Moore, 1993, p.452), in a way that captures teachers' struggles and work lives clearly. Jones (1934, p.25) argues that "the solution of one child's problem of leisure-time activities is frequently the solution of the problem of others in the group". In this thesis, a solution to a time allocation use problem by an individual teacher and/or a group of teachers is certainly a solution to the problem of how teacher time-use and teachers' time-use affects teacher welfare and the work lives of teachers. Clearly, a guiding mechanisms that are useful for creating leisure time for teachers through UBT has been found by providing a framework and for analysing teachers' time-use. The beauty of the teacher's thumbprint is also in the beauty of UBT.

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APPENDIX

APPENDIX A (EXTRACT – (GARDNER & WILLIAMSON, 2004))

Executive Summary

Introduction

In mid 2003, the Tasmanian Branch of the Australian Education Union (AEU) commissioned the authors at the Faculty of Education, University of Tasmania, to investigate AEU members' workloads.

This study had three main purposes: first, to identify and describe the factors that determine the workloads of principals, teachers and other education workers; second, to critically examine these data and to suggest how current workloads may be made more manageable while maintaining desired outcomes; and finally, to suggest ways of ensuring the most effective use of all resources including, where appropriate, more innovative ways of distribution so as to promote student learning.

Accordingly, the authors conducted this study in order to identify the influential factors in workloads as perceived by a sample of the AEU's membership who were, at the time of the study, education workers in the government education system. The AEU membership groups from which samples were drawn included: principals, teachers, professional support service and special education staff, teacher assistants, and library technicians and laboratory technicians. Professional support service staff respondents included guidance officers, social workers and Aboriginal education officers.

Procedures and the samples

The study used a combination of qualitative and quantitative methods (Burns, 2000). An approach incorporating questionnaires and diaries, focus group interviews and individual, face-to-face, semi-structured interviews was used to gather the data. Use of a multi-method approach enabled some triangulation of the data (Denzin & Lincoln, 2000). Following gaining approval from the Human Research Ethics Committee (Tasmania) Network to conduct the research, samples were selected from the AEU's membership using a stratified systematic sampling procedure (Burns, 2000) to ensure selection from all groups of AEU membership groups. Initial analysis of the questionnaires and diaries using a quasi-grounded theory approach (Strauss & Corbin, 1998) revealed emergent themes that were explored during the interviews in order to gather richer data. Focus groups were used to enable the researchers' access to a range of opinion and to allow for examination of concepts and checking understandings with some respondents (Fontana & Frey, 2000). Individual interviews were employed to provide opportunities for gathering data from individual respondents away from the possible pressures of the majority of a group or influential colleagues that may have influenced respondents in the focus group interviews (Burns, 2000).

The study's materials were sent to approximately ten percent of the AEU teacher membership groups; samples comprising higher percentages (ranging from 16 to 100%) were selected for groups with comparatively smaller membership numbers than the teacher groups. Around half of the selected teacher and principal members sent the materials completed the questionnaire and diary. Groups with smaller membership numbers had a return rate of between 20 and 67 percent. Only a few district high school respondents replied; these responses were not retained as a separate group. Table 1 provides details of AEU membership, numbers in the samples

(also expressed as percentages of the membership), completion rates for the questionnaires and diaries (expressed both numerically and as percentages) and numbers of interviews.

Table 1 AEU membership, sample sizes and questionnaire completions (returns) and interviews

Sector / participant group	Members of the AEU	Q'aires sent - no.	Q'aires sent %	Return no.	Return %	Interviews	
						Focus Group	Individ.
primary teachers	1961	170	9	86	51	1	2
secondary teachers	969	100	10	47	47		2
college teachers	556	50	9	26	52	1	
TAFE teachers	367	60	16	19	32	1	1
principals	190	44	23	21	48	1	1
spec ed / support staff	186	30	16	12	40	1	1
guidance officers	20	15	75	7	47	1 (joint)	1
social workers	8	7	88	2	29		
Aboriginal education officers	5	5	100	1	20		
teachers assistants	189	55	29	16	29	1	1
library and laboratory technicians	32	24	75	16	67	1	1
district high teachers	few returns - not retained as a separate category						

The questionnaire items and the diaries invited respondents to share information about the perceptions they had of their roles and the actual tasks and activities performed. Tabulated data and the discussions of main findings about respondents' reported working hours for one week are presented in the "main findings" section.

Main findings

▪ Hours worked

Respondents' diary entries were analysed to provide a "snapshot" of the hours worked by a sample of education workers employed under the Awards for the Teaching Service, Professional Employees and TAFE Teachers during one week in 2003. The snapshot is presented in Table 2. Forty-three (43) percent of respondents reported they worked at least 50 hours; in terms of the Australian Bureau of Statistics (2003), "very long working hours" are defined as 50 hours or more per week. Eight (8) percent of respondents reported they worked at least 60 hours in that week.

Table 2 Snapshot of hours worked one week—reported by respondents employed under the Awards for the Teaching Service, Professional Employees and TAFE Teachers

Participant group	Hours			
	30-39	40-49	50-59	60 or >60
primary teachers	5 ¹	37	21	2
secondary teachers	5	12	17	3
senior secondary teachers	2	15	4	3
TAFE teachers	4	6	4	0
professional support & special education staff ²	1	6	5	0
principals	0	5	9	6

Key: ¹ Numerals refer to full-time staff

² Guidance Officers, Social Workers and Aboriginal Education Officer form part of the professional support service and special education staff group in this and subsequent tables

When the hours reported by respondents were extrapolated to a 46-week working year (from a 40.5-week school year and a 41 week-TAFE teaching year) the average

for five of the six groups was at least 40 hours. Two of the groups' averages were at least 45 hours after extrapolation. Forty-six weeks was used for this calculation based on the fact that many employees in other industries work a 48-week working year and receive an additional 10 public holidays. Table 3 illustrates the average hours worked by the respondents and the extrapolation of their reported hours of work to a 46-week working year.

