MODELLING TEACHER CHANGE

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The process by which classroom teachers change their practices and their knowledge and beliefs about the teacher's role and about their subject is fundamentally a learning process. The purpose of this paper is to outline the characteristics of a new model of teacher change. It must be emphasized that this model deals with a process of change; it is not a model of the instructional process. In this model, the learning aspects of teacher change lead us to characterize the process as "teacher professional growth". In modelling teacher professional growth, our concern is solely with change in each of the four domains which encompass the teacher's world and the mechanisms by which change in one domain leads to change in another. Central to this new conception of teacher professional growth is the significance accorded to the mediating processes of reflection and enactment, by which change in one domain is translated into change in another.

The process by which classroom teachers change their practices and their knowledge and beliefs about the teacher's role and about their subject is fundamentally a learning process. This learning process can be called "professional growth". The purpose of this paper is to outline the characteristics of this new model of teacher change. The research from which this model was developed was conducted in the course of the evaluation of a professional development program for secondary mathematics teachers (the "Active and Reflective Teaching In Secondary Mathematics" (ARTISM) program) (see Clarke, Carlin & Peter, 1992). The model of professional growth which forms the subject of this paper can be shown to be consistent with earlier models of teacher professional development (for example, Guskey, 1985). The challenge in developing the new model was to incorporate the research-substantiated features of existing models, while also modelling aspects of teacher change not addressed elsewhere. In particular, the possibility of teacher change in the absence of external inservice input had not been recognized explicitly in any previous model, despite its acknowledged occurrence (Sparks & Loucks-Horsley, 1990).

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THE EVOLUTION OF MODELS OF TEACHER PROFESSIONAL DEVELOPMENT

In the 70s and early 80s, teacher professional development was identified with inservice activity. A common view of the process of professional development as it was then conceived is displayed in Figure 1 (derived from Guskey, 1985). This model of professional development took staff inservice activity as the sole stimulus for teacher professional growth. The inservice programs which were based on Figure 1 sought to change teacher knowledge and beliefs, on the assumption that these changes would lead to a change in classroom practices, and ultimately result in improved student learning.

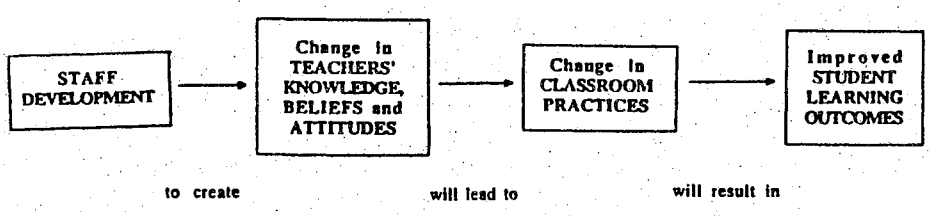

Figure 1. An early model of change in response to staff development

Guskey (1985) offered a reconceptualisation of the model of Figure 1 in which the principle and immediate consequence of inservice activity was seen to be change in teachers' classroom practice. It was suggested that most teachers defined their success in terms of the learning of their students, rather than in terms of their own actions or other factors (Lortie, 1975). This model retained the linear character of the earlier model, but resequenced the elements to locate student learning outcomes as a mediating element in a process whose goal was change in teacher beliefs and attitudes (Figure 2).

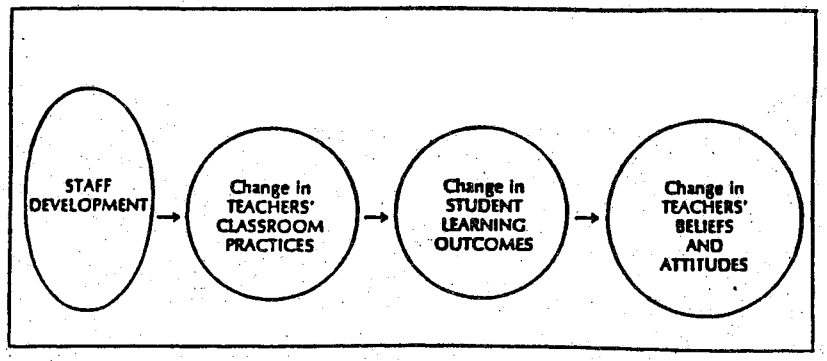

Figure 2. Guskey's (1985) model of the process of teacher change

Clarke's (1988) cyclic model of staff development (Figure 3) introduced two new elements into the modelling of teacher change:

