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 organising 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 1.

Level	Students	Supervisors
1. Receive and accept	5%	29%
2. Select and personalise	45%	57%
3. Select and interpersonalise	26%	0%
4. Reframe	13%	14%

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 is 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.

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