Table 3 Average hours worked by respondents employed under the Awards for the Teaching Service, Professional Employees and TAFE Teachers, and extrapolation to a 46-week working year

Participant group	No. of staff— FTEs	Average hrs reported worked one week	Hours extrapolated from a 40 to a 46-week work- ing year
primary teachers	78	48.7	42.9
secondary teachers	45	51.7	45.5
senior secondary teachers	25	50.0	44.0
TAFE teachers	18	42.3	37.7
principals	19	55.4	48.8
prof. support & special ed staff	20	47.7	42.0

Note Participant group numbers include part-time staff calculated as FTEs

▪ *The questionnaire items*

The questionnaire items addressed five major areas: first, perceptions of change during the last five years; second, aspects of the workplace that assisted respondents' work; third, aspects of the workplace that hindered their work; fourth, respondents' satisfaction with involvement in role-related decision-making; and finally, respondents' suggestions for improvements in their workloads. For each of the first four areas, respondents were invited to indicate whether they agreed or disagreed with a specified statement.

The statements in the questionnaire and a brief summary describing the agreement and disagreement expressed by the respondents

In response to each statement respondents were invited to select one of the following: "strongly agree"; "agree"; "neutral"; "disagree"; or "strongly disagree".

Statement: *There have been significant changes during the last 5 years that have affected the types of tasks/activities I perform in my role.*

Results: More than 50 percent of respondents in each of the participant groups except teacher assistants selected "strongly agree". Most agreement was expressed by TAFE teacher respondents (94%). Thirty-one percent of teacher assistant respondents selected each of the responses "agree" and "strongly agree".

Statement: *Many aspects of my school/s assist my work.*

Statement for principals: *Many aspects of the Department assist my work*

Results: Close to, or more than, 50 percent of respondents in each of the participant groups except TAFE teachers (36%) selected "agree"; agreement was highest in the professional support service and special education staff participant group (72%).

Statement: Many aspects of my school/s hinder my work.

Statement for principals: Many aspects of the Department hinder my work

Results: Between 40 and 53 percent of respondents in each of the participant groups, except senior secondary teachers and teacher assistants, selected “agree”. Thirty-three percent of senior secondary teacher respondents selected “disagree”. Thirty-three percent of senior secondary teacher respondents who selected “agree” or “strongly agree”. Similarly, 33 percent of teacher assistant respondents selected “agree”, however, another 33 percent selected “strongly disagree”.

Statement: I would describe as satisfactory my involvement in school decision-making in relation to my role.

Statement for principals: I would describe as satisfactory my involvement in decision-making at Department level in relation to my role.

Results: Ninety-five (95) percent of professional support service and special education staff respondents selected “agree” (85%) or “strongly agree” (10%). Between 44 and 54 percent of respondents in five participant groups—primary teacher, secondary teacher, senior secondary teacher, principal, and teacher assistant—selected “agree”. Forty-two (42) percent of library technician and laboratory technician respondents selected “strongly agree” or “agree” and another 42 percent selected “disagree” or “strongly disagree”. Fifty-eight (58) percent of TAFE teacher respondents, however, selected “disagree” or “strongly disagree”.

Respondents were invited to comment on their choice of responses to the statements. Analysis of their written responses revealed the themes presented in Tables 5 to 8.

Changes during the last 5 years

Respondents who reported having five or more years’ experience identified a range of factors that influenced their perceptions of changes during the five years prior to their completion of the questionnaire items. These factors were grouped into themes and are presented in Table 4.

Table 4 Changes during the last five years—themes that arose from the eight participant groups

Participant group	Changes during the last 5 years									
	Curriculum & pedagogy	flexible delivery	students’ needs – inclusion	intensification	accountability	reduced resources	community needs / expectations	computers	non-teaching duties	decentralization - centralization
primary teachers	*		*	*	*					
secondary teachers	*		*	*				*		
senior secondary teachers	*		*	*	*					
TAFE teachers		*		*	*				*	
principals			*		*	*	*			*
prof. support & special ed staff			*		*	*				
teacher assistants	*			*						
library and lab technicians				*						*

Key: * indicates the theme was amongst those most prominent that emerged from the respondents’ comments in each of the participant groups so marked—typically in at least 20 percent of responses

Aspects of workplaces that respondents reported assisted their work

Respondents identified aspects of their workplaces that assisted their work. These aspects or factors were grouped into themes and are presented in Table 5.

Table 5 Workplace factors that assist work—themes that arose from the eight participant groups

Participant group	Factors that Assist										
	support-colleagues	support-senior staff / principal	supportive environment & proactive programs	time	professional learning opportunities	environment & resources	others understand role	others value role and work performed	communication	consultation	individual DoE officers
primary teachers	*	*	*	*							
secondary teachers	*	*	*								
senior secondary teachers	*	*	*								
TAFE teachers	*				*						
principals										*	*
prof. support & special ed. staff	*	*	*				*	*	*		
teacher assistants	*	*				*				*	
lib. & lab. technicians	*	*			*						

Key: * indicates the theme was amongst those most prominent that emerged from the respondents' comments in each of the participant groups so marked—typically in at least 20 percent of responses

Aspects of workplaces that respondents reported hindered their work

Respondents identified aspects of their workplaces that hindered their work. These aspects or factors were grouped into themes and are presented in Table 6.

Table 6 Workplace factors that hinder work—themes that arose from the eight participant groups

	Factors that hinder								
	school processes & programs	time issues	student needs - Inclusion policy	support from & valued by colleagues	non-teaching duties	budget - resources	professional learning	DoE policies	decentralization - centralization
primary teachers	*	*	*		*	*			
secondary teachers	*	*	*		*		*		
senior secondary teachers	*	*	*						
TAFE teachers	*				*	*			
principals		*						*	*
prof. support & special ed. staff	*	*	*	*		*	*		
teacher assistants	*	*	*	*					
lib. & lab. technicians	*	*		*					

Key: * indicates the theme was amongst those most prominent that emerged from the respondents' comments in each of the participant groups so marked—typically in at least 20 percent of responses

Satisfaction with involvement in role-related decision-making

Respondents identified aspects of their involvement in role-related decision-making that influenced their satisfaction with decision-making processes. These aspects were grouped into themes and are presented in Table 7.