- First, teacher professional devolopment was conceived as an on-going learning process, building upon successive changes in a spiral of professional growth. In this view, each stage was mediated by factors peculiar to the particular teacher's situation. As a result, the nature of each teacher's professional development was a unique product of their personal history and their present situation;

- Second, it would be possible to join the cycle at any point: a chance question or an improvised activity may demonstrate the inadequacy of previous methods and lead to a reassessment of beliefs about good teaching; or participation in a professional development program might raise the unexpected possibility of attractive new

methods. In this model, it was also possible to leave the cycle at any point should the mediating factors provide insurmountable obstacles. For instance, a new approach might be successful in achieving goals which are not valued by the school community, and the professional development subside for lack of support, recognition or encouragement.

This view of professional development employs the same elements as the linear model developed by Guskey (1985, see Figure 2), and embodied a picture of the teacher as learner, constructing personal professional practice from inservice activities and classroom experiences in a way which reflects the teacher's personal history and present situation.

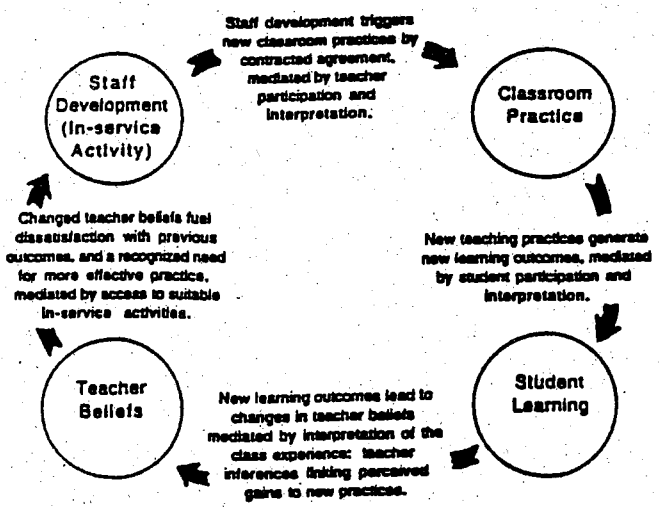

Figure 3. Clarke's (1988) cyclic model of professional development

A DYNAMIC MODEL OF TEACHER PROFESSIONAL GROWTH

The data arising from the evaluation of the ARTISM program informed the refinement of this cyclic model of professional development. Analysis of the research evidence arising from this study (Clarke, Carlin & Peter, 1992) revealed a multiplicity of possible teacher change pathways. Recognition of this multiplicity challenged the sequential nature of all previous models. It also became clear that some elements within existing models were too narrowly conceived: Inservice activity was not the only form of external stimulus for teacher professional growth; student learning outcomes were not the only consequences of changed teaching practice which led to changes in teacher knowledge and beliefs; and, most importantly, the occurrence of teacher change independent of external stimulus or support had to be accommodated in any comprehensive model of teacher professional growth. The model shown in Figure 4 incorporates these additional factors, while retaining all previous models as particular cases or pathways.

The model invokes two distinct categories of construct: *analytic domains* and *mediating processes*. The four analytic domains which characterize the model are:

- The Personal Domain - *Teacher Knowledge and Beliefs*
  Teaching practice is in large part the enactment of individual teacher's knowledge and beliefs regarding their subject, effective instruction, student learning, and the socio-political environment of the school setting. The Personal Domain is concerned with the knowledge and beliefs underlying practice.
- The Domain of Practice - *Classroom Experimentation*
  The enactment of teacher knowledge and beliefs takes the form of classroom practice. Where the classroom situation is perceived as a problematic or challenging one, teacher classroom practice becomes classroom experimentation. We would assert that this experimentation is always present to some degree.

