

# **A Framework of Critical Thinking Skills for Teaching and Learning Physiotherapy**

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To my husband Vinodh  
and  
my daughter Sadhna

## **Abstract**

### **A framework of critical thinking skills for teaching and learning**

#### **Physiotherapy**

The use of critical thinking is called for in the practise of physiotherapy and has been cited as a learning outcome in the design of the physiotherapy curriculum. Further, the South African Draft White Paper on Higher Education (July, 1997) is committed to endow graduates with skills that build the foundation for lifelong learning and included in such skills is that of critical thinking. Although welcomed by the profession, the introduction of critical thinking within the programmes may be premature because of the lack of debate and subsequent understanding about the critical thinking skills necessary for the practise of physiotherapy. Hence critical thinking remains implicit within the context of physiotherapy. Physiotherapy educators are assessing the skill implicitly within the process of clinical reasoning and decision making, without articulating what critical thinking really is, in the context of physiotherapy clinical reasoning. Further one needs to identify the repertoire of component skills that one should possess, in order to be an accomplished critical thinker.

Data obtained from interviews with level co-ordinators, and an examination of the course plans within one department at one institution, provided an insight into how critical thinking is understood within the profession. Further, it identified if, and how, critical thinking was currently incorporated into the physiotherapy curriculum. In an attempt to develop a deeper understanding and a guiding framework for critical thinking in Physiotherapy, a workshop was conducted amongst qualified physiotherapists. They were required to model the clinical reasoning and decision making processes that they employ in the clinical area, in the process of working through the clinical problem that was presented. The data that emerged was qualitatively analysed and categorised. This was for the purpose of generating meaning, and for the development of a framework of critical thinking skills, that may be used in conjunction with the process of clinical reasoning to enhance one's clinical judgement.

Critical factors emerged from analysis of the data. These included the preponderance of the product over the process method for teaching and assessing, the implicit nature of teaching and assessing for critical thinking in physiotherapy, and the similarities and differences in perception and conception about the meaning of critical thinking and its associated skills. The findings of this study contribute to the understanding and development of critical thinking within the specific context of physiotherapy and inform the development of the physiotherapy curriculum towards the realisation of its intended goals.

## **PREFACE**

The research described in this dissertation was carried out in the Department of Physiotherapy at a previously historically black institution, under the supervision of Ruth Searle of the University of Natal, Durban.

These studies represent original work by the author and have not been submitted in any form for any degree or diploma to another tertiary institution. Where use has been made of the work of others, it has been duly acknowledged.

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## **TABLE OF CONTENTS**

1.	Introduction	1
2.	Conceptual Framework	10
3.	Methodology	23
4.	Findings	32
5.	Conclusion	50
	References	53
	Appendices	57
	Letters of Consent	58

## **1. Introduction**

The shifting nature of a Physiotherapy educator's role is largely driven by the needs of physiotherapists in the field whose role is defined by the changing health care requirements of the people they serve. The design of the Physiotherapy curriculum is influenced by the expanded role of the physiotherapist in response to policy developments on health and education, which impact on service delivery. Further, tensions that arise between professional bodies and higher education institutions also mould the curriculum to ensure that the emerging physiotherapy professional will be competent in the changing healthcare environment. What follows is an expression of the symbiotic relationship that exists between the expanded role of the physiotherapist and curriculum development, in response to that change. Hence curriculum revision has to focus on skills that modify the role of the physiotherapist towards greater evaluation and treatment planning, delegation and supervision of care, and teaching of patients, families, and other healthcare practitioners with the physiotherapist as consultant. In addition, the physiotherapist has to be able to deal effectively with the knowledge explosion and have the capacity to deal responsibly with high levels of change.

Against this backdrop, Physiotherapy education and training should produce students who can do more than merely think; it is equally important that they should exercise good judgement. Good judgement rests upon proficient reasoning skills that can assure competency in inference as well as upon proficient enquiry, concept-formation and translation skills. The ability to process complex information within the context of change is enhanced as the parallel development of one's clinical reasoning and critical thinking abilities unfold. This charts the shift from a technical role of the physiotherapist to one that is characterised by professional autonomy, competence and accountability that is consistent with the national goal of higher education. Whereas curriculum changes should consciously be meeting these intended goals, attention to curriculum changes tends to be focused on increasing knowledge and skills to inform the expanded roles of the physiotherapist, rather than addressing how to enable graduates to meet the challenges of change. The result is generally an overloaded curriculum.



Physiotherapy education and training in South Africa is currently only offered at university level. The setting for this study was at a previously historically black university and involved the teachers and clinical educators for the 2000 academic year. An examination of the intrinsic and extrinsic factors that could influence the design and outcome of the physiotherapy curriculum at this institution was undertaken and it yielded the following. Firstly, in an attempt to mould a university student into a physiotherapy professional, Physiotherapy educators need to find a balance between equipping graduates with discipline-specific knowledge and skills as well as helping them to develop generic skills to work effectively within the interpersonal and contextual parameters of the workplace. Secondly, the shift of Physiotherapy education programmes from hospitals, where they were predominantly clinically focused, to universities where they have assumed an applied science status, changed the focus of the programmes to one that was inclusive of general attributes that university graduates are expected to possess. A larger theoretical component has been added to the programme. Hence another challenge of the physiotherapy educator is to promote the integration of the theoretical and practical components to enable students to develop an holistic approach to the practise of Physiotherapy.

Thirdly, the ethos of a university environment and the nature of academic enquiry it perpetuates also had an influence on the design of the curriculum. The purpose of a university education is to cultivate a spirit of critical enquiry and to develop in students the desire to pursue knowledge for its own intrinsic value. It is concerned with the life of the intellect and with building up a community of scholars and students engaged in the task of seeking truth. It also has the responsibility of refining and widening man's simplistic view of the world so that a stage is reached where he can formulate intentions, make responsible choices and use reason in acting and judging. This will contribute to the full personal development of each learner and the social and economic development of the society at large. Universities and other tertiary institutions are aware of this and try to incorporate it into their curriculum. One example of such core values and commitments are reflected in the Mission Statement of this previous historically black university in its intended goals viz.

- ❖ To make university education accessible to all, especially to students who are financially and educationally disadvantaged, thereby opening up opportunities for their personal growth and empowerment;
- ❖ To promote teaching and research in a context of social responsibility and academic excellence.

In order to facilitate and support these goals, the university has set itself the following tasks:

- ❖ The promotion of critical and independent scholarship within a context of social responsibility;
- ❖ The development of the curricula, syllabi and research projects which are appropriate to the professional, vocational and other needs of the country;
- ❖ The establishment of programmes to address specific needs and problems of society.

In the light of the university mission statement, the practice of Physiotherapy has the dual function of **educating and training** students for a profession as well as ensuring the personal development of individuals. This is consistent with the vision of the South African National Qualifications Framework (NQF) which is the mechanism that was introduced to facilitate the integration of education and training (South Africa: Discussion Document – Report of the Ministerial Committee for Development Work on the NQF, February 1996). The vision of a single aim for education and training is in “the provision of meaningful learning experiences which will prepare learners more effectively for life’s opportunities” (South Africa: Discussion Document – Report of the Ministerial Committee for Development Work on the NQF, February 1996). The key objectives of the NQF are access, mobility and progression and the need for enhancing quality in education and training. The implementation of the NQF has been the centrepiece of educational reform in South Africa. The South African Qualifications Authority (SAQA) has been established to oversee the development and implementation of the NQF to ensure the enhancement of quality in education and training so that the intended vision may be realised. For this purpose, SAQA outlined Critical Crossfield Outcomes that should be embedded in all learning programmes:

1. Identify and solve problems in which responses display that responsible decisions using critical and creative thinking have been used.
2. Work effectively with others as a member of a team, group, organization, community.
3. Organise and manage oneself and one's activities responsibly and effectively.
4. Collect, analyse, organise and critically evaluate information.
5. Communicate effectively using visual, mathematical and/or language skills in the modes of oral and /or written presentation.
6. Use science and technology effectively and critically, showing responsibility towards the environment and health of others.
7. Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.

The integration of these outcomes into learning programmes intends to achieve the national goal articulated in the South African Draft White Paper on Higher Education (July, 1997)

to produce graduates with the skills and competencies that build the foundations for lifelong learning, including critical, analytical, problem-solving and communication skills, as well as the ability to deal with change and diversity, in particular, the tolerance of different views and ideas.

The implementation of the NQF is a further factor that has influenced the intended outcomes of the physiotherapy curriculum. The flexibility allowed by the NQF with respect to entrance criteria, permits admission of learners with varying backgrounds of prior knowledge, educational abilities and achievements. The great disparity that exists amongst students of mixed ability and differing social and political experiences presents one of the greatest constraints to teaching and learning. The difficulty that arises lies in the planning of core objectives and outcomes which give consideration to individual learner ability and prior knowledge, whilst taking into account the maintenance of standards of the physiotherapy programme.

Therefore, in planning the implementation of the programme, one needed to focus on the differences related to educational instruction, English language proficiency, the level of critical and analytical thinking relevant to physiotherapy, and the commitment and motivation of the learner to a physiotherapy education programme. The physiotherapy curriculum had to focus on the integration of teaching and learning to produce a graduate endowed with generic skills and attributes to meet the needs of the expanded role of the physiotherapist. At the same time a curriculum had to be created which is flexible and accessible to all students, as outlined by the NQF.

### **Clinical Reasoning and Critical Thinking in Physiotherapy**

At the heart of physiotherapy practice, lies good judgement in clinical decision making and clinical expertise. Clinical reasoning is characterised as a process of reflective inquiry, in collaboration with the client (if possible), which seeks to promote a deep and contextually relevant understanding of the clinical problem, in order to arrive at a sound basis for clinical intervention (Higgs & Jones, 1995). This requires a reasoning process which attends to both diagnostic and non-diagnostic clinical patterns and which incorporates the physical, psychological and social aspects of an individual's problem.

The role of intuitive thinking and the more analytical approaches such as decision analysis and logical argument have been acknowledged as poles on a cognitive continuum which combine to enable judgement. The features of a task will influence the mode of cognition the thinker will adopt (Hammond, 1980). These features include the complexity of the task, the ambiguity of the content of the task, and the form of task presentation. The health care environment is typically characterised by complexity, uncertainty and subjectivity. The ability of one to make sound clinical judgements is based on one's proficiency to engage critically and analytically with the clinical problem, within the hypothetico-deductive model of clinical reasoning, which is cited as the dominant model of clinical reasoning in medicine and physiotherapy (Jones, 1992).

The skill of thinking critically underlies clinical reasoning. The reason for good or poor clinical reasoning depends on our limited information processing capabilities,

referred to as “bounded or limited rationality” (Newell & Simon, 1972). This principle emphasizes that limits exist to the human capacity for rational thought. When considering clinical reasoning, the most relevant limit is the relatively small capacity of working memory compared to the larger size of long-term memory. The limited capacity of working memory cannot work efficiently in a brief period to process data serially, to select data carefully, to represent a clinical problem in a simplified way, and to work as rationally as possible within these simplified representations (Elstein & Bordage in Dowie & Elstein, 1988). Hence the clinician needs to resort to skills of professional judgement and critical self-evaluation to overcome the limitations of one’s inability to access knowledge and solve problems.