Table 7 Involvement in role-related decision-making—themes that arose from the eight participant groups

Participant group	Decision-making					
	"symbolic" or no opportunities	listened to - opportunities	important to be involved in relevant decision-making	importance of being included, feeling valued	varies - depends on level within organisation	system - speed, flexibility
primary teachers		*	*			
secondary teachers	*	*	*			
senior secondary teachers	*	*				
TAFE teachers	*				*	
principals	*				*	*
prof. support & special ed. staff	*	*	*			
teacher assistants	*		*	*		
library and laboratory technicians	*	*		*		

Key: * indicates the theme was amongst those most prominent that emerged from the respondents' comments in each of the participant groups so marked—typically in at least 20 percent of responses

Suggestions offered by respondents for improvement of their workloads

Respondents were invited to provide any suggestions for improvement of their workloads. These suggestions were grouped into themes and are presented in Table 8.

Table 8 Suggestions for improvement of workloads—themes arising from the eight participant groups

Participant group	Suggested improvements											
	appropriate support – staff and students	resources, staffing, staffing equity	DoE communication, co-ordination	DoE initiatives, expectations - time, support	class sizes, teaching space,	appropriat prof. learning, initial training -TAFE	accountability, reporting, admin.	recognition, understanding, expectations, trust, incl. decision-mkg, prof. treatment, leave conditions	appreciation of individual. subject requirements	selection processes	personal strategies – balance life & work	schools should be proactive quality supervisors
primary teachers	*	*	*	*	*	*	*	*				
secondary tchrs		*		*		*	*	*				
senior sec. tchrs		*	*	*	*	*		*	*	*	*	
TAFE teachers		*				*		*				
principals		*		*			*	*			*	
prof. support & special ed. staff		*		*				*				*
teacher assistants	*	*				*		*				*
lib. & lab. techs		*		*		*		*		*		

Key: * indicates the theme was amongst those most prominent that emerged from the respondents' comments in each of the participant groups so marked—typically in at least 20 percent of responses

The main themes that emerged from the analysis of the questionnaire items

1. Intensification

It was not uncommon for teachers and principals to report they worked days of at least 11 or 12 hours with minimal breaks. A half-hour *uninterrupted* lunch break was unusual. This work often was augmented by several hours during the weekend.

Respondents typically considered the intensification of their worklives in negative terms; the number of changes at any one time and the resultant layers of change upon change were problematic. The intentions underpinning change, however, often were viewed more positively. Respondents expressed a range of concerns including:

- needing more time to implement change while dealing with the exigencies of day-to-day work in schools;
- the incoherence of change; the requirement to teach more curriculum, or a broader curriculum, in less time;
- increasing demands on time of non-teaching duties;
- typically having to discuss essential work matters 'on the run';
- the feeling of having to juggle too many demands and expectations, indeed being close to losing control of this 'juggling act';
- rising case loads and a corresponding fall in staff numbers;
- having to perform more, irrelevant or conflicting responsibilities;
- working in contexts in which more people are becoming more demanding;
- being unable to sleep at night because of thinking about the day's activities and planned actions for the next day; and
- the attractiveness of teaching as a profession.

2. DoE policies and associated requirements

The number of policies to which schools had to respond and the speed at which policies occurred were noteworthy. Principals made specific reference to the resultant limitations on schools' capacities: first, to support the Department's priorities; second, to implement worthwhile changes; and finally, to measure improvements in student learning.

Teachers and principals expressed concern and frustration at being held accountable by others for outcomes over which they had either limited control or no control. Although increased accountability was not viewed essentially as a negative development concern was expressed about its presence without accompanying support.

Teachers reported a growing requirement for them to undertake non-teaching tasks, e.g., cleaning, administrative tasks, sharpening pencils, office work and supervising students at recess and lunchtime. Teachers reported they were increasingly unable to focus on the teaching tasks that they were expected to perform. Some respondents proposed improved recognition of expected duties, for example, by means of allocation of official timetabled time.

Some secondary and senior secondary teachers expressed concern about: first, a lack of articulation between current and newly emerging assessment procedures; and second, an apparent focus away from specialist teachers, their expertise and their passion for their specialist teaching areas and a reported accompanying reduction in students' knowledge and skills.

3. Support, resources and procedures

Education policies or initiatives typically were not criticised per se; many teachers and principals, however, expressed a range of strong concerns about both the Department's capacity to support the work of schools and its control of resources. Principals considered that central office decision-makers demonstrated insufficient understanding of school communities' needs and priorities. Principals' other concerns included the requirement that they pursue resources for everyday school needs and the amount of the education budget that their schools were able to access.

Teachers expressed concerns about a range of issues: the standard and features of the physical environments in which they were expected to work; the perceived inequity of school staffing; pressures they felt related to coming to school when ill; and inadequacy of resource provision for schools to implement specific initiatives, for example, curriculum changes and the Inclusion policy.

Respondents considered that computers potentially enhanced students' learning; any advantages of computers in education, however, were overshadowed by respondents' concerns about:

- increased workloads from having to undertake more professional learning;
- feelings of incompetence as a result of lacking skills and confidence in using the technology;
- the quantity of e-mails from the Department considered unnecessary by recipients;
- substandard hardware; and
- an expectation that teachers and professional support service staff would use computers to complete non-teaching tasks formerly completed by non-teaching staff.

4. Students' needs including specific reference to the Inclusion policy

The two main issues reported by respondents related to students' needs were: first, needs of students in classes in accordance with the Inclusion policy; and second, inappropriate student behaviour, with reference made to societal changes, the influences of these changes on students' and their families' needs and the inappropriate or disruptive behaviour of some students at school. In relation to the Inclusion policy the principles were not criticised, however, many respondents expressed considerable disquiet and some anxiety about implementation of this policy and stated there was a need for a review.

Factors that contributed to respondents' concerns about the practicalities of implementation of the Inclusion policy included: class size; classroom size; levels of resource provision; teachers' professional learning needs and opportunities to apply their learning. Some teachers reported experiencing conflicts between needs of students who are "included" and the other students in the class. Some teachers reported they felt inadequately prepared to work with some students. Principals, teachers and teacher assistants expressed some concerns about resources to support professional learning for teachers and teacher assistants and transparency in the implementation of the Inclusion policy.

