

Some Relationships Between Teacher
Characteristics, Subject Taught and
Teaching Practices in Secondary
Schooling

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ABSTRACT

A survey of 285 secondary teachers in the Hunter Region of NSW provided data on teacher background and characteristics including their perceptions of work-related stress, workload and satisfaction. Subsequently the English, Mathematics and Social Science lessons of 71 of these teachers were observed and the nature of specific classroom contextual variables and teaching practices were recorded. Subject taught was found to be related to teacher characteristics and teaching practices. A multivariate model was developed and tested in an attempt to explicate key relationships.

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Introduction

Factors affecting the ways in which teachers teach are many and varied. Much of the literature revolves around community and school contexts which teachers experience and the classroom contexts which they, to some extent, create (Dunkin & Biddle, 1974, pp.41-44). However, personal and background factors related to the teachers themselves have not generally been found to be related to teaching practices (see, for example, Bourke, 1984). The study which provided the data used in this paper included information on a wide variety of the contextual factors found in most studies of teaching practices as well as less common teacher variables such as teacher stress, and teacher satisfaction and workload. The intention was to explain as much of the variation in an approach to teaching as possible while investigating some of the key factors related to it. The teaching approach chosen on this occasion was the introduction and development of new content and skills as compared with providing consolidation and practice of previously learned material.

Potential links between subject taught, class, teacher, school and student characteristics, teacher satisfaction, workload and stress, and teaching practice were investigated. In this paper teaching to develop new content and skills was taken as the dependent variable possibly affected by all other variables in the model, especially teacher satisfaction, workload and stress. In other work being undertaken the extent to which different teaching approaches affect teacher stress is being investigated. Possible reciprocal relationships between aspects of teacher stress and the adoption of a range of approaches to teaching are being investigated.

The Sample

This two-phase study initially involved a sample of 285 secondary school teachers working in 29 Department of School Education secondary schools in the Hunter Region of NSW. The sample comprised almost 50 per cent of the Year 11 teachers at these schools working in the subject areas of Mathematics, English and the Social Sciences (which includes Ancient History, History, Geography, Economics and Legal Studies).

The survey gathered data on teacher background, timetable allocations, and perceptions of work-related stress, workload and job satisfaction. The survey was of a similar format to

that used in a previous study of teacher stress in the Hunter Region (Smith & Bourke, 1992). A separate school-level survey was used to collect data on aspects of school background, including curriculum organisation and the provisions made for pastoral care.

Of the 285 teachers responding, 71 teachers in 26 of the schools volunteered to participate in the second, more intensive stage of the study. This involved the observation of a series of five of their Year 11 lessons and the collection of information from 811 (83 per cent) of the students in their classes. The student information covered student background, achievement at school, feelings about schooling, and post-school educational intentions.

As it was the information from the sub-sample of 71 teachers and their classes that formed the basis of this report, it was necessary to determine the extent to which the 71 volunteers were representative of the larger group of teachers. It would

also be desirable to know the extent to which they were typical of other teachers in the Hunter Region and the State of NSW. The means of the 71 teachers' responses to a number of background variables were compared with those for the larger sample of 285 teachers using t-tests and chi-squared tests ($\alpha=0.05$). The 71 teachers in the sub-sample had an average of almost 18 years of teaching experience and had served almost 8 years in their current school. Of these volunteers, 46 held normal classroom teaching positions, 16 were Advanced Skills Teachers and 14 held executive positions. Degree trained teachers predominated as did males who formed 62 per cent of the sample. None of these parameters was significantly different from those for the full sample. Comparisons with Hunter Region statistics have not been completed at this time.

Even though the samples were demographically similar, some differences existed in terms of teacher attitudes. Work-related stress arising from students and physical conditions amongst teachers in the sub-sample was significantly lower than for the full sample (sub-sample mean=1.96 on a 1-4 scale, full sample mean=2.23, $t=3.33$, $p=.001$). The volunteers in the sub-sample also reported somewhat higher levels of job satisfaction, satisfaction in relationships with students being significantly higher than the larger group (means=2.49 and 2.32 respectively, $t=2.10$, $p=.038$). Some of this difference may be explained by the sub-sample of teachers focussing more on their Year 11 students than the larger group of teachers less directly involved in the Year 11 study.

However, with lower levels of stress and higher levels of satisfaction on these two scales, the sub-sample of teachers observed was considered likely to represent a slightly more contented group of teachers than the full sample.

The 71 volunteers comprised 28 Mathematics teachers, 24 English teachers, and 19 Social Science teachers at 26 secondary schools. In total 346 Year 11 lessons were observed for the 71 teacher volunteers.