Against this backdrop, it is evident that the skills for thinking critically are a vital component in the Physiotherapy curriculum. This has been acknowledged by the Department of Physiotherapy at this university and is articulated amongst the exit level outcomes at fourth year level, outlined in the template document viz:

- ❖ To demonstrate a holistic, problem solving approach in selectively applying diagnostic and treatment techniques and modalities with an understanding of its physiological, anatomical and psychosocial basis to individuals and groups of patients in a caring manner.
- ❖ To critically evaluate and monitor the effectiveness of own and other relevant interventions against expected outcomes in order to modify, grade, continue or terminate interventions.
- ❖ To keep up to date with scientific findings in the field and apply them in practise.

These intended goals of the Department of Physiotherapy articulate with those at national level. It is against the background of South African educational reform and changing health care needs that the curriculum for physiotherapy had to be revised and implemented.

Hence, following this revision, this study aims to:

- a) Identify if and how critical thinking is currently incorporated into the Physiotherapy curriculum

- b) Identify what the current understandings of critical thinking are in the specific context of physiotherapy, with an eye to developing a more explicit model for the discipline
- c) Develop explicit strategies for the teaching and development of critical thinking.

### **Critical Thinking Skills – Specific or Integrated**

There is a need for different modules and levels of the curriculum to contribute to the development of critical thinking. This cannot be left to a single course or intervention but needs to be integrated into the curriculum, allowing students to develop and practise skills on an ongoing basis over time. Often this factor is not recognised in curriculum development. It is left to other or later courses to develop eg. data obtained by interviewing the level co-ordinators revealed the following responses to the question, “Does the current curriculum for this level of study include clinical reasoning skills which students could use in the clinical settings, and how?” were the following:

- ❖ Co-ordinator A: “No.”
- ❖ Co-ordinator B: “I don’t think so. The current syllabus does not allow for this. Trying to teach the skills [physiotherapy], not the thinking.”
- ❖ Co-ordinator C: “It is incorporated into the clinicals [clinical education] but it is not specific in the curriculum.”

Following on from this, it is therefore not surprising to find that amongst the weaknesses of students in the clinical area that were reported on, the component skills of thinking critically were found to be lacking/under developed.

- ❖ Co-ordinator A: “Students can’t see the whole picture, it is disjointed. They can’t make a decision; they can’t problem solve.”
- ❖ Co-ordinator B: “....they find difficulty in identifying problems, analysing problems, to think broadly. They ask questions that are routine, recipe like; not pertinent to the patient.”
- ❖ Co-ordinator C: “Students have critical thinking skills but they do not know what to do with it. They do not know how to bring this together in

the clinicals [clinical education]. They tend to shy away from difficult patients because they lack confidence.”

Hence curriculum change in response to national goals requires physiotherapy educators to re-evaluate their assumptions on implicit student knowledge and also re-evaluate the type of skills that should be propagated. The evidence above suggests that in order to accommodate the diverse needs of the students as well as the knowledge explosion related to the physiotherapy profession, greater propositional knowledge was added to the curriculum. The overloaded curriculum seemed to focus on developing a student into a physiotherapist endowed with relevant knowledge, whilst neglecting the enhancement of generic skills and attributes eg. skills of critical thinking, self-management of one's thinking and learning, skills in communication.

Educators should rather empower students with high-level thinking skills together with propositional knowledge in order to cope with change that is inherent in a healthcare environment. Nickerson in Baron and Sternberg (1987) concludes that students do not acquire high-level thinking skills easily or well on their own or through ordinary instruction and hence would benefit from direct teaching of thinking. Development of such skills requires time and practice and should therefore be integrated into the curriculum as indicated by SAQA.

Knowledge that cannot be accessed for use is forgotten; yet a great mismatch exists between the amount of time used to acquire such knowledge and reproduce it and the time spent learning how to use concepts and ideas. This leads to an inability to ask questions which arise from the concurrent use of different types of knowledge and results in an uncritical, half-understood acceptance of ideas. A necessary solution is to accord process knowledge a high priority in academic and practical settings without neglecting the contribution of propositional knowledge to the process. The teachers and clinical educators in this department of physiotherapy are aware of this shortcoming and are committed to change.

The following problems arise from the foregoing data:

- ❖ The need for the physiotherapy programme to make explicit the teaching of critical thinking skills at all levels.

- ❖ The need for explicit assessment of critical thinking within the clinical area with actual articulation of what the component skills are and how they could be assessed.
- ❖ The need for establishing a consensus of meaning that critical thinking has for the teachers of Physiotherapy, as a skill that informs clinical reasoning and clinical decision making.
- ❖ The need for articulation in the design of the curriculum between the outcomes with respect to critical thinking ability, and the inclusion of teaching and learning strategies to realise the intended goal.
- ❖ The need for the Physiotherapy programme to adhere to/comply with the intended critical outcomes stipulated by SAQA.
- ❖ The need to develop a curriculum towards more consciously meeting the needs of the national goal of higher education in contributing to the full personal development of the individual.

### **Setting for the study**

The rationale for the study is based on the problems outlined above. A qualitative study was undertaken in a Department of Physiotherapy at a previously historically black university in order to develop a deeper understanding and a guiding framework for critical thinking in physiotherapy. This is a perceived deficit in the programme, which is why the skills of critical thinking are often implicit in the curriculum.



## **2. Conceptual Framework**

The use of critical thinking is called for in the practise of Physiotherapy and has been cited as a learning outcome in the design of the Physiotherapy curriculum. Further, the South African Draft White Paper on Higher Education (July 1997) is committed to endow graduates with skills that build the foundation for lifelong learning. Included in such skills is that of critical thinking. Although welcomed by the profession, the introduction of critical thinking within the programmes may be premature because of the lack of debate and subsequent understanding about the critical thinking skills necessary for the practise of Physiotherapy. Critical thinking remains implicit within the context of Physiotherapy. Teachers are assessing the skill within the process of clinical reasoning and decision making, without articulating what critical thinking **really** is and the repertoire of component skills that one should possess in order to be an accomplished critical thinker. Hence, critical thinking is akin to the hidden curriculum.

The skill of thinking critically should serve more than the purpose of academic empowerment. It should be developed sufficiently to allow for the full personal development of the learner. The processes of reflection and critical thinking have been acknowledged as higher order thinking processes that individuals engage in to achieve new understandings and meaning about an action while it is happening or after it has happened. Critical thinking is subsumed into the concept of reflection-in-action which is described as a “complex concept and involves thinking critically about the event while it is happening” (Schön, 1983). However, this does not always occur in practice. The depth of reflection has been criticised as being superficial and not meeting the end of achieving new understandings unless the component of deliberate critical appraisal is incorporated into it. Hence, reflection in physiotherapy is defined by Donaghy & Morss (2000) as the higher order intellectual and affective activities in which physiotherapists engage to critically analyse and evaluate their experiences in order to lead to new understandings and appreciation of the way they think and operate in the clinical setting. This enquiry will extend one’s understanding of practise by challenging the assumptions, ideas and beliefs that underlie routine practise. These deliberations are necessary to bring about change (Fish & Coles,

1998). The conceptual tools that are necessary for engaging critically within the context of clinical reasoning in physiotherapy are unstated, yet their importance is acknowledged. By engaging in this study, the researcher hopes to outline some of these tools at the end of the study.

### **Critical Thinking – defined and compared**

The disciplines of philosophy and psychology have contributed greatly to the conceptions of thinking and reasoning. Philosophy tends to focus on the features and quality of the *products* of critical thinking whereas psychologists focus on components of the *process*. The literature abounds with competing definitions of critical thinking, reflecting the complexity of the concept. Ennis in Baron & Sternberg (1987) defines critical thinking as “reasonable reflective thinking that is focused on deciding what to believe or do”. Within a taxonomy of critical thinking dispositions and abilities, Ennis has identified the elements of problem solving as an approach to critical thinking.

McPeck (1990) contends that the critical component is parasitic upon the knowledge component and the relevant skills to engage in activity with reflective scepticism. A criticism of these definitions is that they are based on concepts such as reasonableness and reflectivity that are themselves not well defined. Perhaps a more acceptable definition is that presented by Paul (1990) who defines critical thinking as “the art of thinking about your thinking”.

Lipman (1991) presents a functional definition of critical thinking as thinking that facilitates judgement because it relies on criteria, is self-correcting, and is sensitive to context. It is thinking that can be assessed by appeal to criteria. A primary function of criteria is to provide a basis for comparison within a context and is a way of establishing objectivity. An important aspect of enquiry is that it aims to discover its own weaknesses and rectify what is at fault in its own procedures. Enquiry then, is self-correcting. Operation of this definition within the field of Physiotherapy has extreme relevance because of the application of relevant knowledge and its concomitant criteria to practise extreme sensitivity to the uniqueness of each situation. Evaluation and monitoring of clinical reasoning at each step of the process as it

unfolds, allows self-correction and will give the individual a heightened awareness of the kinds of claims they are making and the justification needed for them (Kopelman, 1995; Scott et al, 1994).

The evaluation of thinking by appeal to criteria implies metacognition (Kuhn, 1999). Kuhn (1999) describes critical thinking as metacognitive competence. These are second order meta-knowing skills that entail knowing about one's knowing. It has to do with awareness, understanding and management of one's cognition. Three categories of meta-knowing are described – metastrategic, metacognitive, and epistemological. Metastrategic knowing selects and monitors the strategies that are applied to procedural knowing (knowing how). Metacognitive knowing operates on one's base of declarative knowledge – What do I know, and how do I know it? Epistemological knowing has to do with an individual's broader understanding of knowledge. It has a general philosophical aspect – How does one know? and a personal aspect – What do I know about my knowing?

All three kinds of meta-knowing are central to critical thinking. Studies on two kinds of cognitive skills viz. analysis and argument invoke metastrategic skill in selection and monitoring of strategies, whilst co-ordinating theories and evidence requires metacognitive skill in justifying knowledge claims. Epistemological knowing allows for co-ordination of the subjective and objective components of knowing (Kuhn, 1999). This has extreme relevance to the development of critical thinking within the context of clinical reasoning and decision making in Physiotherapy which is reliant on justification for claims to ensure good judgement.

Effective clinical reasoning depends on both the process of the reasoning and the end product to effect a decision. This has important implications if one considers the study undertaken by Jones (1992) who suggested that students may go through the correct motions of an examination or treatment with surprisingly incorrect reasoning. Direct observation of the student in the practise setting will not reveal this, however, if a student were to verbalise his ongoing thoughts the incorrect reasoning would be apparent. Taking this into consideration, the researcher was drawn to the model of reasoning skills proposed by Quellmalz in Baron & Sternberg (1987). The model proposed merged the critical thinking skills model of Philosophy, which is process oriented, and the problem-solving strategies of Psychology, which is product oriented.