- The Domain of Inference - *Valued Outcomes*
  Those professional outcomes to which the teacher attaches value constitute the mediating domain by which classroom experimentation is translated into changed teacher knowledge and beliefs. These valued outcomes may include student learning, teacher satisfaction, teacher planning effectiveness and efficiency, reduced teacher classroom stress, and increased student and teacher classroom enjoyment.
- The External Domain - *Sources of Information, Stimulus or Support*
  Teacher classroom experimentation and teacher reflection may both be stimulated by external sources. These external sources might be an inservice program, professional reading, faculty meetings, or informal conversations with colleagues.

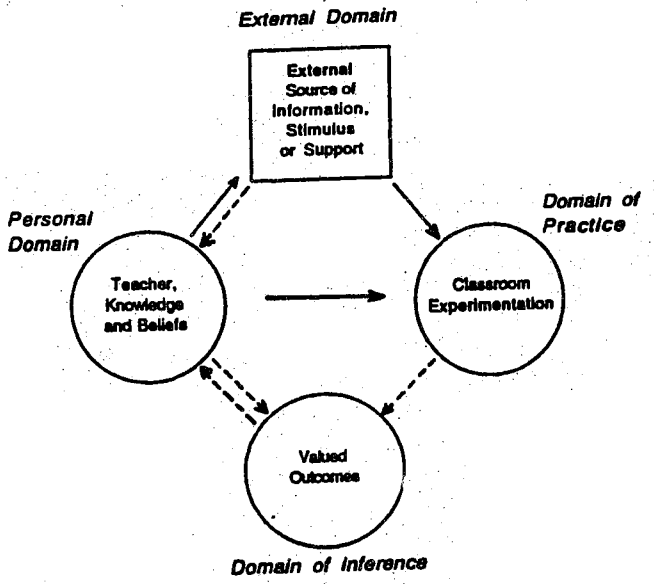

Figure 4. The Clarke-Peter model of professional growth
(solid line = *enactive* mediating process; broken line = *reflective* mediating process)

The mediating processes translate growth in one domain into another. These mediating processes can be classified as being either *enaction* or *reflection*. The term "enaction" has been chosen to distinguish the translation of a belief or a pedagogical model "into action" from simply "acting". Acting occurs in the Domain of Practice, and each action represents the enactment of something a teacher knows, believes or has experienced.

On-going professional growth
The refinement of the cyclic model was one outcome of the ARTISM evaluation study. In the refined model (Figure 4) it is assumed that recognition by teachers of Valued Outcomes arising from new practices will fuel a change in Teachers' Knowledge and Beliefs. Teacher dissatisfaction with previous established classroom practices can be seen to be a basic belief change. This change may prompt some teachers to engage in classroom experimentation with alternative teaching approaches. This model differs from many other models of professional development in its recognition of the possibility of Classroom Experimentation and on-going teacher professional growth in the absence of inservice activity (see Figure 5).

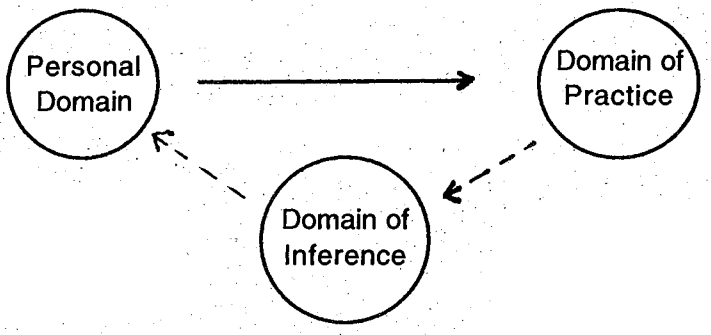

Figure 5. Professional Growth in the absence of External Influences
(solid line = enactive mediating process; broken line = reflective mediating process)

