CONTRASTING IMAGES:

TRANSFERRING OR TRANSFORMING?

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Introduction
In the literature on teacher change, there has been a movement in the way teachers and teaching have been portrayed. Initially, they were viewed as conceptually simplistic, rejecting change if it did not fit their individual intuitive sense of what they should be doing. More recently there has been a theme in literature where teaching has been explained in terms of both organisational factors and teacher personal factors - beliefs, knowledge, attitudes and perceptions. For example, Richardson (1990) points out that the current learning-to-teach research, as well as an increasing number of professional development programs, have their focus on individual teacher's cognition, beliefs and
other mental processes rather than on teaching behaviours per se.

Glasser (1989) has reviewed the advances in the analysis of teacher competence and acquired knowledge and skill as they inform processes, conditions and activities of learning. He concludes that, although much is now known about knowledge structures, cognitive processes and outstanding abilities associated with highly competent performance in a number of arenas, little is known about how these states are achieved.

...we have identified properties of the state of attainment, but know less about the transformation operations that turn novice learners into increasingly competent individuals. How knowledge becomes organised and how the processes that accompany it develop with learning and experience are current fundamental questions. (pg 271).

It is towards these fundamental questions that this paper is addressed.

In studies of teacher development the concept of "image of teaching" has been a useful analytical tool. Calderhead (1988) has discussed the different conceptual levels to which the concept of image is referred. What is evident in each of these referents is that they appear to fall into Glasser's group of states of attainment. This research has been illuminative in that it identifies the knowledge structures that motivate teacher behaviour. At the same time, however, it is limiting in that does not inform those who nurture teacher development or construct teacher education programs. Evans (1991: 25) makes the same point in reviewing the literature on expert-novice differences when he points out that these studies "emphasise a particular aspect of teaching- that concerned with efficiency and smoothness of performance."

The notion of "image" per se however has proved an important analytical tool. Prawat (1991) believes that concepts such as image (and allied notions such as metaphor) provide useful tools to understanding about the underlying variables affecting
teacher actions. He sees "image schema" as a kind of gestalt structure representing a recurring pattern of regularity in one's perceptual or physical interaction with the environment, while "metaphor" allows us to make use of image schema in organisng these more abstract understandings.

This paper seeks to extend the concept of image to enable an appropriate focus to be directed on processes of attaining professional competence. It does this by introducing the notion of "image of development" and uses this concept to map the images of development held by novices and supervisors of novices. This mapping allows a comparison of the views of development held by the two different groups and draw out implications of these differences.

It further seeks to develop a model of learning professional knowledge based on data reported from student teachers about how they develop such knowledge.

Research Design

Ways of coming to know about complex phenomena such as learning to teach and teaching to learn (Feiman-Nemster, 1983) are inseparable from the context within which they both form and locate their authenticity (Peshkin, 1978). The qualitative paradigm adopted in this study sees most appropriate for respecting this contextual specificity and allowing the complexity of meanings constructed to be sensitively represented. Data collection and analysis techniques which are systematic but respondent-driven enable cognitive constructs to be accessed while still acknowledging their effective mediation.

Hence, measuring relationships between elements in any proposed model is of much less significance than trying to describe the ways in which the complex interactions shape and re-shape the model according to the individual's perception of responses to the contextual demands. Recognising that the "meaning making" process is both historical and continuous necessitated a research design which samples over time, taking a
broad sweep
at each data collection point, whilst simultaneously more closely defining
and redefining
the emergent models.

So this phenomenological research study attempts to seek to understand human behaviour
and perspectives from the viewpoint of the insider. Phenomenography is used here to
study learning and thinking and to map the qualitatively different ways in which people
experience or reflect about various educational phenomena. It looks at the relations
between student teachers and the learning world around them by focussing on their beliefs
and perceptions. Therefore, in this interpretative research, the phenomenological
perspective of the student teachers' involvement in their learning is emphasised and regards the participants as being able to construct their own social reality, rather than viewing reality as a determiner of their perceptions. Salijo (1988) believes that access to teachers' perspectives is essential for understanding educational phenomena. We also believe that there is a need to access student teachers' perspectives on what they are learning and what they wish to accomplish as a further extension of their understanding.

To use the terminology of Marton (in Saljo, 1988), our object of inquiry is within a "second order perspective" and concerns how the world is constructed by the actors. The term phenomenography refers to this research which systematically focuses on the second order perspective. Within this research, the notion of concepts of reality represents the content of thinking, the meanings student teachers see in and ascribe to what they perceive. There is always a lens through which the world is viewed if it is to be meaningful to them.