5. Support from workplace colleagues

Collegiality was a central source of support for all groups, except principals. Some respondents referred to the crucial influence of collegiality on their capacity to cope with challenging student behaviour or a demanding work environment and their willingness to undertake more hours of work than they might otherwise consider manageable. A major factor in establishing collegiality was having regular time in common with colleagues and some respondents reported difficulties they experienced by not having this opportunity because of other commitments.

Principals typically sought support from the Department; however, principals who reported receiving little or no support often were in their first few years of their principalship at their first school.

6. Communication and consultation

Respondents reported that good communication processes and the knowledge that their opinions were appreciated assisted the performance of their roles. They believed that feelings of trust and empowerment were engendered by high levels of involvement in role-related decision-making and having access to information. Staff reported they were less inclined to offer their opinions when their views differed from the majority of their colleagues or the opinions of their school's leadership, and when they perceived decision-making processes were "symbolic" only.

Employment status had an effect on employees' reported levels of confidence to initiate communication or to offer their views. Some teachers appointed to temporary vacancies, to base-grade positions or non-class-teaching positions, for example, reported feeling particularly vulnerable in decision-making situations with regard to their employment prospects in the longer term. Similarly, employment for a set number of hours, for example in the case of teacher assistants, and library technicians and laboratory technicians, severely restricted these staff from involvement in what they regarded as essential communication. For example, teachers reported reluctance to ask teacher assistants to meet before or after school—during unpaid time—to discuss learning programs for students with whom the teacher assistants worked.

7. Recognition, understanding and trust

Respondents reported that the trust they were shown, or were not shown, the quality of support and recognition they received from school colleagues, supervisors, other education workers, parents and politicians, and the provision of opportunities, for example, in the form of time to maintain professional relationships influenced: first, their perceptions of what constituted a "reasonable" workload; second, performance of their workload; and finally, their feelings about performing their workload.

8. Coping strategies

Many respondents' comments highlighted the influence of externally imposed factors on their performance. Some respondents, however, reported strategies they had developed independently for managing or reducing their workload, for example, time management, prioritising tasks, establishing definite boundaries between work and home and working part-time, and they expressed varying levels of satisfaction with the outcomes of implementing their chosen strategies.

Practical suggestions

Analysis of the data points to many potential suggestions for improving workloads and the contexts in which education workers perform their work. The most commonly occurring respondents' suggestions for improving their workloads are presented in the form of a statement about the issue followed by a proposed suggestion in bold font. Some issues included in this section emanated from only one, or two, of the eight groups, however, it was noted that the nature of these issues was such that they were specific to particular groups.

1. Intensification

Intensification of workloads was reported by nearly all respondents in all eight participant groups. For many respondents this intensification is nearing, or has already reached, an unsustainable level. Their reports suggested that it would be timely to consider a process for the development, monitoring, implementation and review of initiatives. Respondents expressed concern that the nature of their work is changing because of external—often described as “political”—forces. This issue was of most concern for the principals in this study. Respondents across all groups typically reported they were being pulled away from what they viewed as their core roles and activities. Many respondents reported that non-teaching administrative duties, for example, photocopying, filing, typing and data entry detracted from the time they could dedicate to teaching and student support. Professional support service staff, i.e., guidance officers and social workers, reported perceptions of excessive caseloads. Some TAFE respondents reported concerns about the perceived negative effects, in the context of many more sessional or casual staff, on their management responsibilities, for example, induction and supervision. Many principal and teacher respondents reported being unable to have an uninterrupted 30-minute lunch break; they frequently reported performing a variety of essential activities, for example, communicating with colleagues, parents and other members of the school community, or preparation and marking, if they were not undertaking recess and lunch time supervision duties.

It is suggested: That all stakeholders begin to discuss what it means to be a teacher or allied educator, and what it means to teach, or to support teaching and learning, in the 21st century, to avoid what was described as an accretion of more and more tasks and activities into education workers' roles in an ad hoc fashion.

2. Policies

(i) The large majority of respondents reported that there appeared to be a surfeit of policies that meant that those at the school and classroom levels responsible for implementation felt overwhelmed. Often this was stated in terms similar to “too much change required at any one time”.

It is suggested: That all stakeholders, particularly head office and district level staff, consider whether or not fewer policy initiatives may be appropriate and that where policies are announced that they are linked in an explicitly coherent framework for the implementers.

(ii) A large number of respondents reported that some policies were having what was viewed as a disproportionate impact on school and classroom resources and processes. For example, policies related to Inclusion and computers—in the latter, ranging from use in pedagogy through to use in the preparation of student reports—were seen as activities for which there was not adequate support. Respondents indicated that timely and suitable professional learning programs should be available for all staff—teaching and non-teaching—for these initiatives.

It is suggested: That the stakeholders at school level, district level and head office level review these policies and their implementation and resourcing in the context of the reported problems of implementation.

3. Resources

The large majority of respondents perceived a decrease in available resources. In many situations this was presented in the context of increased competition for resources, e.g., the need to engage in submission writing for grants to provide what were seen as essential, ongoing, Department of Education prioritised activities.

It is suggested: That stakeholders consider not just the overall resources available but also a redirection of some resources to ensure a minimal provision for those activities deemed important or essential. At both school level and district level, stakeholders could investigate broad issues of clustering, and within individual schools, explore provision of particular support for teachers who appear to be bearing the brunt of all or many of these policies in their classrooms.

4. Employment conditions—teacher assistants, and library technicians and laboratory technicians

Respondents in the teacher assistant, and library technician and laboratory technician participant groups typically reported that their employment conditions, i.e., paid hours per week, limited the opportunities for them to attend meetings related to their work or more broadly those relating to their schools as an education community. Respondents' reports of their work indicated that these meetings were seen as a necessary part of their roles. It was noted that many respondents willingly gave unpaid time to their work. Additionally, security of employment was a recurring issue for many respondents in these groups.

It is suggested: That the relevant stakeholders (i) explore ways of facilitating the participation of these groups more fully in schools' day-to-day activities and ways of recognising the key roles of these allied educators as full members of staff and (ii) examine the issue of continuity of employment, particularly with reference to the long period between the end of one school year and the commencement of another.