The core thinking and reasoning skills that are common to the two disciplines were identified. The probable dominant cognitive process for the concomitant skill is also outlined.

**Comparison of reasoning skills Proposed in Psychology and Philosophy**

(Quellmalz in Baron & Sternberg, 1987)

Critical Thinking Skills (Philosophy)	Problem-solving Strategies (Psychology)	Probable Dominant Cognitive Processes (Psychological)
Clarification: Identify or formulate a question Analyse major components Define important terms	Identify the problem Identify essential elements and terms	Analogical Analysis and comparison
Judge credibility of support, the source, and observations	Identify appropriate information, content, and procedural schemata	Analogical Analysis and comparison; Component evaluation
Inference Deduction Induction Value Judgements Fallacies	Connect and use Information to solve the problem	Infer/interpret relationships among components
Use criteria to judge adequacy of solution	Evaluate success of the solution	Evaluate effectiveness of specific and general strategies

Arising from this model, Quellmalz (1987) devised a skills framework that would generalise across academic and practical areas. Quellmalz(1987) proposes that the goal of higher order thinking is for students to engage in purposeful, extended lines of thought in which they use problem-solving strategies and become skillful in monitoring, evaluating and improving those strategies.

Strategies

Students engage in purposeful, extended lines of thought where they:

- Identify the task (or type of problem)
- Define and clarify essential elements and terms
- Gather, judge, and connect relevant information
- Evaluate the adequacy of information and procedures for drawing conclusions and /or solving problems
- In addition, students will become self-conscious about their thinking and develop their self-monitoring problem-solving strategies.

Processes

Cognitive	Metacognitive
Analysis	Planning
Comparision	Monitoring
Inference/Interpretation	Reviewing/Revising
Evaluation	

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The problem solving approach outlines the steps involved in the thinking process but it is not concerned with the criteria for making judgements i.e. whether the result of the thinking process is adequate. There is a lack of critical thinking appeal if the problem solving approach is used in isolation. The approach may allow the clinician to arrive at several hypotheses or plans for action but it requires the mobilisation of processes for advanced clarification i.e. metacognitive, metastrategic and epistemological knowing for a judgement to be made. Monitoring of one’s problem-solving process abets high-road transfer across contexts (Perkins, 1987). This is a necessary skill in clinical decision making.

The proposed framework of Higher Order Thinking Skills by Quellmalz (1987) has great applicability to the development of critical thinking and reasoning skills within the context of physiotherapy. The inclusion of this framework within a model of clinical reasoning in physiotherapy will allow students to monitor their thinking by appeal to criteria for justification of claims. This framework will equip students with the conceptual tools to help them reflect on their actions and experiences and extend

their thinking through critical appraisal to enable multiple points of view and advanced clarification in relation to criteria. Criteria are the reasons we invoke or appeal to in the course of rational thought. They serve as mechanisms for self-correction and are sensitive to context. Lipman (1991) has outlined a list of criteria which physiotherapists may find useful to use in conjunction with the skills framework proposed by Quellmalz(1987) to facilitate a judgement in the process of clinical reasoning in Physiotherapy. The criteria that would apply with special reference to the problem being posed are:

- ❖ Relevance
- ❖ Reliability
- ❖ Common bases of comparison
- ❖ Requirements
- ❖ Perspectives
- ❖ Principles
- ❖ Rules
- ❖ Standards
- ❖ Definitions
- ❖ Facts
- ❖ Test results
- ❖ Purposes

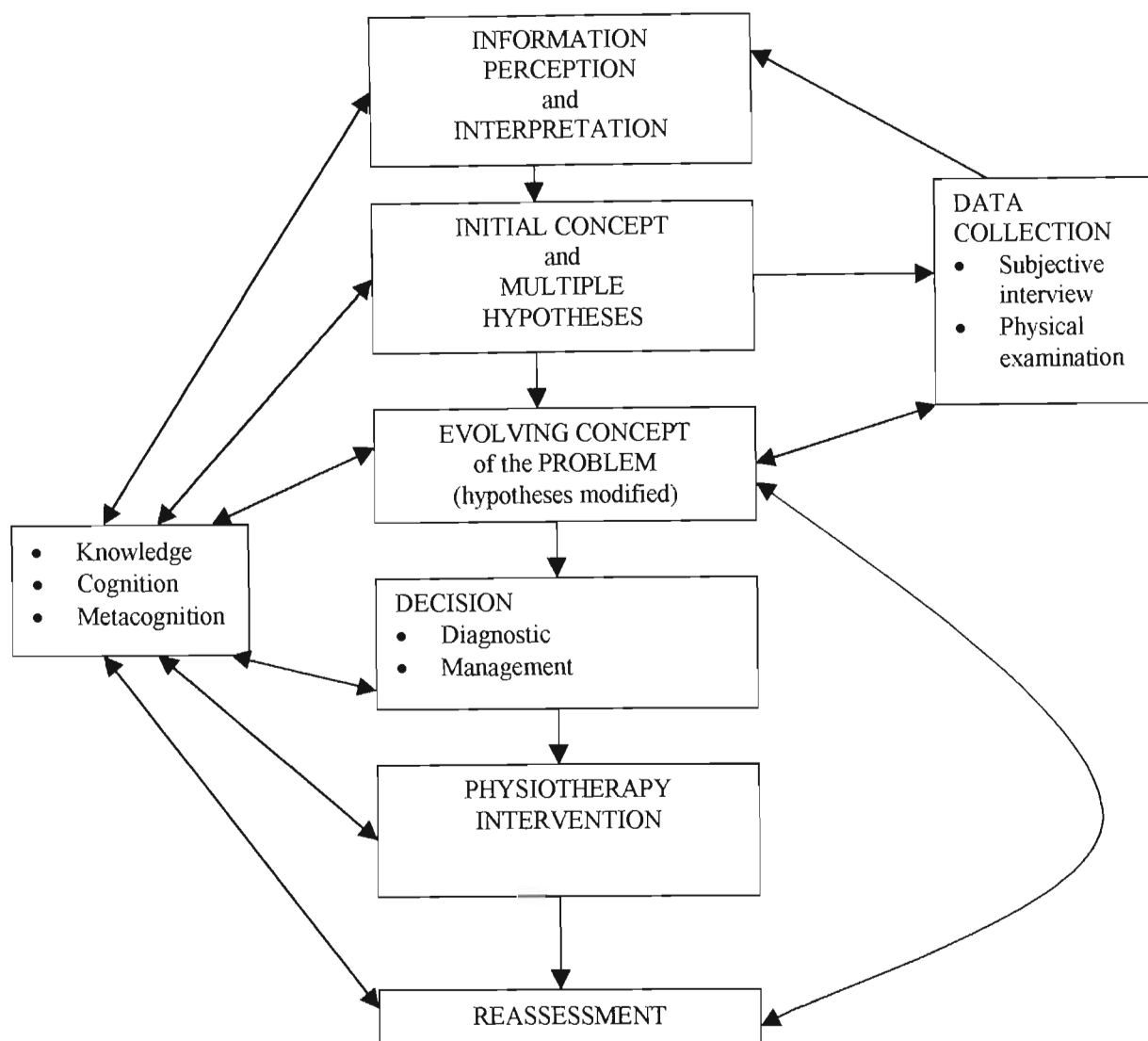
Critical thinking entails the disposition, as well as the skill, to think well. Therefore student attitude and orientation towards critical thinking are important. Ennis (1987) and Perkins et al (1983) identifies these, claiming that people should have a positive disposition as an important criterion for critical thinking. This is a significant exclusion from the list above.

### **The clinical reasoning process and critical thinking skills**

The framework of reasoning skills proposed by Quellmalz(1987) together with the criteria outlined by Lipman(1991) should merge with the model for clinical reasoning in Physiotherapy proposed by Jones(1992). This model is based on the Hypothetico-Deductive Theory of clinical reasoning, cited as the dominant model for clinical reasoning in medicine and physiotherapy. The model illustrates the great influence that the clinician's knowledge, cognition and metacognition has on the process of clinical reasoning at each step. It is unclear if "metacognition" referred to in the model alludes to just one of the three processes of metaknowing described by Kuhn(1999) or if it refers to the composite higher order thinking processes of reflection and critical thinking. Ideally, the latter explanation should apply.

## CLINICAL REASONING PROCESS (Jones, 1992)

(adapted from Barrows and Tamblyn, 1980)



A challenge to the hypothetico-deductive theory is the theory of **pattern recognition** which is based on the notion that the knowledge underlying clinical reasoning is stored in memory in the form of “if.....then....” production rules (Greeno & Simon, 1986). It requires the inductive process of forward reasoning which is fast, efficient and dependent on a good knowledge base in the particular area of practice (Arocha et al, 1993). Whether hypothesis testing (i.e. backward reasoning) or pattern recognition (i.e. forward reasoning) is used will depend in part on the clinician’s level of practical experience, knowledge and method of education as well as the nature of the clinical task itself (Arocha et al, 1993). Another factor that influences decision making, is the manner in which knowledge is organised for easy retrieval. This is consistent with the



clinical reasoning process of qualified physiotherapists that was assessed in a workshop for the purposes of this study.

### **The nature of physiotherapy professional knowledge**

McPeck(1990) whose definition of critical thinking was cited earlier, emphasised the importance of knowledge in the development of one's critical thinking ability. The process of clinical reasoning and the skills to develop critical thinking within that process would be meaningless if the relevant knowledge base was absent. This was also alluded to by participants in the study.

- ❖ “Understanding is fostered by seeing the complete picture; there should be no gaps. Students need to see how the biomedical knowledge fits into the picture.”
- ❖ “Students need time to reflect, to read more to broaden your horizons. This makes one a better critical thinker because of the greater knowledge base.”
- ❖ “We [teachers of physiotherapy] need to be selective about content. We should keep content basic and teach them how to use this knowledge.”

The knowledge base of a profession delineates the nature of professional expertise and, the way in which people use the knowledge they acquire, maps the development of professional practice. An understanding of professional knowledge – its nature, how it is used and how it is acquired is central to the task of recognising and validating the different types of knowledge and modes of cognition that are integrated during professional practice. Eraut (1999) states that learning knowledge and using knowledge are not separate processes but the same process. The process of using knowledge transforms that knowledge so that it is no longer the same knowledge. The nature of knowledge depends on how knowledge is used or transformed to be situationally appropriate. During this transformation new learning takes place and perhaps new knowledge is created.

**Knowledge** has several attributes. It is seen as a dynamic phenomenon, undergoing constant changes and testing in the search for congruency amongst conflicts in an attempt to understand and give meaning. Heightened awareness of the individual is

gained through the testing of required or self-generated understanding. Knowledge holds no absolute truth; events are meaningful in relation to the ways they are construed by the individual. However, traditional higher education pursued the view of disciplined, codified, propositional knowledge as the base for professional knowledge negating personal knowledge, tacit knowledge, and process knowledge. Schön (1983) calls this the dominant “technical rationality” model of professional knowledge.