The concrete praxis of phenomenography implies that any variations in the forms of identifying and describing phenomena can be reduced to a limited set of categories (usually 3 to 5) that depicts significant differences in ways of construing this phenomena.
This orientation became the process of analysis in the study.

Two assumptions were accepted within this approach. The first is that conceptions of reality were not considered as residing in individuals and thereby people have a tendency to use particular conceptions in a number of settings or in relation to a number of problems in different ways. The fact that people change their thinking in various contexts might be seen as a threat to genuine understanding of human thinking and one might ask whether generalisable knowledge is possible. It is anticipated that this is answered by the second assumption which sees conceptions of reality as relational phenomena rather than as inherent qualities in the mind of the thinker or in the phenomena themselves. Conceptions are abstractions from reality and these can represent various providences of meaning. In accordance with this reasoning, the categories of description of the transformational model of professional development constitute the most significant outcome of this present research. If this research has managed to discern the conceptions of the phenomena being investigated, then a territorial map has been revealed which can be used to interpret how student teachers conceive the reality of their professional development.

Methodology

Data Gathering. Data of the study was gathered in two formats - written responses from student teachers and from their supervisors in the schools, and from interviews with a sample of students (two sets of four) selected because they were representative of the range of orientations that had been identified from the analysis of the written responses with respect to their images of teaching and development (Elliott and Lange 1991).

These follow up interviews were conducted on two occasions. At the first of these individual interviews, the student teachers were asked open questions which endeavoured to build on the information focussing on professional development that had
been identified from the earlier written responses. The subsequent interview focussed more specifically on probing the meanings and perceptions that had been identified by the researchers from the data that student teachers had provided at the first interview. Both sets of interviews were audio recorded and transcribed.

A grounded model of "professional development" was conceived from these data by the researchers working independently and then collaboratively. The refined model was "member checked" by reference to the respondents.

Data Analysis. Two analytical procedures were basic to the coding and analysis processes, though it was recognised that their nature changes with each level of coding. The first pertained to the making of comparisons and the other to asking questions.

These two procedures helped to give the concepts in our grounded theory their precision and specificity. As identified by Glasser and Strauss (1967) grounded theory is "the constant comparative method of analysis".

It was found that the naming of phenomena from the interview transcripts continually fixed the researchers' attention to them, to begin to examine them and then ask further questions in later interviews. The asking of these probing questions not only endeavoured to describe them but also to form propositions about the possible relationships of one concept to another. The naming of these concepts and the associated propositions permitted further deductions which in turn guided further data collection which then lead to further induction and provisional testing of the propositions. Ultimately, communication among the investigators, including the vital interplay of discussion and argument necessary to enhance the development of these professional development ideas, was made possible by the specification of concepts and their relationships which we had described in terms of propositions.
Therefore, as concepts are the basic units of analysis in this methodology, conceptualising our data became the first step in the analysis. By breaking down and conceptualising we mean taking apart the interview transcripts with a focus on the sentence describing the phenomena as being the unit of analysis.

Once we had identified particular phenomena in the data, we began to group our concepts around them. The process of categorising or grouping concepts that seemed to pertain to the same phenomena was done to reduce the number of units that we had to work with. It was felt that the conceptual names given to the categories were more abstract than the concepts grouped under it and provided the conceptual power of pulling together around them other groups of concepts or sub-categories. The process of "open coding" (Strauss and Corbin, 1990) which was used was the analytical process by which concepts were identified and developed in terms of their properties and dimensions.

Open coding fractured the data and allowed the identification of categories, properties and dimensional locations. A set of procedures was undertaken, whereby the data was put back together in new ways after open coding, by making connections between categories. This was done by utilising a coding paradigm involving conditions of existence, contexts, interactional strategies and consequences. Strauss and Corbin (1990) refer to this process as "axial coding".

Axial coding puts the data generated by open coding back together in new ways by making connections between a category and its sub-category. In this phase we were concerned to elaborate the meanings of the major categories beyond simple properties but, in reflection, often found ourselves moving back to open coding processes. In other words the processes of fracturing the original data and reconstituting it were not strictly linear and occasionally cyclic.