5. Communications and decision-making

A strong theme was that respondents either knew they were trusted to do their job, or that they reported that they should be trusted to do their work, and this came or would come, in part, from clear and open lines of communication and opportunities to participate in decision-making through workplace planning committees or Department planning committees. There were reports of dissatisfaction and

frustration with “symbolic” decision-making processes, few or no opportunities to offer input into decision-making, or perceived difficulties in obtaining information that respondents believed would support the performance of their work. Alternatively, there were a number of very positive comments from respondents who described having opportunities to participate in decision-making and who described receiving appropriate support to implement agreed decisions.

It is suggested: That at school level and system level ways of strengthening existing lines of communication and involvement in decision-making be explored to ensure open, two-way participation.

6. Mentoring beginning principals

Some of the beginning principals reported on their need for ongoing and independent mentoring and support.

It is suggested: That the relevant stakeholders explore possible ways of providing this support, and the forms it could take and its duration.

7. Coping strategies

Most respondents reported dealing with many simultaneous demands; many reported feelings of being “stretched” and a few reported being at “breaking-point”. A few respondents, however, reported they had developed professionally appropriate ways of coping with matters related to intensification of their work. That is, they described how they were able to balance their perceived increased workloads while at the same time maintaining what were for them appropriate social and family lives.

It is suggested: That individual schools and the AEU consider ways to facilitate sharing of coping strategies that will assist all education workers.

Appendices

Appendix 1 Sample set of materials sent to prospective respondents

Appendix 2 Reported hours of work—groups employed under the Awards for the Teaching Service, Professional Employees and TAFE Teachers

Appendix 3 Main tasks and activities identified, and tasks and activities recorded in the diaries by principals

Appendix 4 Main tasks and activities identified, and tasks and activities recorded in the diaries by each participant group (except principals)

Item 4a Primary teachers

Item 4b Secondary teachers

Item 4c Senior secondary teachers

Item 4d TAFE teachers

Item 4e Professional support service and special education staff

Item 4f Teacher assistants

Item 4g Library technicians and laboratory technicians

Appendix 5 Changes during the last 5 years

Item 5a Primary teachers

Item 5b Secondary teachers

Item 5c Senior secondary teachers

Item 5d TAFE teachers

Item 5e Principals

Item 5f Professional support service and special education staff

Item 5g Teacher assistants

Item 5h Library technicians and laboratory technicians

Appendix 6 Aspects of workplace that assist performance of work

Item 6a Primary teachers

Item 6b Secondary teachers

Item 6c Senior secondary teachers

Item 6d TAFE teachers

Item 6e Principals

Item 6f Professional support service and special education staff

Item 6g Teacher assistants

Item 6h Library technicians and laboratory technicians

Appendix 7 Aspects of workplace that hinder performance of work

Item 7a Primary teachers

Item 7b Secondary teachers

Item 7c Senior secondary teachers

Item 7d TAFE teachers

Item 7e Principals

Item 7f Professional support service and special education staff

Item 7g Teacher assistants

Item 7h Library technicians and laboratory technicians

Appendix 8 Satisfaction with involvement in role-related decision-making

Item 8a Primary teachers

Item 8b Secondary teachers

Item 8c Senior secondary teachers

Item 8d TAFE teachers

Item 8e Principals

Item 8f Professional support service and special education staff

Item 8g Teacher assistants

Item 8h Library technicians and laboratory technicians

Appendix 9 Suggestions for improvement of workloads—all participant groups

APPENDIX B (THE QUESTIONNAIRE)

Teacher Questionnaire – 'Workloads of Government school teachers and allied educators in Tasmania'

Educators' workloads: Identification of typical activities and the main influences

The purpose of this questionnaire is to take a close look at a broad range of educators' (teachers, principals, allied workers) workloads. You are invited to answer the following questions and to complete a diary over the course of one week. Your responses will, of course, be confidential. Your time and thoughts are greatly appreciated. Thank you!

Background Information

PLEASE TICK THE APPROPRIATE CATEGORIES:

1.1 Gender male ☐ female ☐

1.2 Age 21-30 yrs ☐ 31-40 yrs ☐
41-50 yrs ☐ 51-60 yrs ☐ 60+ yrs ☐

1.3 Including the current year how many years teaching experience do you have?

1 yr ☐ 2 yrs ☐ 3 yrs ☐ 4-10 yrs ☐

11-15 yrs ☐ 16-20 yrs ☐ 21+ yrs ☐

1.4 Including the current year how many years teaching experience in your present workplace?

1 yr ☐ 2 yrs ☐ 3 yrs ☐ 4-10 yrs ☐

10+ yrs ☐

1.5 Type of educational institution

Special ☐ Primary ☐ Secondary ☐

District High ☐ College ☐ TAFE ☐

1.6 Including your present school how many schools/colleges have you taught in?

1 ☐ 2 ☐ 3 ☐ 4-10 ☐ 10+ ☐

1.7 Employment status

Perm. ☐ Fixed term ☐ Casual / Relief ☐

Full-time ☐ Fractional or Part-time ☐

If part-time please state fraction _____
(e.g. .4)

1.8 Location of institution

urban difficult to staff ☐ rural ☐

isolated ☐ urban mainstream ☐

1.9 Number of students enrolled at your institution

Below 51 ☐ 51-100 ☐ 101-200 ☐

201-300 ☐ 301-400 ☐ 401-500 ☐

501-600 ☐ 600+ ☐

1.10 Do you consider you are teaching out of area
(e.g. teacher trained for ECE, now teaching in
primary; secondary trained in HPE, now teaching
secondary maths)

Yes ☐ No ☐

Do you hold, or are you acting in, a promotion
position?

Hold substantively ☐ Acting ☐ No ☐

If "yes" please write the position title

Teacher Questionnaire – 'Workloads of Government school teachers and allied educators in Tasmania'

PLEASE COMPLETE WHICH EVER ITEMS IN SECTION 2 ARE APPLICABLE TO YOUR SECTOR OF SCHOOLING. THIS MAY INVOLVE COMPLETING MORE THAN ONE CATEGORY. THEN GO TO SECTION 3.