Eraut (1999) has distinguished different types of knowledge that constitute professional knowledge. The role of each within a professional knowledge framework is also described:

- ❖ **Propositional knowledge** refers to discipline based theories and concepts, generalisations and practical principles in the applied field of professional action. This is the knowledge base used for the construction of syllabi. This knowledge may be used in one of four modes – replication, application, interpretation or association.
  
- ❖ **Impressions, Personal Knowledge and the Interpretation of Experience** – Our lives are embedded in a continuous flow of experiences. Discrete experiences are distinguished from this flow and become meaningful when they are accorded attention and reflected upon. The ‘act of attention’ brings experiences, which would otherwise simply be lived through, into the area of conscious thought. Personal knowledge that has been accorded little attention is referred to as ‘**impressions**’. The professional person’s stock of knowledge will owe a great deal to propositional knowledge in its codified, public form together with knowledge gained from experiences, which have no educational purpose. Young professionals in possession of relevant knowledge need to develop greater awareness of how it is used and examine the underlying assumptions. They possess impressions, which can contribute to their professional knowledge base, but these need further organising and processing. They need to become aware of how to use experiential learning to supplement their knowledge base as more deliberately gathered information.

The element of reflection is introduced so that higher-order learning can occur, even from the level of impressions.

❖ **Process Knowledge** – is knowing how to conduct the various processes that contribute to professional action. This includes knowing how to access and make good use of propositional knowledge. Eraut (1999) has identified five kinds of process important to process knowledge:

1. The acquisition of information requires at least four types of knowledge

- an existing knowledge base in the area concerned
- some kind of conceptual framework to guide one's inquiry
- skills in collecting information; and
- skills in interpreting information

Interpretation is a particularly important aspect of information acquisition, with deliberative interpretation being the most cognitively demanding.

2. Deliberative processes such as planning, problem-solving, analysing, evaluating and decision-making lie at the heart of professional work. These require the more cognitively demanding activities of deliberative interpretation and analysis, for which one needs to be able to draw upon a wide repertoire of potentially relevant theories and ideas. This process requires a combination of propositional knowledge, situational knowledge and professional judgement.

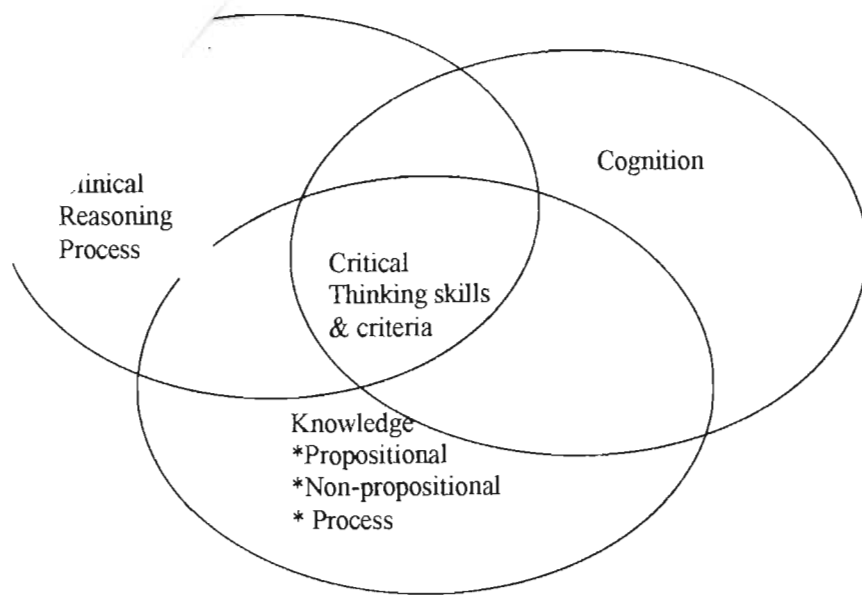
3. Metaprocesses describe the thinking involved in directing one's own behaviour. This involves the evaluation of what one is doing and thinking, the continuing redefinition of priorities, and the critical adjustment of cognitive frameworks and assumptions. Its central features are self-knowledge and self-management for judging the importance and significance of one's actions.

4. Skilled behaviour is complex action which becomes routine through practice and is accompanied by a diminution of self-consciousness. Hence, it becomes tacit knowledge.

5. Giving information is a skill of good communication.

Each of the processes outlined above has relevance to Physiotherapy training, yet our focus as educators rests largely on imbuing our graduates with the skilled use of their hands. The method used to teach the skill involves initial demonstration by the supervisor, the student practices this under supervision and is given feed-back, the student then practices the skill without supervision. This method of instruction fosters the development of a routine approach to practice, which makes unlearning of the process difficult. It does not allow for deliberative decision-making, planning, problem solving, analysing, and evaluating. It uses procedural knowledge alone, which prevents the enhancement of higher order thinking ability.

Arising out of all the previous models, a more comprehensive or inclusive one can be developed. The researcher suggests integrating the framework of reasoning skills proposed by Quellmalz(1987) together with the criteria outlined by Lipman(1991), and with the model for clinical reasoning in Physiotherapy proposed by Jones(1992). The result is the following diagram which depicts the relationship one needs to develop amongst the components of knowledge, the process of clinical reasoning, one's cognitive ability and the skills of critical thinking in order to exercise good judgement. Each of these factors cannot operate exclusively, but as the diagram suggests, each is a part of a complex whole. The skill of thinking critically is instrumental for self-correction in each of the supporting sets that together determine judgements in the clinical area. Testing one's own reasoning for internal consistency, will develop intellectual self-reliance.



In summary, to arrive at a clinical decision, one requires monitoring of one's cognition as the clinician searches for and interprets diagnostic and non-diagnostic cues. This requires a highly advanced organization of propositional, non-propositional and process knowledge together with sound cognitive and critical thinking skills. Further, one should have a positive disposition towards critical thinking and deliberate reflection. In addition one should have the ability to transfer knowledge and skills across contexts and evaluate hypotheses and plans for action against criteria. These theories will be tested against the actual practice of qualified physiotherapists during the workshop.

### **3. Methodology**

A qualitative research strategy has been adopted for the purposes of this study. The qualitative paradigm is based on interpretation, holism and subjectivity. The qualitative research paradigm is interpretative in that qualitative researchers stress the socially constructed nature of reality, the intimate relationship between the researcher and what is being studied, and the situational constraints that shape inquiry.

Qualitative research uses a variety of methods of data collection, or triangulation, to secure an in-depth understanding of the phenomenon in question. The researchers seek answers to questions that stress how an experience is created and given meaning. Hence qualitative research implies an emphasis on processes and meanings that is more reflective of the world of practice. Therefore this research strategy is applicable to this study as the researcher aims to seek a deeper understanding of the processes involved in critical thinking and clinical decision making with a view to improving practice.

Holism is the assumption that the whole is greater than the sum of the parts, and that the context is essential for understanding meaning. The qualitative research process seeks to present a holistic, ethnographic approach to the phenomenon under investigation. Descriptions of total phenomena within their various contexts are constructed and the complex inter-relationships of causes and consequences that affect human behaviour toward, and belief about the phenomena, are generated. The combination of multiple methods, empirical materials, perspectives and observers add rigour, breadth and depth to the investigation by securing rich descriptions. The research methods used in this study viz. workshop participation, interviews and examination of course plans, combine to present a holistic, in depth perspective of the current reality of the phenomenon under study.

Objective reality cannot be captured by using the qualitative strategy. The strategies used to elicit the data, represent the worldview of the participants. To understand the complex processes that precipitate practice, it is necessary to obtain information that is relevant to various attitudinal and situational factors in the world of those being investigated. Therefore the ethnographic research strategy is empirical and

naturalistic. Methods such as participant observation and interviewing are used to acquire first hand, sensory accounts of phenomena as they occur in real world settings.

This study aims to discover what it means to be accomplished in critical thinking in the context of Physiotherapy and the component skills one needs to focus on to teach and develop critical thinking within the context of Physiotherapy clinical practice. The process has to begin with an examination of the current practise in order to assess its strengths and weaknesses, with a view to adopting the strengths and improving the weaknesses in the implementation of a new programme. A cyclical process of evaluation and implementation will chart the course of improving practice in keeping with the changing requirements of the students and the profession. Hence an action research process is a necessary strategy to meet such needs. Action research is based on the fundamental concepts of action learning, adult learning and holistic, dialectical thinking, and on the principles of experiential learning and critical thinking (Zuber-Skerritt, 1992). The four fundamental moments of action research are linked dynamically in a cycle: to plan, to act, to observe and to reflect. The main benefits of action research are the improvement of practise, the improvement of the understanding of practise by its practitioners, and the improvement of the situation in which the practise takes place.

### **Research design**

To understand the interpretation of critical thinking amongst the teachers of Physiotherapy, and recognising their assumptions and values that underpin their conclusions and practice, it is necessary to see the “world” through their eyes. This is supported by Jensen (1989) who states:

Physical therapy as a field of study contains phenomena, events, problems, people, and processes rich in resources for different types of inquiry. A broad array of quantitative and qualitative research methods will enable us to understand the complexity and richness of both the clinical and educational environments in physical therapy...



As was cited earlier, traditional higher education pursued the view of disciplined, codified, propositional knowledge as the base for professional knowledge negating personal knowledge, tacit knowledge, and process knowledge. This is referred to by Schön (1983) as the dominant “technical rationality” model which excludes knowledge gained from situations and phenomena necessary for professional practise. The domination of this paradigm in physiotherapy has been challenged due to its inability to enhance the practitioner’s depth of understanding of the perspectives of the key actor, the wholeness of human experiences and the interaction between these experiences and the context in which they occur. Physiotherapy is not a technical profession. Therefore, we need to question the tools we employ as to how and why we use them. Hence an interpretative, holistic approach is sought through a qualitative research approach.

The motivation to discover and understand the nature of practice is intrinsic to the researcher and this is achieved through an action research process. It is through the process of collaborative action research that participants engage in a form of reflective self-enquiry to improve the rationality and justice of their own practices, their understanding of these practices and the situations in which these practices are carried out (Carr & Kemmis cited in Tesch, 1990). This study represents the first cycle in the ongoing action research cycle. The actual data in the study were at an experiential level, revolving around the self-awareness, self-perceptions and self-conceptions of the teachers of physiotherapy in their current practice.

### **Sources of Data**

#### **Ethical considerations**

Official permission to undertake the study was gained from the academic registrar and the head of department of physiotherapy at the institution. This was for the purpose of gaining access to and acceptance from the institution and to allay tensions around the anonymity of the institution and the research participants. Informed consent was sought from the three level course co-ordinators for freedom to use relevant



information that served as data for the study. Confidentiality was maintained by deletion of identifiers within the study.

To operationalize the study, the triangulation strategy of Denzin & Lincoln (1998) was incorporated into the research design. The triangulation strategy should embrace multiple sources of data, multiple perspectives and multiple methods. The rationale for this is that data triangulation and methodological triangulation combine different methods in order to produce more meaningful results than can be achieved by any single method alone. This rests on the assumption that all methods of data collection have strengths and weaknesses and the weakness in each method is counterbalanced by its strengths, or by using several methods.