Thus, in summary, the basic analytical procedures by which this was accomplished was
by asking questions about the data and making comparisons with each description of the phenomena. Similar conceptualisations were labelled and grouped to form the basic categories. These were used to articulate the components of the model of professional development.

Data analysis and interpretations

As noted above, this study collected data in two formats—written responses from student-teachers and from their supervisors in schools and interviews with a sample of students.

The results associated with the former data have been reported elsewhere (Elliott and Lange, 1991) and the findings associated with "images of development" are reviewed here, because they bear directly on the issue under consideration in this paper.

The students and their supervisors were asked to indicate how they believed student-teachers developed professional knowledge for teaching. These responses were classified on a four point scale as follows.

Level 1: Receive and accept.
   Respondent receives information from a range of sources and plans for teaching on this information alone.

Level 2: Select and personalise.
   Respondent uses received information and personally tests the information in classes. The outcome of this trial is the use of selected knowledge in a practical setting.

Level 3: Select and interpersonalise.
   Respondents receive information and, apart from trialing it, discuss it with others. The outcome is still used in a practical setting.

Level 4: Reframing.
   Respondents take information and trial it and discuss it with others. This level differs from level three in that the respondent acknowledges that one of the
rationales for this trial and discussion is to redevelop appropriate knowledge bases.

Table 1. below indicates the result of the analysis of the data from students and school supervisors.

<table>
<thead>
<tr>
<th>Level</th>
<th>Students</th>
<th>Supervisors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Receive and accept</td>
<td>5%</td>
<td>29%</td>
</tr>
<tr>
<td>2. Select and personalise</td>
<td>45%</td>
<td>57%</td>
</tr>
<tr>
<td>3. Select and interpersonalise</td>
<td>26%</td>
<td>0%</td>
</tr>
<tr>
<td>4. Reframe</td>
<td>13%</td>
<td>14%</td>
</tr>
</tbody>
</table>

From this table it appeared that a greater proportion of the students in this study conceive of professional development in a reflective manner compared with their own supervisors. This is extremely evident when comparing classifications in levels one and three.

This conclusion was also supported from other aspects of the data collected in this early phase of the study. Both students and supervisors were asked to indicate what they thought good teachers did and what knowledge they needed to in order to do this well. The responses to these questions were classified as either responsive or technocratic according to a defined set of criteria (Elliott and Lange, 1991) which were consistent with current analyses of teaching in these terms (Bowers: 1990). In the analysis reported by Elliott and Lange (1991) it was revealed that, while sixty two percent of the teachers' responses could be classified as technocratic with respect to teacher style and supporting knowledge, only thirty nine percent of the students could be likewise classified.
If one particular image of development pervaded the responses from teachers it was their belief that students needed only to "practice their teaching skills" or work out how to translate theory learned at university into practical skills. The following extracts from teachers' responses illustrate this point.

(Students should be) spending as much available time as is practical working in classrooms, both observing and teaching.

(Students should learn from) real teachers in the field... who are still in touch with current teaching issues.

(Students should learn) by practice and seeing them in action From "on the job" training and observations in schools.

By being thrown in at the deep end and given responsibility.

Experienced teachers could give student their methods and content structures.

What many of the teachers seemed to be commenting upon was induction for a particular employment context. The respondents seemed to have little notion of the need to consider professional development from a wider perspective. Either they were not aware of the issues of professional development from a learning perspective or the questions used to elicit responses did not tap these ideas.

These conceptions of learning to teach are consistent with what Zeichner and Liston (1987) refer to as an apprenticeship model. In such a model those who guide teacher development aspire to provide student teachers with pedagogical skills and techniques derived from preexisting bodies of knowledge.

In contrast, the students appeared to have a view of development in which professional knowledge is situated, being in part a product of the activity, context and culture in which it is developed and used (Brown, Collins and Duguid, 1989).

The differences between the students and the school
supervisors were regarded as a significant aspect of the initial data analysis and for this reason it was decided to more fully investigate the images of development which the students held.

The transcripts of the interviews with students which followed the written data gathering phase were subjected to open coding strategies as noted above. In broad terms the data indicate that there are four categories associated with images of development. This means that phenomena associated with professional development reported by students can be categorised in a four dimensional space. The dimensions of this space are:

Category 1. General Metaphors and understandings.

Category 2. Contexts in which development is facilitated.

Category 3. Cognitive and metacognitive operations in framing and reframing knowledge about teaching.

Category 4. Antecedent conditions including personal predispositions to professional development and prior experiences.