Primary class teachers:

2.1 Tick the grade group/s you teach currently.

K ☐ P ☐ 1 ☐ 2 ☐ 3 ☐

4 ☐ 5 ☐ 6 ☐

2.2 Do you teach a single class, or are you a member of teaching team in a double class or more?

Single class ☐ double class ☐ triple class + ☐

2.3 How many students on your class list/s? (If you teach in a double unit or larger, please give average class group size per one teacher)

Below 17 ☐ 17-20 ☐ 21-24 ☐

25-27 ☐ 28-30 ☐ 31-34 ☐ 34+ ☐

Primary specialist teachers:

2.4 Tick the grade group/s you teach currently.

K ☐ P ☐ 1 ☐ 2 ☐ 3 ☐

4 ☐ 5 ☐ 6 ☐

2.5 How many students on your class lists?

Below 30 ☐ 31-60 ☐ 61-90 ☐

91-120 ☐ 121-150 ☐ 151-180 ☐

181-210 ☐ 210 + ☐

Middle school class teachers:

2.4 Tick the grade group/s you teach currently.

5 ☐ 6 ☐ 7 ☐ 8 ☐

other ☐ (please specify)

2.5 Do you teach a single class, or are you a member of teaching team in a double class or more?

Single class ☐ double class ☐

triple class + ☐

2.6 How many students on your class lists?

Below 30 ☐ 31-60 ☐ 61-90 ☐

91-120 ☐ 121-150 ☐ 151-180 ☐

181-210 ☐ 210 + ☐

Secondary class teachers:

2.7 Tick the grade group/s you teach currently.

7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐

12 ☐ VET ☐

2.8 Do you teach a single class, or are you a team member in a double class or more?

Single class ☐ double class ☐ triple class + ☐

2.9 How many students on your class lists?

Below 30 ☐ 31-60 ☐ 61-90 ☐

91-120 ☐ 121-150 ☐ 151-180 ☐

181-210 ☐ 210 + ☐

Teacher Questionnaire – 'Workloads of Government school teachers and allied educators in Tasmania'

Special school teachers:**2.10 Tick the age group/s you teach currently.**4-7 yrs ☐ 8-11 yrs ☐ 12-16 yrs ☐**2.11 How many students on your class list/s?**Below 8 ☐ 9-12 ☐ 13-16 ☐ 17+ ☐**TAFE Teachers:****Tick your main teaching group at present. (one only)****2.12 Main teaching area by discipline group**

- ☐ Adult Education
- ☐ Automotive & Electrical
- ☐ Business
- ☐ Community Services & Health
- ☐ Construction & Textiles
- ☐ Design & Communication
- ☐ General Education
- ☐ Hospitality & Tourism
- ☐ Information Technology
- ☐ Metal & Engineering
- ☐ Natural Resources
- ☐ Other - please specify
-

2.13 Which level of qualification do you teach mostly?

- ☐ Entry/prep/Cert I & II
- ☐ Initial vocational/Cert III and IV
- ☐ Post-initial/Diploma & above

2.14 How many students on your class list/s?

- Below 30 ☐ 31-60 ☐ 61-90 ☐
- 91-120 ☐ 121-150 ☐ 151-180 ☐
- 181-210 ☐ 210+ ☐

2.15 Are you a Team Leader?Yes ☐ No ☐

Teacher Questionnaire – 'Workloads of Government school teachers and allied educators in Tasmania'

General Questions

3 GENERAL QUESTIONS

3.1 Please list, as you would describe them, the main tasks/activities that you perform in your role as a teacher or senior staff member?

You may wish to consider areas such as: teaching, planning, marking, committee work, leadership roles, communication with parents.

.....

.....

.....

.....

.....

.....

If you have been teaching for five or more years please respond to the following question. If not, please go to question 3.3.

3.2 Would you agree or disagree with the following statement?

There have been significant changes *during the last 5 years* that have affected the types of tasks/activities I perform in my role (as per the items you listed in Q3.1).

Please circle one of the following:

Strongly / Agree / Neutral / Disagree / Strongly
agree disagree

If you would like to comment further on changes during the last 5 years, please do so below:

.....

.....

.....

.....

.....

.....

Teacher Questionnaire – ‘Workloads of Government school teachers and allied educators in Tasmania’

The next two questions ask you about helpful and unhelpful aspects of your school/s in relation to facilitating or hindering your work.

3.3 Would you agree or disagree with the following statement?

Many aspects of my school/s assist my work.
(you may wish to consider structures, programs, processes, administration requirements, colleagues)

Please circle one of the following:

Strongly / Agree / Neutral / Disagree / Strongly
agree disagree

If you would like to provide details about aspects of your school/s that you believe assist your work you are invited to use the space below:

3.4 Would you agree or disagree with the following statement?

Many aspects of my school/s hinder my work.
(you may wish to consider structures, programs, processes, administration requirements, colleagues)

Please circle one of the following:

Strongly / Agree / Neutral / Disagree / Strongly
agree disagree

If you would like to provide details about aspects of your school/s that you believe hinder your work you are invited to use the space below:

Teacher Questionnaire – ‘Workloads of Government school teachers and allied educators in Tasmania’

The following question asks about your perspectives on your involvement in decision-making related to your work.

3.4 Would you agree or disagree with the following statement?

I would describe as satisfactory my involvement in school decision-making in relation to my role.

Please circle one of the following:

**Strongly / Agree / Neutral / Disagree / Strongly
agree disagree**

If you would like to comment further on your involvement in decision-making in your school/s in relation to your role, please do so below:

.....

.....

.....

.....

.....

.....

3.6 Please list any work-related suggestions you have for improving your working life.

.....

.....

.....

.....

.....

Teacher Questionnaire – ‘Workloads of Government school teachers and allied educators in Tasmania’

Thank you for completing this questionnaire.

Your contributions to this study are appreciated. Please add any additional comments you would like to make in the space below.

.....

.....

.....

.....

.....

.....

.....

.....

.....

APPENDIX C (TEACHER'S TIME DIARY)

24 Hour diary - 'Workloads of Government school teachers and allied educators in Tasmania'

Diary

Please provide a sample of your daily work-related activities for one week in the following diary. Commence the diary on any day and continue for 7 consecutive days. Briefly describe the education/school related tasks you perform during each of the half hour periods on each day of the 7 consecutive days. The starting time for each half hour period is listed in each section of the diary page, e.g. the section labelled 10am is for work-related activity between 10 am and 10:30 am.