Sources of data to describe the perspective of critical thinking in Physiotherapy included:

1. The template document and course plans
2. A semi-structured interview with the three level co-ordinators in Physiotherapy
3. A workshop on “Critical thinking and clinical decision making in Physiotherapy”

The reflective nature of the interviews and interaction in the workshop served as a vehicle for soliciting in-depth data on participants’ awareness, perceptions and conceptions of critical thinking in the practice of teaching Physiotherapy. The course plans and interviews represent the formal and recorded statements of intention.

### **Template and course plans**

The template document for submission of programmes (August 1999) and the course plans for levels 2, 3 and 4 for the 2000 academic year were examined for articulation between objectives and outcomes, and teaching, and assessment strategies. An examination for the inclusion of strategies to develop the skills of critical thinking at each level was also undertaken.

## Interviews

A tape-recorded semi-structured interview was conducted with three course co-ordinators for levels 2, 3, and 4. Participants were asked for their consent to be tape-recorded as the information derived from the interviews was to be used as data for the study. The reason behind selecting the course co-ordinators as the interviewees is because it is incumbent upon the course co-ordinators to articulate the expected clinical and academic outcomes per level of study. Further, it is the responsibility of the co-ordinator to examine the academic and clinical programme for synergy between the expected outcomes and objectives and to assess the academic programme to establish if it informs the requirements of the clinical programme appropriately. The development of the programme and amendments at each level, consistent with the desired outcomes, is the responsibility of the co-ordinator.

The active nature of the interview in this study was based on the work of Holstein and Gubrium in Silverman (1997). Active interviewing is a dynamic form of interpretative practice. The focus is on how meaning is constructed, the circumstances of construction and the meaningful linkages that are made between the respondent and the interviewer. In this study the content of the answers produced was in collaboration with an active interviewer. The questions were structured to test the problems relating to curriculum design and critical thinking ability in the clinical areas. The questions were derived from the formulation of the research problems that were outlined earlier. The topics provided a structure for later analysis and interpretation. Although free narration by the interviewees is encouraged in this method, such narration must be guided if the interviews and the data that are collected are to contribute to the research objectives. The researcher was alert to the meanings of the information given and consequently posed questions to clarify these meanings.

After replaying of the recording, transcripts of the interviews were drawn up noting the responses of the interviewees in full. On studying and comparing the transcripts, concepts, ideas and patterns were recorded as they became apparent. This provided the first step to the development of categories and emergent analysis based on the work of Tesch(1990). The emerging data was used to help structure the workshop.

The template, course plans and interviews give information for identifying what is taught and how, and to assess for current gaps in the curriculum and teaching. The participants of the workshop were to model the actual process of clinical reasoning that practitioners go through. An assessment of this process is necessary to provide a base for developing a particular model of clinical reasoning and critical thinking for physiotherapy. The researcher is unaware of the existence of any other such specific model for physiotherapy.

## **Workshop**

A workshop was conducted amongst 25 teachers and clinical educators involved in the teaching and supervision of clinical practise in Physiotherapy at the institution. The rationale for the workshop was based on the diversity of interpretations related to what critical thinking is and the component skills that would make one accomplished in critical thinking within the context of clinical reasoning in Physiotherapy. The workshop was based on analysis of the reasoning skills of qualified physiotherapists in determining the diagnosis of a patient presented in the form of a paper case. The participants in the workshop were arranged in groups of four. Each participant within the group was assigned a task that was related to the clinical problem. The data was derived from written transcripts of responses to the tasks.

The repertoire of reasoning skills displayed by the experts, and their sequencing and logic for the choices made, were analysed with a view to creating a framework of reasoning skills that could be used by students in their clinical practice. This is supported by Jones (1997) who advocated that students can develop their reasoning skills by practising the reasoning strategies used by physiotherapists.

The participants were given the following paper case.

*Three weeks ago a 40year old accountant was on his way to the flea-market, when he was struck down by a 4x4 vehicle whilst crossing the street. He was bumped on his back by the bull-bars of the vehicle. He was thrown up into the air and subsequently landed on the ground, lying on his right side. He was helped up onto his feet and noticed that he had sustained a twisted right ankle, grazed right upper limb, a bleeding right knee and lacerations in the small of his back. Nevertheless, he felt well enough to go shopping after he tidied himself up. The next day he felt no pain but he noticed that he walked awkwardly. On day 3 following the MVA, the patient was unable to get out of bed that morning due to extreme pain on the left side of his back, and radiating into the groin – “felt like a girdle on the hip”. Over the next few days the pain progressed down the posterior aspect of the left lower limb into the calf. He now presented with increasing difficulty in getting out of bed in the mornings, walking, sitting on the toilet/chair.*

*Orthopaedic consult : X-rays NAD*

*Diagnosis – muscular pain. Requires Physiotherapy*

*Medication – Myprodol 4-6/day*

*A week later, the patient bent to wash his face when he felt extreme pain in his back and numbness in the left lower limb. He fell to the ground and any movement produced pain in his back, especially on the left side. He was unable to flex the lower limbs. The patient was admitted to hospital for traction and was given Voltaren injections twice a day. He remained in hospital for a week. The acute pain in the back and numbness in the left lower limb abated, and was replaced by a dull ache.*

Within each group, **Participant A** was required to model the clinical reasoning and critical thinking skills used by an experienced physiotherapist to arrive at a diagnosis. The participant was asked to “think aloud” while solving the clinical problem. Further, the participant was asked to describe his/her reasoning process whilst interpreting the clinical data. This is based on the information-processing approach where the person processing the information is to define precisely the processes and states that a particular subject is using to solve a particular problem. Methodologically, this approach relies on direct observation of behaviour combined with introspective reports to determine the thought processes used to solve a problem.

The introspection may be obtained by having the problem solver think aloud while solving the problem or by video-taping the problem-solving session. In this study, both methods were employed during the problem solving session. Verbatim transcripts of the session served as the source of data for analysis of the clinical problem.

**Participant B** was to interrogate the process outlined by A. This was to clarify the process of reasoning of A; similar to testing one's own reasoning for internal consistency.

**Participant C** was to comment on the cognitive processes and critical thinking skills that A and B employed to effect a diagnosis. The participant was involved in examining the process of clinical reasoning and abstracting the relevant information from it. By engaging in this process, it allayed the notion of researcher subjectivity which may have arisen if the researcher had been involved solely in the abstraction. The researcher did however check the abstractions of participant C.

**Participant D** was to determine methods for implementation of teaching of the clinical reasoning process displayed by A and B.

A representative chosen from each group presented the findings to the larger audience. This was followed by a facilitated discussion that involved the entire group. The purpose of the discussion was to interpret findings and get consensus on the clinical reasoning process and the component skills of critical thinking used in the process, from the rest of the group. The researcher was a participant-observer in the process. The researcher endeavoured to share her meaning and interpretations of the observed phenomena with the people concerned in the research, inviting their views and criticism, and negotiating a consensus of meaning. The researcher engaged in a 'learning conversation' with the participants in the research by facilitating the construction of meaning from emerging insights and theories.

The workshop presented a useful method to brainstorm the methods of clinical reasoning employed by physiotherapists, who presented varying levels of experience and diverse areas of expertise from within the profession. This added to the depth and

richness of the data as it exemplified the diversity of thinking that lies behind one's ability to reason clinically and to make decisions. Further, presentation of such diversity allowed teachers to examine their own teaching methods and styles, with an eye to incorporating these insights into their teaching. Also this could enhance their interpretations of clinical reasoning that students manifest. The different perspectives that were provided by the academic staff and the clinical educators also shed more light on the issues under discussion.

Whereas most participants lauded the merits of such as exercise, a few participants felt that their knowledge and skills were being put to a test and their shortcomings were exposed. A negative disposition of this nature may stifle the fluidity of thought necessary for the problem solving exercise. One needs to be cognisant of this sensitive issue when selecting participants from different spheres and levels of expertise.

## **4. Findings**

The aim of qualitative studies is to ultimately describe and explain (at some level) a pattern of relationships, which can be done only with a set of conceptually specified analytic categories. The categories may arise inductively or deductively from the data when one embarks on an interpretative analysis of the data to extract meaning.

### **Analysis of the data**

An analysis of the data was made on the basis of selected “tactics” for generating meaning (Miles and Huberman in Denzin & Lincoln, 1994). These included noting patterns and themes, seeing plausibility, and clustering which helped the researcher to see the initial connections. This led to particulars being subsumed into the general, shuttling back and forth between first –level data, ( i.e. data arising from documentary analysis and interview data) and more general categories, noting relations between variables and finding intervening variables. Finally, a coherent understanding of a data set was formed by building a logical chain of evidence and making conceptual coherence through comparison with the referent constructs in the literature. This was done in conjunction with the qualitative analysis strategy presented by Tesch (1990) which encompasses the three core steps of qualitative analysis methods: developing an organizing system, segmenting the data, and making connections.

The analysis was undertaken in three parts viz:

- ❖ Documentary analysis of the template document and the course plans for levels 2, 3, and 4.
- ❖ Analysis of the interview data
- ❖ Analysis of the workshop findings

The data was analysed using the models for critical thinking ability and clinical reasoning in physiotherapy that were discussed in the conceptual chapter. This provided a context for data analysis, and facilitated interpretation and meaning.

**(i) Analysis of the template document and course plans**

An assessment of the course plans for levels 2-4 and the template document revealed no explicit evidence of critical thinking skills for clinical reasoning being taught at any level of study. Confirmatory evidence in this regard was provided by the co-ordinators, as has been indicated earlier (chapter 1). However, selected objectives outlined in the clinical programme for the third level make explicit reference to the requirement of critical thinking viz:

- ❖ Integrate and apply theoretical knowledge intelligently in the clinical situation.
- ❖ Extract the relevant facts from the patient's medical records and interpret pertinent special investigations accurately.
- ❖ Evaluate a patient comprehensively.

This is also evident in the departmental exit level outcomes with respect to clinical decision making viz:

- ❖ To demonstrate a holistic, problem solving approach in selectively applying diagnostic and treatment techniques and modalities with an understanding of its physiological, anatomical and psychosocial basis to individuals and groups of patients in a caring manner.
- ❖ To critically evaluate and monitor the effectiveness of own and other relevant interventions against expected outcomes in order to modify, grade, continue or terminate interventions.
- ❖ To keep up to date with scientific findings in the field and apply them in practise.