Description of the Observations

In brief, the classroom observation schedule was developed from the model put forward by Burns & Anderson (1987). To operationalise this model the observers made minute-by-minute recordings of the dominant modes of delivery. These were used to identify lesson segments. For each segment of the lesson assessments were made of the general importance of pedagogical behaviours, specific aspects of the lesson context, and aspects of lesson purpose. The importance for the segment of a range of teacher and student behaviours and the use made of the various modes of delivery were considered as the key aspects in the conceptualisation of an individual teacher's approach to teaching. Once this information was encoded the observations for individual lesson were aggregated for use in the current teacher-level analysis.

The importance of teacher/student behaviours was assessed for each lesson segment on a five-point scale ranging from 1 (insignificant) to 5 (highly significant), with an additional 'not applicable' category). Assessment was made in terms of the importance of teacher/student behaviours to the achievement of lesson purpose during each segment of the lesson. Table 1 provides an outline of these behaviours and their mean importance levels across all observations.

TABLE 1. TEACHER/STUDENT BEHAVIOURS AND THEIR MEANINGS.

BEHAVIOUR	SCORE	DESCRIPTION
Instructing	2.78	Teacher presenting and explaining academic material
Questioning higher order	1.79	Asking questions which require higher level responses

Structuring Ideas	1.74	Organisational cues which facilitate cognitive structuring
Providing Examples	1.65	Examples provided to assist student understanding
Discussing ideas	1.55	Importance placed on exchange of ideas with individual and class
Monitoring progress	1.33	Movement and watchfulness, observing and assessing student progress
Providing Extra Help	1.32	Assisting students who ask for or are observed to need help
Supervising	1.09	Classroom management aimed at setting standards and avoiding problems
Maintaining Lesson Flow	0.99	Timing and scheduling work, catering for differing rates of completion
Probing for Information	0.72	Teacher leads class or individual towards improved answer

It should be noted that the five-point scale used to rate the importance of teacher/student behaviours cannot be used to interpret the aggregated scores. With an average of 15 segments taught by teachers during the five lessons observed, a particular behaviour forming a significant part of only a few of these segments will receive a small overall score after aggregation. Consequently, the low scores for activities such as maintaining lesson flow (0.99) and asking probing questions (0.72) could mask their pedagogical importance at the time they were employed in a particular segment.

The most important teacher/student behaviours observed were those of instructing, asking questions, structuring ideas, providing examples, discussion, monitoring progress, providing extra help, supervising work, maintaining the activity flow of a lesson, and probing for additional information.

TABLE 2. DOMINANT MODES OF DELIVERY AND THEIR MEANINGS

MODE OF DELIVERY	% LESSON TIME	DESCRIPTION OF ACTIVITY
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Seatwork	35.3	Written work at desks e.g. from text, from the board, a test
Exposition	19.4	Teacher presentation, some interaction and input from the class
Give Directions	6.1	Outline lesson, guide class, set lesson expectations
Question & Answer	1.5	Teacher controls development or review by asking a series of questions
Blackboard	1.5	Teacher gives presentation using the blackboard for notes, summary, examples
Discussion	1.4	Open interchanges and student-initiated academic talk
Demonstrate	0.5	Teacher models correct procedure or technique, includes explanation

Minute-by-minute coding of the dominant mode of delivery in use was conducted throughout each lesson. Because of their frequency the activities of most interest in this paper were Seatwork, Exposition, Directing, Questioning, Blackboard, Discussing and Demonstrating. Seatwork occupying just over one-third of lesson time and exposition occupying one-fifth of lesson time were predominant amongst these proportions (see Table 2). Other modes of delivery including lecturing, dictating notes, student or teacher reading, drill, and the use of audiovisual materials, played lesser parts with respect to the current analysis and have not been discussed here.

Development of the Dependent Variable

The dependent variable in this study was the main approach to teaching adopted by each teacher in relation to the concept of developmental press. Developmental press concerns the extent to which teachers commit their class time to introducing and developing new ideas and concepts with their students. All of the classes observed were following content-laden Year 11 Higher School Certificate syllabi at either the 2-Unit or 3-Unit level. The press to develop new content in such courses can be contrasted with time spent revising and reinforcing concepts already learnt and in practising skills. The

evolution of the dependent variable Developmental Press involved a complex three-stage process which is now described in some detail.