Associated with each of these categories there are subcategories which not only serve to differentiate the data but also elaborate the meanings of the categories. This differentiation and elaboration is undertaken below as each of the major categories is examined.

Category 1. General metaphors.

Three groups of metaphors for professional development were identified in the data and the labels for these categories have been taken from specific references from the students. It was agreed by the four researchers on the project that all general references to development could be categorised within the three identified metaphors. These three groups of metaphors were:

The metaphors of absorbing. Students indicated that there were "huge amounts" of information to be processed as part of their professional development and often
they needed to act as a "sponge" or a "filing cabinet".

One such student, in reflecting on the knowledge which she had developed indicated that "you may get it from things that you read, you may get it from teachers you observe, you may get it from other people in your course: you feel a bit like a sponge, you just sort of soak it up."

Another indicated that she was "willing to absorb anything new".

The metaphors of filtering. While there were constant references in the data to the students absorbing information from a variety of sources each was tempered with a perspective of processing this knowledge. In broad terms students conceived of the processing in terms of "filtering" or "pot boiling". While some discussed the process of filtering through their value system, others discussed the process of "filtering" new knowledge through previous ideas.

An interesting point to note about "filtering" is that students indicate that knowledge is used in the filtering process continually and there may be significant delays between the reception of the knowledge and its filtering. As one student noted "I'm not sure what twigs it off but it just sort of filters through there at different times. The time lapse may be a day or maybe a couple of months, but its just coming on board the whole time and I'm filtering it through"

The metaphors of collating. The third category indicating a broad general process of professional development concerns how different ideas are put together. One student noted that "from a lot of things you see around you and a lot of personal experience you get it together with a lot of superglue."

These broad general metaphors contrast significantly with the images outlined by the supervisors in their written responses. The supervisors often referred to "observation and then practice". This image of observation followed by practice is recognised as static by
the students in that it represents a frozen point in time. In fact, one student reported that
"observing doesn't show you what came before or what came after" and "you don't see
what they did the night before or the week before or the year before". This static process
of observing contrasts directly with the dynamic notion of "filtering" elaborated by the
students. It is an essential distinguishing feature between the images of "transferring"
knowledge as noted by the supervisors and the images of "transforming" knowledge as
noted by students. This point is also noted by Evans (1991) in reporting data from
Diploma in Education students. He reports that these students rated the idea of
"modelling" lowly as a strategy for learning to teach.

From the students' perspective, they are not passively absorbing the norms of the
school but actively processing feedback information in terms of their own
conceptions. (p. 26)

Category 2: Contexts in which development occurs.

The students identified five distinct contexts where development of knowledge about
teaching occurred during their course. These are noted below.

The context of being alone. A significant number of references to being alone and
activities associated with being alone are noted in the data. Activities which the
students reported as important for them in developing professional knowledge
when they were alone included the obvious activities such as reading and writing
reports but many also referred to the importance of types of thinking
which could only be undertaken alone. Some reported this as "nutting it out for
yourself" or as
"you create it yourself- it just occurs to you (when you are alone). You get new
ideas- a flash of an idea and you try it." These latter ideas are important for the
general metaphors of "filtering" and "absorbing" discussed above in developing
professional knowledge because they illustrate the specific contexts where these
general metaphors become realities of practice.

The context of interacting with peers, formally and informally. While students indicated
that experiences which they had in formally arranged groupings (such as tutorials)
were important in developing professional knowledge, it seems that the informal
situations were at least as important, if not more so. For example, one respondent
reported that "discussing (ideas) with peers has been a huge help" and another
claimed that success came from "finding the people you can get on with and then
working(ing) with them". In discussing the mutual support to be derived from
informal peer interactions one student commented about "talking to other students
about how they feel about it; because talking to them sort of justifies your
feelings"

The context of formal learning environments. In their interviews students listed
indiscriminantly the full range of formal contexts provided by course structures as
relevant sources of professional knowledge. Amongst those mentioned were
listening in lectures, participating in particular subjects and teaching clinics.

Contexts associated with practice teaching. Three different types of contexts were noted
by the students. Some referred to experiences with specific teachers such as the
student who indicated the importance of her being taken "right into the teachers
group and allowed to sit in the lunch room". In this setting the student indicated
the teachers were "so willing to talk". This process contrasted markedly with other
reported episodes such as those noted by a student who said she was "not
permitted to sit in the same room as the teachers".