These outcomes and objectives demonstrate how critical thinking is understood within the profession, and will contribute to the model that the researcher is to develop. In the course plan there is however, no outline of appropriate teaching strategies that could be used to facilitate the stated outcomes above. Within the clinical block, one of the teaching and assessment strategies commonly used is the presentation by students of part or whole of their recorded assessment and treatment of patients to the clinical



educator on an individual basis. Similar presentations are also made to the rest of the student group. In this way, individual and peer assessment can be undertaken as a mechanism for formative evaluation, before the summative evaluation at the end of the block is performed. In my experience, the process involves the clinical educator commenting on the performance and choice of the physical skill with respect to the patient's condition, followed by a corrective demonstration by the clinical educator if necessary. Comments on the performance and the reasons for the choice of the skill are also elicited from the rest of the student group. While performance of tasks is directly observable, abilities that underlie the performance are necessarily inferred. This means that assessment of competence will inevitably be based on inference from a sample of performance. Hence the need to incorporate an assessment of attributes viz. skills in clinical decision making, the critical thinking skills that underlie these skills, affective attributes, etc. alongside the assessment of the practical task.

Some clinical educators also incorporate case presentations as a teaching strategy into their clinical education programme. Students are encouraged to present a holistic approach to the patient, integrating the relevant biomedical knowledge into the assessment and treatment plan for the patient. However, this is not a formalised teaching strategy throughout, with some clinical educators implementing it and others not.

In examining the form used to evaluate a student's ability to perform an assessment on an unseen patient, one may not find sufficient criteria listed for assessing the process of clinical reasoning and decision making used by the student (Refer to Appendix A). Broad categories for assessment that are currently used are indicated as listed below. These imply that a student is deemed competent in assessment if the following components are satisfactorily completed.

- ❖ **History** – abstracting information from case notes, X-ray reports, laboratory reports and other relevant sources.
  - ability to obtain further information from patient particularly as it pertains to physiotherapy
  - interpretation of information
- ❖ **Interpersonal relationship**

- ❖ Assessment – choice of technique/procedure
  - quality of performance
  - documentation
- ❖ Identification of problems
- ❖ Aims/goals of treatment – short term
  - long term
- ❖ Outline of treatment plan

Effective clinical reasoning depends on both the process of reasoning and the end product to effect a decision. The researcher draws the reader's attention to the earlier citation of Jones(1992), who claimed that students may go through the correct motions of an examination or treatment with incorrect reasoning. Assessing students' ongoing thoughts can rectify this situation. In the light of this claim, the assessment form above awards very little attention to process knowledge or the criteria one could use to make a judgement on the quality of clinical reasoning and critical thinking ability that the student displays. This is further highlighted in the form that evaluates the student's performance on treatment of the assessed patient. A major portion of the marks is allocated to the performance of the physical skill with little attention awarded to the thinking that underlies that ability (Refer to Appendix B). Again, the assessment of critical thinking and clinical reasoning is implicit and there exists no guidelines for students or clinical educators to chart the progress and development of this ability.

Hence the evaluation of a student's skill of patient assessment is product based and explicit. On the other hand, assessment of process knowledge is implicit without any element of formalisation with regard to the development of specific competencies. This contributes to an assessment bias because of inconsistencies amongst clinical educators in assessment practise. Another important implication of this practise, is that if the skills in clinical reasoning and critical thinking are not sufficiently highlighted, it will necessarily emphasise the product as the ends of practise as opposed to the synergy between the product and the process. Although the outcomes and objectives draw attention to the development of critical thinking ability, there is very little follow through with teaching and assessment strategies that could enhance that ability. There is some attempt to assess critical thinking attributes on the form

that charts the continuous assessment of the student through the clinical block (Refer to Appendix C). However, it is a very small contribution and draws the evaluator's attention more to the critical thinking disposition of the student rather than the ability itself. It is therefore evident that the situation requires revision or else the exit level outcomes stipulated by the department and the critical cross-field outcomes of SAQA will not be achieved. Hence the broader goal of higher education will not be realised.

## **(ii) Analysis of Interview Data**

The interviewees were asked to comment on the expected departmental outcomes for students in the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> levels of study. The emerging strengths and weaknesses of students, in relation to critical thinking and clinical reasoning, within the clinical setting were juxtaposed against the expected departmental outcomes for students at the different levels. The expected learning outcomes at second and third year levels were designed with a view to the achievement of the exit level outcomes at fourth year level. The outcomes at 2<sup>nd</sup> and 3<sup>rd</sup> year levels are based on assessment techniques and skill acquisition, where the students are guided through the skill of patient assessment at 2<sup>nd</sup> year to performing an independent assessment and treatment plan for patients at 3<sup>rd</sup> year. At fourth year level, the student is expected to arrive at a diagnosis by incorporating a holistic approach to patient assessment.

A common weakness identified across the levels was the varying degree of ability amongst students to identify, analyse and solve problems within the clinical context.

- ❖ “Students can't see the whole picture, it is disjointed. They can't make a decision; they can't problem solve”
- ❖ “.....they find difficulty in identifying problems, analysing problems, to think broadly. They ask questions that are routine, recipe like; not pertinent to the patient.”
- ❖ “Students have critical thinking skills but they do not know what to do with it. They do not know how to bring this together in the clinicals [clinical education]. They tend to shy away from difficult patients because they lack confidence.”

An analysis of the foregoing data suggests that students are not seen as employing an analytical, reflective approach to enable judgement. Further, it suggests that students are not monitoring and evaluating the steps in their process of clinical reasoning appropriately. In addition, they may be unaware of how to integrate their knowledge in order to identify, analyse and solve problems. It may also be the result of poor monitoring of the steps in the process of problem-solving that prevents transfer of knowledge across fields (Perkins, 1987). This would suggest that the three categories of meta-knowing described by Kuhn (1999) need to be facilitated and developed to enhance the awareness, understanding and management of one's cognition in relation to clinical reasoning and decision making.

A further point needs to be considered. The interviewees have alluded to the lack of formalised teaching of clinical reasoning skills in the curriculum. Whereas at one level the clinical reasoning skills were incorporated into the clinical education programme, at the other two levels there was a distinct absence of clinical reasoning skills. Here the emphasis lay more on the physical handling skills of physiotherapy.

- ❖ “The current syllabus does not allow for this. We are trying to teach the skill not the thinking.”
- ❖ “It is incorporated into the clinicals [clinical education] but it is not specific in the curriculum.”

This is consistent with the findings that emerged following the examination of the course plans. There was little evidence to be found for articulation with the course objectives, and the teaching and assessment strategies to realise the outcomes. This may be a factor that should be considered if one is to explore reasons for poor or under developed ability in clinical reasoning and critical thinking amongst students during clinical practise.

In order to teach well and to help students develop the skills and positive disposition towards critical thinking it is imperative that teachers develop an understanding of critical thinking and its integration in the context of Physiotherapy. With this in mind, the researcher posed the following question to the interviewees that yielded a plethora of responses.

“Critical thinking underlies clinical reasoning. What does this mean to you?” A commonality amongst the responses was that critical thinking equated to problem solving. It was also seen as one’s ability to use knowledge and skills with a questioning mind.

- ❖ “To problem solve; see pros and cons. Prioritise in a situation and you have a reason for what you’re doing, you’re thinking logically.”
- ❖ “.....to ask ‘why?’, it is a logical sequence of thought, the thought process must make sense. It requires a lot of understanding and understanding is fostered by seeing the complete picture, no gaps; students need to see how the biomedical knowledge fits into the picture.”
- ❖ “It is a step pattern in problem solving to arrive at a judgement. One needs to go through a series of processes to analyse the problem by putting all the information together, then synthesise the information. Information should have meaning for the student; if not there is no problem solving.”

The responses highlighted both the critical thinking ability and the critical thinking disposition which is supported by the literature as being a necessary complement to develop a critical thinker. No one definition provided a complete understanding of the concept, indicating the complex nature of critical thinking itself. Much of what has been theorised about in the preceding discussion was actually seen in the workshop when the physiotherapists modelled the clinical reasoning process in response to the paper case presented.

The skills of critical thinking and the critical thinking disposition that students should be in possession of to be proficient in the clinical area were also outlined by the interviewees.

- ❖ Be able to transfer and apply knowledge
- ❖ Be able to synthesise information and thoughts to extract meaning
- ❖ Need to have an open mind, not dogmatic in one’s thinking
- ❖ Need to understand that the process of learning is inherent with mistakes and one needs to develop the skill of self-correction

- ❖ Need to be critical of oneself, to know one's strengths, weaknesses and limitations
- ❖ Of equal importance to being in possession of critical thinking skills, is knowing how to use them
- ❖ Find the cause of the problem and then solve it.

These abilities were exhibited and also articulated by the participants who modelled and interrogated the clinical reasoning process that was used to solve the paper case at the workshop eg. integration of anatomy and biomedical knowledge to see the complete picture, presentation of multiple hypotheses, analysis of the problem. The participants identified the following necessary dispositions to clinical problem solving:

- ❖ "Need to have an open mind and accept that two or more conditions can exist at the same time."
- ❖ "One should look at a problem holistically."

The interviewees were asked to describe how they assessed for the skills that were outlined. One co-ordinator stated that there was lack of assessment of the thinking behind the physical technique, "there is assessment of technique, not the thinking behind the technique". However, the other responses included:

- ❖ "Identify how they analyse the problem, examine the treatment plan to see if it is correct for the patient, identify problems by questioning and probing."
- ❖ "During the assessment of a patient, I ask them: 'Why are you doing so and so?'"

There is evidence during the assessment of elements of problem solving and the monitoring of cognition. However, it is incomplete in its depth for extracting relevant information and it is not a formalised practise. The assessment form that is used to evaluate the student's competence in the clinical area does not make explicit reference to the assessment of clinical reasoning ability. This could be the reason why there is such variability in the way it is evaluated, its implicit nature and the reason for it

assuming lesser significance than the assessment of physical skill. The evaluators are guided in their assessment by what is made explicit in the assessment form; in this case the proficiency of physical techniques (Refer to Appendix C).

An interesting criticism with regards to the current assessment practise is that there is a grave mismatch with the type of assessment that is conducted in our classrooms compared with that which is expected of our students in the clinical area, as stipulated by the outcomes. The assessment of practical skill in the classroom is based on the method of objectively structured practical examinations (OSPE). The student is tested on an isolated skill with no reference to context. It is purely a test of technique. This type of testing is atomistic compared with the holistic approach to patient assessment which is required of the student in the clinical area. This does not promote transfer and association of knowledge and skill within a context of a problem, which students could mirror in the clinical area.

These shortcomings were acknowledged by the co-ordinators. They suggested strategies for inclusion of critical thinking and clinical reasoning into the teaching programme. These were:

- ❖ Facilitated bed side teaching
- ❖ Patient presentations by staff
- ❖ Facilitated clinical practical laboratories where students are guided through the process of clinical reasoning with the aid of paper cases or real patients.

Similar teaching strategies were suggested by the participants at the workshop. These will be discussed later.

### **(iii) Analysis of workshop findings**

The findings of the workshop were divided into two parts

- a) The process of clinical reasoning and the concomitant use of critical thinking skills to solve the clinical problem

- b) Teaching and assessment strategies that could be used to promote clinical reasoning and critical thinking

The analysis of part (a) was done using the earlier model that merged clinical reasoning and critical thinking. An important component in the process was to establish the type of questioning that elicited the skill of critical thinking.