It was hypothesised that some of the more important specific teaching behaviours would relate to a model of direct instruction similar to that outlined by Joyce & Weil (1986, pp.326-27). A typical lesson sequence under Direct Instruction would involve the explanation of a new concept or skill to the class, testing understanding, teacher-controlled practice, and then private practice under teacher supervision (seatwork). The teacher plays a central role in this approach to instruction; selecting tasks, providing directions, arranging groupings, and minimising non-academic activity. Freedom of choice is thus limited for students in a teacher-controlled, academically oriented learning environment. Exploratory factor analysis of the teaching behaviour variables established four reasonably-independent dimensions of teacher instructional orientation. Three of these dimensions related to different aspects of direct instruction: the presentational orientation with a focus on instructing, structuring and providing examples, the control orientation involving supervision and maintaining lesson flow and

discussion (discussion being on-task talk between students or student initiated talk with the teacher), and the guided practice orientation involving the provision of help and monitoring student progress. There was an additional dimension related to a conceptual change orientation involving questioning and probing for information, which could be congruent with either direct or indirect modes of instruction.

The descriptions and reliabilities of these dimensions of teaching behaviours are shown in Table 3. Correlations between the dimensions were all in the range 0.04 to 0.40. Significant correlations were those between the Presentational and the Conceptual Change orientations ($r=0.40$, $p=.000$), between the Presentational and the Guided Practice orientation ($r=0.31$, $p=.004$), and between the Control and the Guided Practice orientation ($r=0.37$, $p=.001$).

TABLE 3. TEACHER INSTRUCTIONAL ORIENTATIONS

FACTOR	BASIC ORIENTATION (Associated teacher behaviours)	RELIABILITY
1.	Presentational orientation (Providing Examples/Structuring/Instructing)	0.67

2. Control orientation (Supervision/Maintaining Flow/Discussing) 0.73
3. Guided Practice orientation (Providing Extra Help/Monitoring Progress) 0.77
4. Conceptual Change orientation (Questioning/Probing for Information) 0.79

Most teachers used various combinations of teaching behaviours at different times, but tended to have a dominant mode of delivery and a preferred instructional orientation. As a second step in developing a measure of an overall approach to teaching for each teacher, the instructional orientation variables were weighted by their correlations with the dominant modes of delivery to provide an indicator of each teacher's commitment and use of each instructional orientation. The commitment was thus based on a combination of importance of instructional orientation and frequency of delivery systems.

TABLE 4. CORRELATIONS BETWEEN BEHAVIOURAL FACTORS AND MODES OF DELIVERY 1

MODE OF DELIVERY	% LESSON TIME	PRESENT -ATION.	CONTROL	GUIDED PRACTICE	CONCEPT CHANGE
Seatwork	35.3	.	.30	.65	-.31
Exposition	19.4	.	.	-.36	.31
Giving Direct.	6.1	.	.	-.30	.
Questioning	1.5	.	.	-.33	.33
Blackboard	1.5	.25	.	.	.
Discussing	1.4	.	-.24	-.36	.
Demonstrate	.5	.38	.	.37	.

Note 1. Only significant correlations are shown. For example, the Guided Practice orientation was correlated

quite strongly ($r=0.65$, $p=0.00$) with the relatively high proportion of lesson time spent involved in Seatwork (35 per cent of effective lesson time). The observations confirmed that the teacher behaviours of monitoring progress and providing individual assistance, which were significant to the achievement of lesson purpose, occurred most frequently in classrooms where Seatwork sessions were more common. Seatwork and the other the modes of delivery significantly correlated with Guided Practice (see Table 4) and thus contributed to the new compound variable. The result was referred to as the Guided Practice model which in essence indicates each teacher's commitment to and use of those aspects of direct instruction characterised by teacher monitoring and the provision of extra assistance.

Values for the other three orientation models were calculated in a similar way to that described for Guided Practice. The four orientations provided a more complete picture of classroom activity when viewed together. For instance in many lessons guided practice was often used after an initial presentation, questioning and structured practice were used to establish new content or skills. In fact, on many occasions Guided Practice involved the students in private work at their desks for almost the full lesson, the preliminary steps having been completed in previous lessons. Such a sequence emphasises the need to compare the activity structure of a particular lesson to that of preceding and following lessons. Other less-direct lessons emphasised content-based presentations and the development of conceptual understanding.

Teachers varied markedly in terms of the teaching models developed from the four orientations. Similar to the findings of Powers (1992), the 71 Year 11 teachers used multiple models with most being quite eclectic in their combination of all four. As discussed later in the paper, teaching subject and developmental press were noted to be underlying factors in this variation.

The final step in the evolution of the developmental press variable involved comparing the four teaching orientation models in terms of their relationship to a variable measuring the proportion of lesson time spent developing new content and skills as opposed to reviewing or reinforcing previously treated work. A mean of 43 per cent of lesson time was spent developing new content and skills but this figure varied considerably from teacher to teacher (the range was from zero to 87 per cent with a standard deviation of 22.0).