> Teachers learn many things on their own. They read professional publications, engage in discussions with colleagues, and experiment with new instructional strategies, among other activities. All of these occur with or without the existence of a formal staff-development program.
>
> (Sparks & Loucks-Horsley, 1990, p. 235)

The role of inservice activity

As Sparks and Loucks-Horsley (1990) make clear, teacher experimentation may be informed by conversations with colleagues or by professional reading. Teaching is a creative activity, and some teachers will engage in classroom experimentation informed solely by their personal "wisdom of practice" (Shulman, 1987, p. 11). However, it may be that a teacher lacks either the expertise or the knowledge of possible alternatives required to engage in effective experimentation. The role of inservice activity can then be seen as stimulating and supporting *informed* teacher experimentation. The schematic model of professional growth shown in Figure 4 has at least two distinguishing characteristics: its non-linear nature; and the essential recognition that professional growth is an inevitable and continuing process which will occur to some extent whether or not it is informed by inservice activity or, indeed, by any External Sources of Stimulus, Information or Support. These external sources, where present, could include demonstration lessons, structured reflective forums, informal discussion with colleagues, or professional reading.

The effect of teachers' experience of such external sources may be realized through either the process of enactment or of reflection (see Figure 6). Change in teacher classroom experimentation arises from the enactment of models of pedagogical practice provided by such external sources. Change in teacher knowledge and beliefs is a consequence of teacher reflection on the examples, values, research findings, and the shared wisdom of practice provided by such external sources.

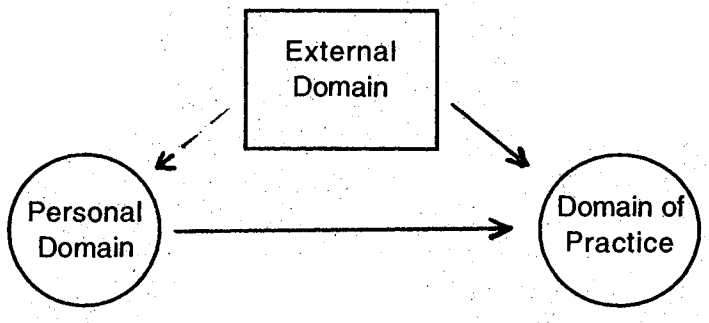

Figure 6. The effect of External Sources of Information, Stimulus or Support.
(solid line = enactive mediating process; broken line = reflective mediating process)

Teacher professional growth must be viewed in the same way as any other form of learning. As learners construct cognitive models of past experiences and test these against new experiences, so teachers experiment with new classroom practices and refine these acccording to their perceived association with valued classroom outcomes. Central to this process of experimentation and refinement is teacher reflection on valued outcomes and their relationship to the classroom experimentation.

The role of teacher reflection

Figure 4 suggests that professional growth involves a continual and complex cycle of action and reflection. The only pathway to the Domain of Practice (Classroom Experimentation) is via a mediating process involving enaction. By contrast, change in Teacher Knowledge and Beliefs can only arise within the model as a consequence of reflection. Ultimately, Teacher Knowledge and Beliefs are translated into practice via a mediating process of enaction. Professional growth is conceived as residing in the combination of the Personal Domain of Teacher Knowledge and Beliefs and the Domain of Practice (Classroom Experimentation). Since the only avenues to change in Teacher Knowledge and Beliefs are mediated by teacher reflection (see Figure 7), the provision of opportunities for structured reflection should be given the highest priority in any professional development enterprise.