The first phase of the clinical reasoning process involved **information perception and interpretation** of data in relation to the relevant knowledge source in an attempt to extract meaning. Participants examined each line of the clinical problem for words that presented as cues so that a broad idea of what the problem was, could be determined. The process of identification of the initial concept and the formation of multiple hypotheses, began with the question “What am I looking for?” The initial impression that one arrived at from assessment of the cues i.e. “bumped on his back”, “extreme pain on the left side of his back”, “pain progressed down the posterior aspect of the left lower limb”, “any movement produced pain in his back”, suggested to the participants that the broad picture was one of injury to the back with the involvement of a nerve. More cues were identified and their underlying assumptions and meanings were uncovered to form the bigger picture. This started the process of analysis and comparison. The search for cues at this stage was related to the identification and analysis of any predisposing factors that may have contributed to the injuries the patient sustained in the accident. “Where do I search for predisposing factors?” This question elicited the following analysis:

- ❖ The patient was an accountant by profession. Therefore, his job entails sitting at a desk for most of the day (an inference).
- ❖ The sitting posture was analysed using support for claims from the knowledge of anatomy and biomechanics to arrive at a further assumption, that
- ❖ The sustained neck and trunk flexion immediately predisposes the patient to back problems because of its adverse effect on neural tension, together with a sustained increase in intradiscal pressure.

Assumptions arising from the paper case that related to the patient’s life-style, were also presented by the participants. This was in an attempt to assess the patient



holistically and to evaluate his life-style as a possible pre-disposing factor to the injury. As the patient was not available for clarification, and data related to this analysis was not available, these assumptions were debated but were not used to determine the final outcome. An important predisposing factor that was not given any attention by any of the participants was the age of the patient and the biomedical knowledge related to persons of this age with respect to back problems. In view of the assumptions uncovered, this might have been a more credible claim to support the findings that were developed further on. This was an observation of the researcher.

An analysis of the mechanism of injury and the resulting behaviour and nature of the signs and symptoms was undertaken to determine multiple hypotheses and subsequent clarification of the main problem. The analysis that emerged was probably in response to the question,

- ❖ “Of what significance is the mechanism of injury to the presenting signs and symptoms?”

Participants used the process of visualisation to explain how the mode of injury resulted in changes to the anatomical structures and biomechanics of the back. They also used this analysis to confirm the main focus of the problem i.e. the ankle injury and lacerations to the back are minor injuries; the major focus being the direct injury to the back. The following data emerged from the analysis, in response to the question, “what does this mean?”

- ❖ The patient was hit on his back by the bull-bars of the vehicle. This suggests that specific areas of the back were affected and one would have to consider that the pathology would not be confined to one specific vertebral level. The levels of injury would most likely follow the lines of the bull-bars. This is different to a person being knocked down by a car / bus where a broad area would be involved.
- ❖ The patient was thrown up into the air and subsequently landed on his right side. The analysis of this action was related to the changes in the patient’s anatomy and the resulting pain profile and neurological changes (“The patient landed on the right side. The resultant impact will cause a

shift of the vertebral structures and opening of the vertebral joints on the left side. Therefore, the presenting pain and neurological changes on the left lower limb.”)

Only one participant was able to draw the first conclusion that related to the impact from the bull-bars. However, neither she nor any of the other participants were able to relate this information to the two different sites of pain that the patient complained of. This deficit may be interpreted as an inability to associate knowledge in order to enable one to see the complete picture. Both analyses followed the pattern of inductive reasoning. Against this background, participants then used deductive reasoning to hypothesise about the structures most likely to be affected by the resulting impact (“ligamentous injury”, “fracture of the vertebrae”, “injury to the disc”, “injury to muscle tissue”). Following the formulation of multiple hypotheses related to the main focus of the problem, participants then used discrimination and support for each claim to arrive at **the main evolving hypothesis**. This allowed one to accept or refute claims in the light of emerging pros and cons. This process was probably in response to questions viz. “What is it like?”, “How does it compare with.....?” or “What distinguishes it from.....?”. The process is presented as follows:

- ❖ “It is not a fracture because there is no evidence on X-Ray findings.”
- ❖ “The patient may have a bulging disc with nerve involvement because the activities that would normally increase pain if an intervertebral disc is involved, was reported by the patient as being difficult eg. sitting on the toilet, pain on waking, pain on bending forwards. Also the patient presents with referred pain down his left lower limb, indicating impingement/pressure on a nerve root.”
- ❖ “Not in agreement with the diagnosis proffered by the orthopaedic surgeon.”

There is evidence of analysis of the major components in order to extract meaning and clarification of claims by using credible sources of information. Further, there is monitoring of the cognitive process and reviewing of the claims in relation to relevant criteria, before judgements are made. Relevant information is connected as the fuller picture begins to form.

However, further confirmatory tests of an objective nature need to be performed to support the subjective claims. This is probably in response to the question “How can I be certain?”. Analysis of the test results would serve the purpose of pattern recognition and to establish inconsistencies. The subjective history should correlate with the objective findings. Therefore, the selection of tests should be relevant to the hypothesis in order to determine if the results fit a pattern that is consistent with the initial hypothesis. Participants selected similar tests for confirmation of the hypothesis. Once all the data from the tests and history had been acquired, interpretation of the data followed to establish meaning to enable a **diagnosis**. Only two of the participants suggested scanty reasons for the selection of the tests and the type of responses that would have confirmed the hypothesis. There was evidence that some participants followed a systematic checklist without allowing for selective discrimination of tests for the particular problem. This suggests that there may be poor correlation of knowledge with use of the if....then reasoning process or the participants were unsure of the extent of the problem.

Different routes were taken by the participants to arrive at a diagnosis. In the one instance, the participants matched the signs and symptoms to the condition viz. “flexion is painful if the patient has a disc bulge or a prolapsed disc”. Another alternative that was presented was relating the anatomy and biomechanics of an activity to the pathology eg. “when in sitting, the nucleus of the disc moves posteriorly and exerts pressure on the nerve roots”. However, participants who used the relevant anatomy as evidence were not altogether precise and the exact relationship between the anatomy and pathology that would explain the nature and behaviour of the patient’s condition were not alluded to. This is in keeping with the remarks of Jones (1992). Participants who matched the signs and symptoms to the condition, did not offer the underlying anatomy to enhance clarification. This would have strengthened their claims by making meaningful associations.

Participants exhibited inductive and deductive reasoning, together with pattern recognition, to establish a diagnosis and a particular reasoning process did not dominate. There was evidence of each of these within a hypothetico-deductive model of clinical reasoning. This was confirmed by evidence of some of the participants who

were involved in interrogating the process of participant A. By questioning the choice of action or reasoning of A, a broader, clearer picture emerged. This suggests the need for internal questioning in order to monitor and evaluate one's reasoning and the importance of developing one's ability to question and evaluate one's reasoning to advance clarification.

#### **(b) Strategies for teaching critical thinking**

The participants agreed that it was necessary for educators of physiotherapy to teach students how to think analytically and for transfer. It was evident from the data arising out of the workshop, that the skill of analysis and transfer was used by the participants to make judgements. Teaching strategies that could be adopted for the purpose were suggested:

- ❖ The process of thinking through a clinical problem should be emphasised rather than placing all the importance on the end product
- ❖ Reasoning skills should be integrated into teaching at each level of the curriculum
- ❖ Students should be given case studies and paper cases with tutorials to guide the clinical reasoning process. These strategies were also cited as important techniques for assessment purposes
- ❖ Incorporate more sessions of facilitated bed side teaching into the programme
- ❖ Students should be responsible for wards of patients in the clinical areas as opposed to treating selected patients. In this way they will improve their skill of clinical reasoning when faced with unpredictable situations.

The teaching strategies that were suggested by the workshop participants mirrored those that were articulated by the co-ordinators.

## **Interpretation of Data Analysis**

Although the focus of the study was to determine what it meant to be accomplished in critical thinking and the skills one would focus on to develop critical thinking in physiotherapy, it was incumbent upon the qualitative researcher to develop a holistic picture of the current practise of critical thinking in physiotherapy. Further, it was necessary to determine what constituted the meanings and perceptions of the concept of critical thinking for the teachers of physiotherapy.

During the analysis of the data, definite patterns and categories emerged within each method of data collection and across the methods. Certain critical factors appeared which are important for evaluation viz:

- ❖ the implicit nature of teaching and assessing for critical thinking in physiotherapy
- ❖ the preponderance of the product over the process method for teaching and assessing
- ❖ the similarities and differences in perception and conception about the meaning of critical thinking and the associated skills
- ❖ use of critical thinking skills by the qualified physiotherapists to aid clinical reasoning.

It is a truism in education that assessment methods drive student learning. There is evidence for this in this study. Therefore teaching, learning and assessment should be integrated such that tasks on assessment are also learning activities.

The repertoire of critical thinking skills that have emerged as essential components to develop that ability seemed to focus largely on

- ❖ analysis for clarification
- ❖ association amongst components
- ❖ testing out assumptions
- ❖ discrimination
- ❖ induction

- ❖ synthesis of data
- ❖ comparison
- ❖ pattern recognition
- ❖ interpretation for understanding
- ❖ transfer of knowledge
- ❖ making value judgements

Choices were made and judgements were reached by appeal to relevant criteria viz.

- ❖ application of acceptable principles
- ❖ consideration of alternatives
- ❖ evaluation of differential diagnoses
- ❖ balancing and weighing data
- ❖ evaluation of results of objective tests
- ❖ relevance and perspective specific to the problem
- ❖ requirements based on patient's needs

These processes were initiated by relevant questioning to uncover justifications for one's actions, and to develop a process of logical and sequential thought such that meaning was generated. The basis of the questioning was to determine the following:

- ❖ What do I know?
- ❖ How do I know it?
- ❖ How does anybody know?

These are the questions that will develop one's process of meta-knowing that have been described by Kuhn(1999).

The **critical thinking dispositions** that have been articulated by participants in this study and which have featured significantly by the participants in the workshop are listed. These have been complemented by the list of critical thinking dispositions outlined by Ennis, in Baron and Sternberg, 1987.

- ❖ Be open-minded
- ❖ Take into account the total situation i.e. look at the problem holistically

- ❖ Seek a clear statement of the thesis or question
- ❖ Seek reasons
- ❖ Look for alternatives
- ❖ Take a position (and change a position) when the evidence and reasons are sufficient to do so
- ❖ Deal in an orderly manner with the parts of a complex whole
- ❖ Try to be well informed
- ❖ Use and mention credible sources
- ❖ Seek as much precision as the subject permits
- ❖ Be critical of oneself; know one's strengths, weaknesses and limitations
- ❖ Use one's critical thinking abilities

The organisation of knowledge into easily retrievable systems to inform the process of reasoning and logic, is an important factor to justify and extend our claims when making decisions and value judgements. This element of knowledge is an integral part of a complex to ensure the success of one's ability to think critically.