The variable developing new content and skills was significantly correlated (all $p<0.02$) with each of the

teaching orientation models as follows: Presentation -0.27 , Control -0.25 , Guided Practice -0.56 , and Conceptual Change 0.46 . The teaching orientation models were weighted by this correlation to produce the dependent variable Developmental Press. The Developmental Press scores thus indicated a range from the less direct models of instruction frequently used by English and Social Sciences teachers to more direct models used by the majority of Mathematics teachers.

Interpretation of the Developmental Press Variable

Table 5 describes the relationships between the four models of teaching orientation and Developmental Press. Teachers having high Developmental Press scores were characterised by their strong commitment to the Conceptual Change Model and lack of commitment to the Practice Model, with some use being made of the Control Model. Important teaching behaviours associated with these models were those of questioning, probing and classroom management functions. Exposition, question and answer, giving directions and lecturing were commonly occurring modes of delivery amongst this group of predominantly Social Sciences and English teachers.

TABLE 5. Relationship of Developmental Press to Models of Teaching

DEVELOPMENTAL PRESS	DELIVERY MODE	SUBJECT AREA	PRACTICE MODEL	CONTROL MODEL	PRESENTATIONAL MODEL	CONCEPT CHANGE MODEL
HIGH DEV. PRESS SCORES		English /S.Sci. (89%)	Very Low	Low	Variable	High
^	Exposition	^	^	^	^	^
	Lecturing					
	Question.					
	Giving directions					
Median Dev. Press Score						
	Demonstration					
	Seatwork					
v		V	V	V	V	V
LOW DEV. PRESS		Maths (71%)	Very High	High	Variable	Low

SCORES

Teachers with low developmental press scores were characterised by a strong commitment to the Guided Practice and Control Models, and a low commitment to the Conceptual Change model. Teacher demonstration and seatwork typified the teaching style of these, predominantly Mathematics, teachers with low Developmental Press scores. The Presentational Model was less commonly ascribed to and more variable in relationships with other variables than the other models. Presentation formed a part of the style of teachers at both ends of the Developmental Press scale but slightly more commonly amongst those (principally Mathematics teachers) at the lower end. Practice and Control were by far the most commonly ascribed to models, they were strongly related to other variables, and served to differentiate teacher's styles most clearly.

There was no significant difference ($t=1.59$, $p=0.119$) between the mean Developmental Press scores for English teachers ($z = 0.449$) and those for Social Sciences teachers ($z = 0.675$) but both were significantly different from the mean score for Mathematics teachers ($z = -0.843$). Consequently English and Social Sciences teachers were considered as sharing a common approach to teaching. Mean Developmental Press scores were significantly higher for the combined group than for Mathematics teachers ($t=6.81$, $p=0.000$).

The Multivariate Model

The major interests in this paper were the relationships between the contextual class, teacher and student variables and teaching approach. The teaching approach variable used was developmental press which indicated a continuum between an emphasis on developing new content and skills and an emphasis on reviewing or reinforcing previously learned work. Multiple linear regression analysis was used to determine the relative importance of the contextual variables in explaining the variance in teaching approach for the 71 teachers of Year 11 classes for whom observation data were obtained. All the variables included had previously been found to be related to teaching practices but, in this case, only those variables significantly correlated with developmental press were included in the analyses.

The analyses were structured around a four-stage model with developmental press as the ultimate dependent variable. The exogenous variables were student, teacher, class and school contexts considered likely to affect all subsequent variables in the analyses. Student variables were first aggregated to provide class means and standard deviations. At the first stage of intermediary

variables, class practice and process variables were entered successively as dependent variables and, at a second intermediate stage, these variables were added to the initial background variables as independent variables and teacher satisfaction and workload variables were entered as successive dependent variables. The penultimate stage included all previous variables as independent variables and the two teacher stress variables which had been found to be related to developmental press, as the successive dependent variables. Approximately one half of the variance observed in each of the teacher stress variables was explained by the variables included in earlier stages of the model.

Finally all variables were included in a multiple regression analysis with developmental press as the dependent variable. Variables were entered simultaneously into the regression equation then removed sequentially until only significant variables remained.