Please circle the appropriate day, a brief description of your activity for each time and whether another adult was working with you, or with you and students, if this is relevant to your situation. Enter the daily hours total on each page in the space provided.

Indicate if you were able to have uninterrupted recess or lunchtime breaks.

The next page provides an example of how diary entries might be recorded *for a teacher* for one 24-hour period. Please note **you** are provided with 7x24 hour days to complete. In cases where work related activities occur prior to 6am, please use the space provided at the top of the diary page.

Special note for Allied Educators (Teacher Assistants, Library Technicians, Laboratory Technicians and Aboriginal Education Workers): In addition to recording the total hours worked each day, please complete the *paid hours* space.

THANK YOU!

Before you commence, please tick one of the following to describe your role:

- | | |
|--|---|
| <input type="checkbox"/> Primary teacher | <input type="checkbox"/> Teacher assistant |
| <input type="checkbox"/> District high teacher | <input type="checkbox"/> Special/support teacher |
| <input type="checkbox"/> High school teacher | <input type="checkbox"/> Guidance officer |
| <input type="checkbox"/> Secondary college teacher | <input type="checkbox"/> Social worker |
| <input type="checkbox"/> TAFE team leader | <input type="checkbox"/> Principal |
| <input type="checkbox"/> TAFE teacher | <input type="checkbox"/> Aboriginal education officer |
| <input type="checkbox"/> Library technician | <input type="checkbox"/> Aboriginal education worker |
| <input type="checkbox"/> Laboratory technician | <input type="checkbox"/> Other (please specify) |

24 Hour diary - 'Workloads of Government school teachers and allied educators in Tasmania'

SAMPLE DIARY PAGE

(Please circle day)	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Work related tasks or activities undertaken between midnight and 6am today - indicate the times							
6am			3:00pm	instructional time ceased – spoke with a parent re student then cup of coffee			
6:30am			3:30pm	marking work			
7:00am			4:00pm	marking work			
7:30am			4:30pm	phone call from parent + setting up room for tomorrow			
8:00am	whole staff meeting – urgent, student's family issue		5:00pm	setting up room for tomorrow			
8:30am	in classroom – greeting students and parents, overseeing lunch orders and excursion money collection		5:30pm	15 mins for tea then setting up for school social with other teachers			
9:00am	teaching my class		6:00pm	setting up for school social with other teachers			
9:30am	teaching my class		6:30pm	school social – with other teachers			
10:00am	teaching my class – teacher asst working with small group		7:00pm	school social – with other teachers			
10:30am	recess duty + teaching my class (15 mins each) (no recess break)		7:30pm	school social – with other teachers			
11:00am	teaching my class		8:00pm	school social concluded – helping with tidying up – with other staff			
11:30am	teaching my class		8:30pm	helping with tidying up till 8:45 then home			
12 midday	teaching my class		9:00pm				
12:30pm	supervise class for 10 mins lunch then ate my lunch before 12:55 case conference		9:30pm	planning			
1:00pm	case conference with GO & parents until 1:20 time for a drink		10:00pm	planning			
1:30pm	teaching my class		10:30pm				
2:00pm	my class at phys. ed. – phone call to parent of sick child to collect – took sick child to office to be collected – normally non-contact time		11:00pm				
2:30pm	teaching my class		11:30pm				
Total worked hours today <u>13</u> Total paid hours today (Allied Educators only) _____							

24 Hour diary - 'Workloads of Government school teachers and allied educators in Tasmania'

Day 1

(Please circle day)	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Work related tasks or activities undertaken between midnight and 6am today – describe and list times.							
6am				3:00pm			
6:30am				3:30pm			
7:00am				4:00pm			
7:30am				4:30pm			
8:00am				5:00pm			
8:30am				5:30pm			
9:00am				6:00pm			
9:30am				6:30pm			
10:00am				7:00pm			
10:30am				7:30pm			
11:00am				8:00pm			
11:30am				8:30pm			
12 midday				9:00pm			
12:30pm				9:30pm			
1:00pm				10:00pm			
1:30pm				10:30pm			
2:00pm				11:00pm			
2:30pm				11:30pm			
Total worked hours today _____				Total paid hours today (Allied Educators only) _____			

Appendix 1 Sample set of Materials sent to prospective respondents

A sample set of the diary and questionnaire are presented on the following pages of Appendix 1. In addition to the questionnaire and diary that were adapted for each of the eight participant groups the materials included:

- a letter of invitation
- an information sheet
- a statement of informed consent (for prospective interviewees only)

There were three versions of each of the “letter of invitation” and the “information sheet” for each of the two interview types—focus group and individual face-to-face—and the prospective respondents sent only the questionnaire and diary.

The “statement of informed consent” was modified for each of the two types of interview.

The sample questionnaire provided in this Appendix 1 was for the teacher respondents. One form of the diary catered for all eight groups. The first three pages of the diary are provided; subsequent pages sent to members of the AEU selected in the samples were for days 2 to 7.

The materials explained the purpose of the questionnaire and diary (and interviews) and assured respondents that what they reported, either in writing or at interview, would be treated in the strictest confidence.

APPENDIX D (ILLUSTRATING THE RE-CODING VARIABLES)

Variables	
Name	Label
pritr	primary teachers
no	primary teacher id number
gen	gender Male=1; Female=2
age	Age 1=21-30; 2=31-40
exastr	Teaching experience
noschs	Number of schools taught at
xcrtsc	Experience in current school
empst	Employment status
fte	full time equivalent
locatn	1: urban 2: rural 3: city central 4: other
nsts	number of students at school
ooa	teaching out of area: 1=Yes, 2=No
promps	promotion and position
poshld	position held 1: AP, 2=AST3, 3=AST2
k	kindergarten
p	primary school
c17	grade 1 dummy: 1=Yes, 0=No
c18	grade 2 dummy: 1=Yes, 0=No
c19	grade 3 dummy: 1=Yes, 0=No
c20	grade 4 dummy: 1=Yes, 0=No
c21	grade 5 dummy: 1=Yes, 0=No
c22	grade 6 dummy: 1=Yes, 0=No
c23	grade 7 dummy: 1=Yes, 0=No
c24	grade 8 dummy: 1=Yes, 0=No
clargt	class arrangement: 1=single, 2=double, 3=3plus
stsc1	students in class: 1 =fewer than 17