Other students referred to the specific class as a point of learning. These
references included "getting to know children just by the way they react" and the
importance of having a context where "trial and error" could occur.
Yet others did not refer to specific elements in the practice teaching context but rather noted the importance of practice teaching as a whole experience. These references seem to focus on the overall impact of the practice placements in terms such as "the major way I've learned about teaching" or "the main contributor to what I've learned".

Contexts associated with significant others. The final category of contexts where they developed their professional understandings which were identified by students focussed on the range of significant others in their lives. Significant others included individual children they interacted with ("applying different strategies to a little girl who couldn't get fractions") and family members ("talk it over with my mother and go through what you think").

Category 3: Cognitive and metacognitive operations.

Throughout the interview process students referred to the cognitive and metacognitive operations associated with general metaphors reported earlier as general processes of developing professional knowledge. While a number referred to processes of "general thinking" and engaging in "extensive work" as important in developing ideas about teaching, the most common references were to specific operations they engaged in on particular occasions. The most significant of these are noted below.

Rejecting, recalling, reframing, applying, realising, adopting, reinforcing, observing, making meaning, organising, associating, retrieving, experiencing (and learning by the experience).

As noted below students indicated that different operations were associated with different metaphors of development and others indicated that different operations were associated with different contexts. These issues are explored in relation to an integrated model of professional learning.
For the purposes of this paper the relationships between and among these operations and processes is not explored. Data indicates that there is an ordering and operating procedure amongst them and this is the subject of ongoing development in the research.

Category 4: Personal predispositions to professional development

While the students in this study reported their professional development in terms of processes in which they engaged in the context of their preparation course, they often discussed these processes in terms of a number of antecedent conditions. In other words, while a number of students may all engage in similar experiences in the same context, how they related this contextual knowledge to their prior experiences, often differentiates them. That is, the knowledge they constructed from the course experiences is a function, in part, of their prior experiences and predispositions towards learning and teaching.

As one student reported, "there is a lot of stuff in your head and it's just how you come to teaching that matters." Others indicated that life experiences were extremely relevant because these experiences "help (them) relate what is said in theory."

The general metaphor of "filtering" discussed above is important here because these antecedent experiences become just as important in the filtering process as what is learned formally in classes or in school rooms. As noted by one student "the way you teach is the way you are - a reflection of yourself" and "in teaching you just keep using all your experiences wherever they may come from".

The process of filtering brings antecedent experiences into present knowledge relevant to the current situation.

Three specific antecedent conditions seemed to be relevant in the data reported by the students and these are noted below.

Willingness to change. Interviews with students who had been in para-
professional roles
such as teacher aide contained a number of references to the need to keep check on previous ideas. For example a student reported that she had "a few bad habits" which she had to modify and this required a conscious act on her part. The notion of willingness to change is mentioned again when she claimed that "I've formed my ideas by having a willingness to change - instead of coming to university with the view that I knew it all".

The notion of subjecting prior learning to scrutiny was couched in a range of different language for different students. One student referred to the ability to fight preconceptions, which seems to be a stronger form of "willing to change". This student reported that she had to "fight preconceptions of what a teacher is and does."

Fitting into the system. allied with the notion of fighting preconception and having a willingness to change some students referred to the need to adapt to a system or institutional structure and format. For example, a student reported that "although you've got to have your own philosophy, in the reality of it you have to clip your wings to fit in with the system."

Knowledge from specific contexts. While a number of students discussed antecedent conditions in general terms there were references to specific experiences with significant others. Some referred to their own children: "Having your own children helps, you're aware things aren't perfect"; others to their own parents: "I saw my parents... I saw that model for me"; and yet others to past teachers: "a cranky teacher who hit children if they had a problem - everyone would just sit afraid to ask."

Analysis: Towards a model of professional learning.

The four categories of phenomena associated with professional development
and learning
to be a teacher are illustrated in Figure 1 below. The figure indicates how
the phenomena
interrelate and relate to professional knowledge but it does not indicate
how the different
phenomena produce knowledge appropriate for teaching.

[Figure 1 about here]

Such a model of professional development which indicates how knowledge
appropriate to
particular situations is created is shown in Figure 2. This model has been
derived from
later interview data (as part of the member checking process) where
students were asked
to indicate how the different major categories and their associated sub-
categories were
interrelated.

[Figure 2 about here]

In this process some students were clearly referring to a perspective of professional
development which may be classified as a micro perspective. The idea of a micro
perspective is appropriate where the respondents related and associated
cognitive operations with general metaphors at one point in time.