The clinical reasoning process that was modelled by the qualified physiotherapists, and their use of critical thinking skills, may be used as the basis to develop a framework for teaching and learning clinical reasoning and critical thinking within the context of Physiotherapy. An important inclusion within the framework are examples of questions that will elicit one's critical thinking ability. Arising from the data the researcher has developed the following framework of critical thinking skills that may be used to enhance the process of clinical reasoning.

## **A Proposed Framework of Critical Thinking Skills for Clinical Reasoning in Physiotherapy**

<b><i>CRITICAL THINKING SKILL</i></b>	<b><i>INTERNAL QUESTIONING (Adapted from Cox, 1996)</i></b>	<b><i>CLINICAL REASONING PROCESS (Jones, 1992 adapted from Barrows &amp; Tamblyn, 1980)</i></b>	<b><i>PROBABLE DOMINANT COGNITIVE PROCESS (Adapted from Quellmalz, 1987)</i></b>
Identify broad focus Identify cues related to focus Analysis & comparison	What am I looking for? How do I search? Where do I search? Predisposing factors	Information Perception and Interpretation	Analysis and Comparison
Discrimination / grouping of appropriate cues based on criteria	What is my main focus? What is my minor focus? How do I separate it from background?	Initial Concept And Multiple Hypotheses	Analysis and Comparison
Analyse and associate cues by uncovering assumptions	What is it like? How does it compare with....? What distinguishes it from....? What is it not?	Evolving Concept of Problem (hypotheses modified)	Evaluation Analysis and comparison Infer/interpret relationships among components
Clarify/confirm using findings from objective examination and investigations Synthesis of information from subjective and objective examination for pattern recognition Application of knowledge & clinical memory Reformulation of problem	Am I certain? If.....then reasoning Does it fit a pattern?  Any mismatch? If so,  Where else do I search? What else do I seek?	Process to Diagnostic Decision Making	Infer/interpret relationships among components  Analysis, evaluation
Interpret data for meaning  Judgement using induction, deduction, inference in relation to criteria	What does it mean? What is its significance?  What is my diagnosis?	Decision : • Diagnosis • Management	Analysis  Evaluation
Decision, Action	What shall I do?	Physiotherapy Intervention	Analysis
		Reassessment	Analysis and evaluation



## **5. Conclusion**

The conclusion of the study pertains to the component skills of critical thinking on which a teacher might focus to teach and assess for critical thinking within the context of Physiotherapy, and on the appropriateness of the methodology that was employed for this study.

### **1. Critical thinking skills**

A repertoire of critical thinking skills has been identified to assist clinical decision making in Physiotherapy. These include analysis for clarification, comparison, discrimination, evaluation, inference, synthesis of data, interpretation for understanding, transfer of knowledge, synthesis of data, association amongst components, pattern recognition, testing out assumptions and making value judgements. Each of these skills is assessed by appeal to criteria. Criteria are part of the apparatus of rationality. They allow one to reflect on the strengths and weaknesses during the process of clinical reasoning. Hence, enquiry is self-correcting; in that it aims to discover its own weaknesses and rectify what is at fault in its own procedures. It is the skill of questioning that uncovers the strengths and weaknesses of a judgement. The basis of the questioning is to determine the following:

- ❖ What do I know?
- ❖ How do I know it?
- ❖ How does anybody know?

This cognitive accountability (Lipman, 1991) is an accomplishment of thinking critically. Together with the skills for thinking critically one has to be endowed with a positive disposition for thinking critically. These are a necessary complement to each other.

The strategies for teaching and assessing critical thinking have to be made explicit. Teaching and assessment strategies should be more process focused by including and assessing for skills in reasoning within courses and in the clinical area. The start of

facilitated clinical practical laboratories as a strategy to mirror the process of clinical reasoning in the real world of patients should incorporate a diverse range of clinical conditions. This will promote transfer of knowledge through exposure to a variety of thinking frames related to the clinical conditions. Transfer of knowledge can be encouraged by explicitly promoting high-road transfer through emphasis on self-monitoring and deliberate abstraction and application, or by explicitly promoting low-road transfer through practice on a variety of examples that include a wide range of potential applications. This may be followed through in the real world by entrusting students with wards of patients in the clinical areas as opposed to treating selected patients. Students could work in pairs initially, and model the questioning process that was demonstrated by participants A and B in the workshop. This will be useful to initiate and develop the process of monitoring of one's thoughts and actions, as a step towards individual self-correction through internal questioning.

## **2. Qualitative Research Framework**

The qualitative research approach employed in this study succeeded in capturing the nature of critical thinking in the department of physiotherapy. The approach achieved a breadth and depth in coverage of the total experience of critical thinking within the world of physiotherapy at this institution, from novice student to expert practitioner. It also had an exploratory function in identifying areas that could benefit from further investigation. This will form part of the action research cycle.

A feature that has arisen through the processing of data, is that the participants of the workshop who had specialist training in Orthopaedic Manipulation Therapy found the clinical problem easier to solve because of adherence to a systematic checklist that the course propagates. However, some participants who did follow the checklist were not able to substantiate reasons for their choice of test or how the emerging results could contribute to the diagnosis. It seemed that the arrival at a diagnosis was largely dependant on clinical memory and pattern recognition, as opposed to making the features fit into a recognisable pattern. The rigidity of a checklist does not allow for thinking outside a framework and does not allow one to consider alternatives, other than those presented. If one takes this into account, the argument will also hold for the framework presented in this study. However, as students are being initiated to the

process of critical thinking, this framework can serve as a guide and as their skills of critical thinking in conjunction with those of clinical reasoning develop, their reliance on this framework will also reduce to accommodate a broader vision.

As indicated earlier, this study represents the first cycle of an ongoing action research cycle. What follows hereafter is the implementation of the facilitated clinical practical laboratories in conjunction with the framework of the critical thinking skills that has been presented. Observation and assessment of the process will follow to assess its merits. Following the use of a paper case in the workshop as a strategy to assess reasoning ability, some academics have already implemented this method as an assessment strategy in their courses.

The way forward will include:

- ❖ critical analysis of the implementation of facilitated clinical practical laboratories
- ❖ the development of teaching and assessment strategies that promote the synergy between process knowledge and propositional knowledge within a clinical area
- ❖ an assessment of the content of individual modules and accompanying teaching and assessment strategies that inform the process of teaching and learning
- ❖ an assessment of critical thinking attributes that students consider desirable for learning physiotherapy.

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## **APPENDICES**



## APPENDIX A

### Practical Examination - Assessment of Patient

Name: \_\_\_\_\_ Examiner/s: \_\_\_\_\_

Date: \_\_\_\_\_ Diagnosis: \_\_\_\_\_

<b>Categories for marks</b>	<b>Comments</b>	<b>Marks</b>
<b>1. History</b> 1.1 Abstracting information from case notes, X-ray reports, laboratory reports and other relevant sources  1.2 Ability to obtain further information form patient particularly as it pertains to physiotherapy  1.3 Interpretation of information		/10
<b>2. Interpersonal Relationship</b>		/5
<b>3. Assessment</b> 3.1 Choice of techniques/Procedure  3.2 Quality of Performance  3.3 Documentation  subminimum 30/60		/50   /10
<b>4. Identification of problems</b>		/10
<b>5. Aims/Goals of Treatment</b> 5.1 Short term  5.2 Long term		  /10
<b>6. Outline of treatment plan</b>		/5
<b>Total</b>		<b>/100</b>

General Comments:

Examiner's signature : \_\_\_\_\_

## APPENDIX B

### Treatment of Assessed Patient

Name: \_\_\_\_\_

**Diagnosis :** \_\_\_\_\_

**Examiner/s:** \_\_\_\_\_ **Date:** \_\_\_\_\_

[illegible]

**General Comments:**

Examiner's signature : \_\_\_\_\_

## CONTINUOUS EVALUATION

**BLOCK:** \_\_\_\_\_ **DATE:** From \_\_\_\_\_ to \_\_\_\_\_

CLINICAL SUPERVISOR/S: \_\_\_\_\_

[illegible]

Categories for marks	Mark	Comments
<b>5. SELF-MANAGEMENT</b> 5.1 Time management / organisation of work load 5.2 Flexibility, adaptability, crisis management and Coping skills 5.3 Active team participation 5.4 Ability to manage wards/groups of patients 5.5 Initiative 5.6 Ability to work independently	/15	
<b>TOTAL</b>	/100	

**General Comments:**

**Students Signature :**

**Note:** According to the Health Professionals Council of South Africa, the total number of clinical hours = 1 000 hours. Students must fulfill this requirement in order to qualify for the final examination.

## **LETTERS OF CONSENT**

### **Statement of Consent from the Academic Registrar**

I am aware of the study being conducted by Mrs SS Ramklass for the purposes of a dissertation titled

“A study to develop a framework of critical thinking skills for teaching and learning Physiotherapy”

and that every effort has been made to ensure the anonymity of the institution.

-----  
Professor A Brimer  
Academic Registrar

Date signed:

### **Statement of Consent from the Academic Registrar**

I am aware of the study being conducted by Mrs SS Ramklass for the purposes of a dissertation titled

“A study to develop a framework of critical thinking skills for teaching and learning Physiotherapy”

and that every effort has been made to ensure the anonymity of the institution.

A handwritten signature in cursive script, appearing to read 'A. Brimer', written over a dashed horizontal line.

Professor A Brimer  
Academic Registrar

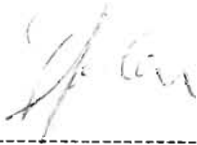
Date signed: 13 / 12 / 00

### **Statement of Consent from Head of Department**

I am aware of the study being conducted by Mrs SS Ramklass in the department of Physiotherapy for the purposes of a dissertation titled

“A study to develop a framework of critical thinking skills for teaching and learning Physiotherapy”

I hereby allow permission for the use of departmental information for the stated purpose.



-----  
Prof P Gounden  
Department of Physiotherapy

Date signed: 5/1/2001



### Statement of Consent from Co-ordinators

Having provided information for data collection for the purposes of a dissertation titled

“A study to develop a framework of critical thinking skills for teaching and learning Physiotherapy” by Mrs SS Ramklass,

I, THIYA NADARAN ----- have read the chapters where this information has been used and I agree that this data may be used in this fashion and form.

Date signed : 13/12/2000  
Thiyanadan.

### **Statement of Consent from Co-ordinators**

Having provided information for data collection for the purposes of a dissertation titled

“A study to develop a framework of critical thinking skills for teaching and learning Physiotherapy” by Mrs SS Ramklass,

I Pamela Langat ----- have read the chapters where this information has been used and I agree that this data may be used in this fashion and form.

Date signed : 13/12/2000 .

Langat

### Statement of Consent from Co-ordinators

Having provided information for data collection for the purposes of a dissertation titled

“A study to develop a framework of critical thinking skills for teaching and learning Physiotherapy” by Mrs SS Ramklass,

I M. Rhode ----- have read the chapters where this information has been used and I agree that this data may be used in this fashion and form.

Date signed : 31/12/2000

M. Rhode

Muxuode