APPENDIX E (VARIABLES DEFINITIONS FOR TIME EXPENDITURE)

Name	Label
dmo	total hours worked on MONDAY
dtu	total hours worked on TUESDAY
dwe	total hours worked on WEDNESDAY
dth	total hours worked on THURSDAY
dfr	total hours worked on FRIDAY
dsa	total hours worked on SATURDAY
dsu	total hours worked on SUNDAY
dwtot	total hours worked over WEEK (Mon-Sun)
tt3	weekly time(hrs) spent on planning & preparation
tt1	weekly time(hrs) spent on teaching alone
tt2	weekly time(hrs) spent on teaching with others
tt4	weekly time(hrs) spent on duty
tt11	weekly time(hrs) spent on meetings
tt5	weekly time(hrs) spent on professional discussion with colleagues
tt6	weekly time(hrs) spent on formal communication w parents
tt7	weekly time(hrs) spent on INFORMAL communication w parents
tt9	weekly time(hrs) spent on students supervision
tt8	weekly time(hrs) spent on staff supervision
tt12	weekly time(hrs) spent on professional learning
tt10	weekly time(hrs) spent on administration
tt13	weekly time(hrs) spent on extra school expectations
ttt	total time over all the tasks
__brk	
wehrs	Time spent during the weekend
mybreak	Weekly Uninterrupted Break Time

APPENDIX F (SHOWING DATA LAYOUT)

	pitr	no	gen	age	exastr	noschs	xcrts	empst	fte	locatn
4	1	6	2	3	6	4	4	2	.6	
5	1	41	2	3	5	4	4	2	.5	
6	1	80	2	3	6	.	4	2	.5	
7	1	73	.	.	.	.	.	2	.8	
8	1	65	2	4	6	.	4	2	.8	
9	1	32	2	4	7	4	4	2	.6	
10	1	28	2	1	1	2	1	2	.75	
11	1	68	.	2	1	.	1	2	.8	
12	1	54	2	2	6	4	4	2	.6	
13	1	25	2	2	4	4	1	2	.5	
14	1	52	2	3	6	4	4	1	.8	
15	1	18	2	2	4	2	1	2	.7	
16	1	69	1	3	7	5	2	2	.8	
17	1	34	2	3	6	4	4	2	.9	
18	1	61	2	3	5	4	4	2	.8	
19	1	36	2	3	7	4	5	2	.5	
20	1	50	2	.	7	4	4	2	.8	
21	1	58	2	3	7	4	5	2	.8	
22	1	67	2	2	4	4	4	2	.7	
23	1	66	2	3	7	5	4	2	.5	
24	1	75	.	.	.	.	.	.	1	
25	1	85	1	3	6	.	2	1	1	

	dmo	dtu	dwe	dth	dfr	dsa	dsu	dwtot	tt3	tt1
4	0	0	7.75	8	8	3	2	28.75	8	12.75
5	4.5	5	5	7	0	0	2	23.5	8.75	11.75
6	4.75	5.75	4.5	4.75	4.5	0	1	25.25	5.75	3.75
7	7	9.5	7	4.75	0	0	0	28.25	5.75	6
8	7	11	10.75	9.75	0	0	0	38.5	11	11.75
9	11	10.75	9	3	1.5	3.5	3.5	42.25	13.75	10.75
10	8	8.5	8	6.5	1	0	1.75	33.75	8.5	16
11	9	8.75	1.5	10.5	7	0	0	36.75	11	11.75
12	8.25	10	10	8.25	5	1	1	43.5	11.5	
13	10.5	9.75	9.5	0	0	0	1.5	31.25	11.75	12
14	9.25	9.25	10.75	6.25	0	0	4.5	40	11	
15	3.5	10	7.25	10	4.5	3.5	2.5	41.25	19.25	14.75
16	0	0	9.75	10.25	9.75	14.5	0	44.25	6.25	14.75
17	9.5	9.25	8.75	12.75	11.5	1.5	5	58.25	10.75	18.75
18	9.5	7	7.75	6.75	0	1.75	.75	33.5	12	16.75
19	4.5	7.5	6.25	7.75	2.5	0	0	28.5	3.25	7
20	5.75	6.75	7.25	7.5	0	0	0	27.25	8	12.75
21	9.5	9.75	9	8.25	0	0	1.5	38	13	16
22	7.25	6	8.25	6.5	0	0	0	28	3.25	
23	8.5	8	6	0	0	0	2	24.5	6.25	
24	0	0	0	0	0	0	0	0	0	
25	10	9.5	9	9	8.25	1.5	1.5	48.75	8.75	

APPENDIX G (ILLUSTRATING METHODS USING PSEUDO-CODING)

AIM: To calculate time budgets and time shares, and conduct t-test of differences in means

For each teacher,

 For each diary,

 For each day,

 Calculate number of hours worked for each day of the week (**time budgets**).

 Dmo=hours worked on Monday

 Dtu=hours worked on Tuesday

 ... (repeat for all days of the week)...

 Dsu=hours worked on Sunday

 For each week,

 Calculate total hours expended

 Generate $hr_week = dmo + dtu + \dots + dsu$

 Calculate share daily **time share** in hr_week

 Compute $dmo_s = dmo / hr_week$

 Compute $dmo_s = dmo / hr_week$

 ... (repeat for all days of the week)...

 Compute $dsu_s = dmo / hr_week$

For all teachers,

 Note the hours of uninterrupted break time reported.

 Generate a variable mybreak for uninterrupted break time

 Test for differences in hr_week between full-time and part-time teachers

 (See STATA output for **ttest hr_week , by(fulltime)**) in Appendix H)

 Test for differences in mybreak enjoyed by full-time and part-time teachers

 (See STATA output for **ttest mybreak, by(fulltime)**) in Appendix H)

 Test for differences between Monday time budgets and Tuesday time budgets

 (See STATA output for **ttest $dmo = dtu$ if fulltime==1** in Appendix H)