For some teachers a consequence of the process of reflection was a marked change in knowledge and beliefs relating to the teaching of mathematics. As Schulman (1986) and Bromme (1992) have noted, change in teacher knowledge and beliefs can be classified in different ways. It is important to recognize that change in teacher knowledge can take distinct forms. While most professional development enterprises appear to have as their goal change in "pedagogical content knowledge" (Shulman, 1986), it is important to recognize the possibility of change in any of the following: Content knowledge; Curricular knowledge; Pedagogical knowledge; or Pedagogical content knowledge

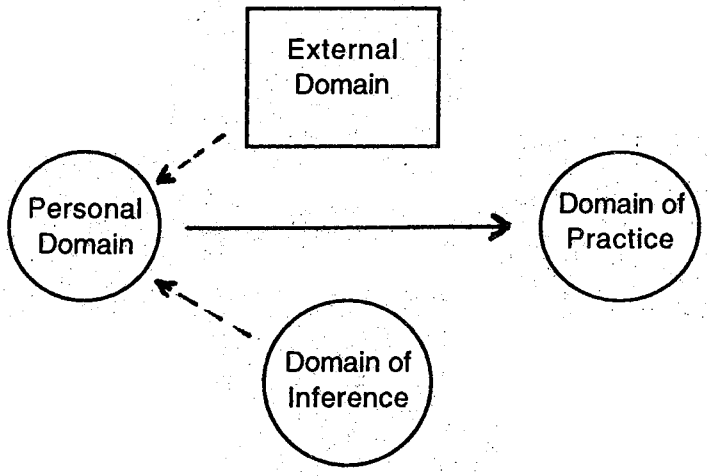

Figure 7. Change in the Personal Domain
(solid line = enactive mediating process; broken line = reflective mediating process)

Consequences of change in teacher knowledge and beliefs

Change in Teacher Knowledge and Beliefs can have three consequences:

a. Recognition of a need for professional growth can be enacted through participation in professional development programs, through professional reading, or the initiation of discussion with colleagues; that is, the teacher seeks information, stimulus or support from some external source;

b. Change in teacher knowledge or beliefs can be enacted through classroom experimentation;

c. Change in teacher knowledge or beliefs can take the form of a restructuring of the teacher's value system and lead to a reassessment of existing outcomes, mediated through reflection.

These three change pathways are illustrated in Figure 8.

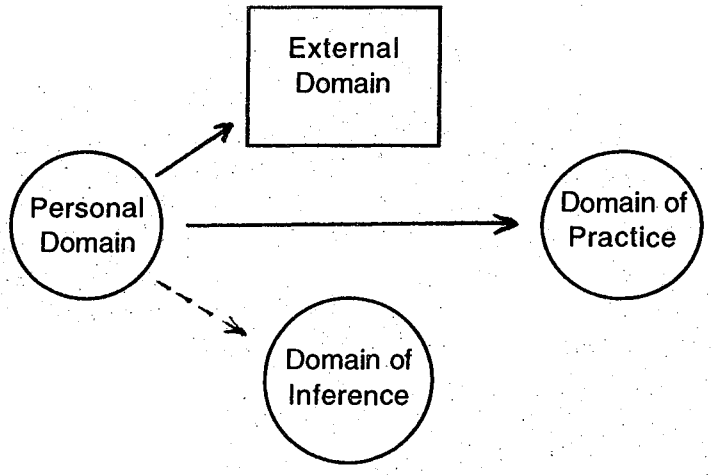

Figure 8. The consequences of change in teacher knowledge and beliefs
(solid line = enactive mediating process; broken line = reflective mediating process)

Teacher experimentation is the principal operationalized consequence of the changes in knowledge and beliefs, as well as being a principal stimulus for reflection. From this perspective the role of teacher classroom experimentation within professional growth is a central one.

Classroom experimentation

Teacher classroom experimentation is seen as the critical catalyst for teacher professional growth. Figure 9 makes it clear that the role of teacher classroom experimentation as a component of professional growth can take three forms, each corresponding to the relationship between Classroom Experimentation and one of the other three analytic domains.