Others were referring to a more macro perspective of development. The idea of a macro
perspective is appropriate where the emphasis is on the formation of professional
knowledge across relatively long periods of time. The focus in this latter perspective is on
the way different cognitive operations were associated with contexts across time.

These two perspectives can be integrated into a single model of professional development.
Within this model, teacher knowledge is regarded as situated in the context. Further, it
results from the interaction of specific cognitive processes, the context in which it is
developed, and the antecedent conditions.

Thus, the data support an information processing model of professional development in
which perception of contexts and conditions, together with cognition, become significant.
They are significant because they not only identify the integrating aspects of the model
but also identify the transformation processes by which student teachers comprehend
phenomena associated with the process of teaching and learning. To paraphrase Shulman (1987), there is a cyclic process of pedagogical reasoning and action in teaching that can be conceptualised as "comprehension and reasoning, transformation and reflection".

Such a model of professional development and learning, based on these data, is illustrated in Figure 2. The model is an integrated model in that it addresses both the micro perspectives of professional development and learning and the macro perspectives.

The micro perspectives are addressed by incorporating cognitive operations under executive control, acting to filter knowledge which is rendered accessible either directly from action or from episodic memory.

The macro perspective is addressed by incorporating processes of absorption and storage of contextually bound information. Contextually bound events may be stored for subsequent filtering to render propositional knowledge.

In a continuous cycle of transformations, this propositional knowledge is capable of further filtering. This process may occur while the student is alone, generating a series of propositions to be tested at some later time in the context of the classroom.

The model also incorporates the important elements of predispositions. Butt, Raymond and Yamagishi (1988) likewise evolve a conceptualisation of both the nature of teachers' knowledge and how it has been formed and expressed. This conceptualisation is based on the notion that teachers, as persons, bring to teaching a particular set of dispositions and personal knowledge gained through personal history. These are termed the architecture-of-self and this evolves continuously as the teacher interacts with a variety of contexts.

There are three important features of the model indicated in Figure 2 that are supported by contemporary literature:
the incorporation of perception and cognition as important elements is professional development of knowledge which relates such knowledge to the situation.

The constructionist view of knowledge whereby knowledge is continually transformed through processes of absorption, filtering and creating.

the transformation of knowledge through cognitive operations so that it relates to the situation.

Perception and Cognition. The literature on information processing models is inconclusive concerning the importance of perception. The model developed here draws from the work of Prawat (1991) and Neisser (1991) concerning the importance of perception but also adopts the constructivist perspective of workers such as Bodner (1986).

In this model, professional knowledge is developed in a continuous process of filtering new perspectives in the context of previously developed understandings about teaching. Teachers (and student teachers) perceive a range of experiences in formally and informally constructed contexts and the knowledge so developed is stored in a long term capacity to be filtered alongside other knowledge at some later time. The time delay between perception and filtering is variable and contextually dependent. When this experiential knowledge is retrieved and filtered it is under the control of executive processes that direct and monitor a range of cognitive processes. Executive processes can be regarded as skills which monitor and direct the cognitive activities in progress. Activities which are associated with executive action include monitoring situations, evaluating the results of action, and deciding actions based on feedback. Thus, such functioning is based on metacognition and directs the cognitive strategies, which are behaviours and thoughts that influence the encoding and transforming processes of professional knowledge. It likewise directs the way in which students
select, acquire, organise and integrate experiences stored in episodic memory. Evans (1990:31) argues that such processes control other functions but they also:

...activate propositional knowledge, which is used in the course of action to direct, monitor, and evaluate specific procedures in terms of feedback from performance and the results of performance.

The result of filtering and transforming previously formulated knowledge in a particular context is a new formulation which influences further perceptions.

Figure 2 addresses the issues which Luckner (1990) argues should be considered in information-processing models of knowledge acquisition. First, he argues, there are limits to the amount of information which neophytes can process effectively. This is accounted for in the model by incorporating a process whereby knowledge is stored in its perceived form to be filtered at some later date. Secondly, new information has to be processed if it is to become "working" knowledge. In the model in Figure 2, the filtering of knowledge, under the control of the executive processing, is the mechanism by which this occurs. Frequent reordering and reframing in the manner discussed by Noordhoff and Kleinfeld (1990) is needed and this occurs as a consequence of the filtered knowledge being freely available for refiltering in the light of newly gathered information.