Overall, two-thirds of the variance in developmental press was accounted for by the contextual variables. By far the most significant direct relationship with developmental press was that Table 6. Direct Multivariate Relationships of Variables with Each Stage of the Model. (Standardised coefficients x 100)1

DEP.VAR Indep.Var\	CLASS PRACT	TEACHER SAT.& WL	TEACHER STRESS	DEVELOP. PRESS
Student Background				
Gender balance	32			
SD class ability	-35*	28		
ESL at home			-18	
Student Achievement				
English ability			-38	
SD Yr11 achievement		-33*	19	
Student Opinion				
Satis.with results	-31	-23		
SD sat.with results	19			
Control of learning	-21	-24		
Further study plans			-26	
QSL status	33			
Teacher Characteristics				
Current prof.develop.	23			
Prior use of inservice		26		
Position on staff	23	30	22	
School Characteristics				
Size	25	-41		
Classification		-21	-26	
Pastoral care		-40		

Limit no.of teachers	-22			
Class Characteristics				
Maths/other subjects	33		-28	-56
Class size	-41			
Effective period lgth		45*	-22	-15
Class Practices				
No.of segments/period	NA			21
Teacher engaged	NA	28		
Students on task	NA			25
Teacher Attitudes				
Satis.WL & conditions	NA	NA	-21	
Satis. students	NA	NA	-21	
Non-teaching WL	NA	NA	23	
Profess. commitment	NA	NA	-23	
Influence results	NA	NA	-31	
Teacher Stress				
Time pressure	NA	NA	NA	16
Student contact	NA	NA	NA	13

Note 1. A blank indicates no significant relationship existed. An asterisk indicates that there was more than one significant path from this variable to the stage specified, and the largest coefficient has been shown. NA indicates there was no postulated path coefficient linking these stages in the model tested.

with the subject taught. This variable represented Mathematics classes compared with all other classes (English and Social Sciences) because there were no significant differences between the teaching practices observed in the English and Social Sciences classes. Other notably important areas were teacher stress (which directly affected developmental press), and satisfaction and workload (indirect effects), class characteristics and practices such as length, number of lesson segments and proportions of students on task (all directly), and many other student, teacher, class and school variables with indirect effects on teaching approach. Details of the direct contextual variable relationships with developmental press are shown in Table 6.

The total effect of each variable consists of a summation of direct and indirect paths to the dependent variable. Most indirect paths were small and added little to the pattern of relationships developed from the direct paths, but there were three contextual variables where indirect paths did add somewhat to the magnitude of relationships. These were the lesson length, subject taught and teacher satisfaction, for which total effects shown in Table 7.

Table 7. Developmental Press: Total Effect Influenced by Indirect Paths

VARIABLE	DIRECT EFFECT	INDIRECT EFFECT	TOTAL EFFECT
Lesson length	0.15	0.06	0.21
Subject taught (maths)	0.56	0.04	0.60
Teacher satisf.	0	0.13	0.13

Conclusions

As expected, the particular teaching approach examined which involved an emphasis on developmental press was related to several of the contextual variables, particularly the subject being taught in the Year 11 classes studied. Mathematics lessons observed had a lower developmental press and a more practice-oriented approach with skills being reviewed and reinforced than did English and Social Science lessons. On the other hand, variables related directly to higher developmental press were higher teacher stress arising from both time pressure and contact with students, shorter effective period length, more lesson segments, and higher proportions of students on task. Variables related indirectly with a higher developmental press were lower teacher satisfaction with workload, students and efficacy, and a higher workload from administration. Teacher stress was related to many contextual variables concerned with all aspects of context: student, teacher, class and school characteristics and particularly teacher attitudes. Teacher satisfaction was also related to a wide range of contextual variables including effectively longer periods, more able students and the school holding a special classification.

It would seem that teachers who feel more stress from time pressures give more time to development of new content and skills and less time to practice and consolidation. Perhaps they see this teaching pattern as necessary to 'get through' the course content. Teachers who feel more stress related to contact with students may ensure that they have less personal contact with students which would be necessary while giving individual assistance, and consequently spend more time in group interactions while developing new content.

The converse may also be true: it is probable that teachers who more often engage in developing new content become more stressed as a result, because this may be a more demanding teaching task than supervising student practice and consolidation. Initial investigations indicated that this is more likely to be the case for stress related to time pressures where the reciprocal path from the

teaching approach of developing new content was greater than the path from stress to teaching approach. However, in the case of stress from students the reciprocal path from teaching approach was quite small and certainly not significant. The question of reciprocal causation between teacher stress and teaching approaches in this study requires further work.

Finally, it must be emphasised that these results do not support the use of one approach to teaching in favour of another. What is important is the influence of specific aspects of the context in which the teaching occurs, especially that of subject taught, over the approach to teaching. Also, the lesson-level analyses which are yet to be completed should produce more revealing descriptions of the relationships between these variables.

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