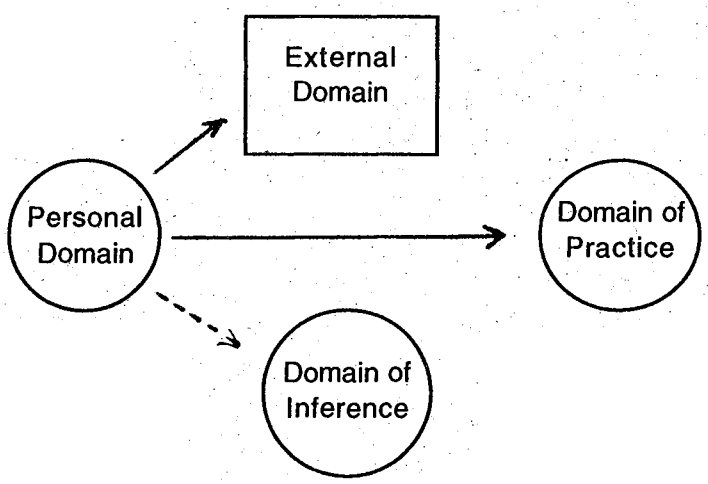

Figure 9. The role of the Domain of Practice within Professional Growth
(solid line = enactive mediating process; broken line = reflective mediating process)

The most obvious form was teacher classroom experimentation as the *informed mimicry of advocated innovative practice* arising from a teacher's participation in an inservice program.

The second function of Classroom Experimentation within teacher professional growth is as a *stimulus for reflection.* This reflection process mediates between Classroom Experimentation and the teacher's Valued Outcomes. It is within this Domain of Inference that the teacher judges the success or otherwise of the new practices.

To this point, the change sequence: Inservice, Classroom Experimentation, Valued Outcomes, Knowledge and Beliefs reproduces Guskey's linear model of teacher change (1985, p. 58). An essential feature of the Clarke-Peter model, however, is the recognition that change can occur without the mediation of any inservice activity through the *operationalization of Teacher Knowledge and Beliefs.* In particular, where Teacher Knowledge and Beliefs changes in response to the inferred success of new practices, further Classroom Experimentation can occur as teachers put into practice their changed beliefs regarding effective mathematics teaching without the further intervention of additional inservice activity (see Figure 5). This progressive refinement of teaching practices establishes individual teacher ownership of the new strategy and the associated beliefs. It was clear from the data collected in the ARTISM study that the process of teacher professional growth was marked by adaptation of advocated practices, rather than simply their adoption. Figure 5 suggests that this adaptation occurred as a process of cyclic refinement.

CONCLUSIONS

The purpose of this paper is the explication of a new model of teacher professional growth. The data from which the model was derived (Clarke, Carlin & Peter, 1992), and which have served to illustrate the various relationships, also led to the following propositions:

- Previous models of teacher change have given inadequate recognition to the complexity of the process of teacher professional growth, leading to inadequate and simplistic descriptions of the relationship between action and reflection;
- Teachers are always experimenting, and the role of an inservice program is to inform and stimulate their experimentation;
- It is in the combination of the Personal Domain and the Domain of Practice that a complete description emerges of the individual teacher. This emergent picture sets out what the teacher knows, what the teacher believes, and what the teacher does;
- Classroom experimentation should be seen as the contextual catalyst for professional growth, and the outward evidence of teacher change;
- Reflection is the key mediating process by which teacher experience changes teacher knowledge and beliefs;
- Enaction is the mediating process by which change in knowledge or beliefs is translated into changed practice;
- Changes in teacher beliefs regarding the efficacy of new practices are mediated by the teacher's inferences linking the new practices to valued outcomes. These valued outcomes will inevitably reflect the teacher's existing conception of the goals of instruction, and of acceptable classroom practice; that is, the teacher's knowledge and beliefs.

The structure of the Clarke-Peter model (see also Clarke & Peter, 1993) and the findings of this study have significant implications for future teacher professional development programs. Recognition of the complexity of professional growth in a form which models possible growth pathways allows the developers of inservice programs and other professional development enterprises to anticipate and encourage all avenues to professional growth. The location of key analytic domains and mediating processes within the model highlights the particular elements which might most usefully form the components of an inservice program.

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