Constructionist perspective. Bodner (1986:874) argues that we must move away from a traditional realist view of knowledge where it is assumed we build replicas of realities in our mind, because of its reductionist view of reality. We need to move to one incorporating a process of knowledge acquisition where:

Each of us builds our own view of reality by trying to find order in the chaos of signals that impinge on our senses. The only thing that matters is whether the knowledge we construct from the information functions satisfactorily in the context
in which it arises.

In the model under discussion, it is argued that the processes associated with the metaphors of filtering and transforming will result in such knowledge being rendered satisfactory for adoption, for understanding and for action.

Situated knowledge. Drawing on recent research into cognition as it is manifest in everyday activity, Brown, Collins and Duguid (1989) argue that knowledge is situated, being part of a product of activity and context. In pointing to the consequences of this, they argue that a theory of situated cognition suggests that activity and perception are importantly and epistemologically prior - at a non conceptual level - to conceptualisation and it is on them that more attention needs to be focussed.

The process of filtering and transforming noted in the model under discussion results in knowledge which relates to its situation through a set of indices (Elliott, 1981). These indices are similar to those identified by Peirce (in his classic treatise on the meaning of signs.

Implications

Given the model of professional development illustrated in Figure 2 and how it contrasts with the images of development held by supervising teachers a number of implications follow for the structure of preservice teacher education courses and development of reflective teachers.

Firstly, this study highlights the importance of a knowledge base for teacher education students. If, as indicated in this paper, teacher education students filter their experiences through previously developed knowledge, then the transformed knowledge is influenced by that knowledge. This means that course developers need to give careful attention to the nature of knowledge to be transmitted to students as an integral part of teacher education.

There are suggestions in some contemporary literature that the processes of development
are more important features of course design than the knowledge base to be
developed. For example, the notions of "storying and restorying" outlined by Clandinin
and Connelly (1991) imply the primacy of process over knowledge. The evidence reported
in this paper does not support this position.

Secondly, the model implies that there is a need to identify those activities which will
enhance the executive control strategies. The recent work on case knowledge and the
associated activities for developing case knowledge in both education and law may lead to
future development in this area. The key to identifying the knowledge base of teaching
lies at the intersection of content with pedagogy - in the capacity to transform content into
pedagogically powerful forms adaptive to the variety of students and contexts. The
processes that facilitate this transformation need to be identified and encouraged in teacher
education programs. This process places emphasis upon the intellectual bases for teaching
performance rather than on behaviour alone and has significance beyond teacher education
- significance for recognising teaching as a profession.

The model highlights the importance of individuality in professional development and
learning. An implication of this is that course models need to reflect this individuality.
For example it is important to realise that specific knowledge is stored in memory and
processed at later stages and the time between storage and recall depends not only on
situations in which individuals are placed and accompanying time factors.

Finally, the model has implications for processes of selecting students for teacher
education courses. Because the model highlights the importance of knowledge bases,
predispositions and cognitive operations in the process of becoming a teacher, each of
these should feature in selection strategies. Specifically, with reference to the latter point
of cognitive characteristics, there is mounting evidence that placing students in contexts
where they are expected to display characteristics of reflective practitioners is
inappropriate when the students lack appropriate cognitive abilities (Reyes, 1987).

Conclusions

Clark (1988) notes that research in teacher thinking has documented the fact that teachers develop and hold implicit theories about teaching. This paper proposes a model illustrating how these implicit theories are developed. The model is grounded in the participants' perceptions of their own development, the forces which shape their images of development and subsequently influence their images of teaching.

Such images play an important part in the decisions and interpretations which teachers make on an ongoing basis throughout their professional lives.

The model which is developed in this paper indicates the importance of the metaphor of absorbing, filtering and transforming in the process of developing implicit theories. Such processes are important because, although teachers have implicit theories that are robust, idiosyncratic and pragmatic, they are constantly refining these through these filtering processes. At any one point in time the theories that a teacher has developed have been pragmatic enough to get her to the point where she is, but they are constantly being transformed to develop further refined propositions and theories.

What is required to develop the ideas explored in this paper is a further elaboration of the specific cognitive operations associated with professional learning. Operations which may be regarded as low order and those of higher order need to be identified. Further, it would be useful to identify which strategies student teachers adopt in particular contexts and which are associated with particular metaphors. It is to these ends that the writers of this paper are directing their research endeavours.

References


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