CHAPTER 6

INTEGRATION OF RESULTS

6.1 INTRODUCTION

Results obtained from the Test of Ability to Explain- for Zulu-speaking Children confer with recent findings of the Joint International Unesco-Unicef Monitoring Learning Achievement (MLA) Project in African countries (Strauss and Burger, 1999). In this study, South African grade 4 pupils (9years) were found to have performed on the lowest levels of the spectrum for numeracy, and slightly better for literacy and life skills. The salient point here is that this study tested children from Africa only, thus middle-class American standards were not the norm standard. Much research has been produced demonstrating inferior performance of South African black children on various psychological tests in relation to children from western cultures (Bentley, Kvalsvig & Miller, 1989; Mwamwenda and Mwamwenda, 1991;Viljoen, Levett, and Tredoux, 1994) This project, however, places South African children in the context of Africa. It is sobering to note, that despite the fact that South African Educational policies are hailed as among the most advanced in the world, these findings, as well as the findings from the TATE-ZC indicate that children in this country face a bleak future from an educational point of view.

Points for discussion in the integration of the results described in chapter 5, relate to the measurement of thinking skills, including a critical analysis of scores obtained by rural Zulu-speaking children for oral thinking and reasoning skills, and how these relate to text based reasoning. Evidence for oral reasoning as a precursor to text-based reasoning is presented through an analysis of error patterns in both areas. The lack of correlation between verbal reasoning and academic performances is analysed, as well as the finding of superior performance by boys for thinking skills. The final section attempts to analyse the source of the problem in terms of previous theoretical discussions relating the impact of cognitive style on inferential reasoning

6.2 THE MEASUREMENT OF THINKING SKILLS

6.2.1 A critical look at the results

When the results obtained on the TATE-ZC are evaluated according the criteria identified in Table 5.11, they indicate that, at the level of verbal reasoning, the responses of the grade 2,3,4, and 5year (7-10year) children, are equivalent to those required by children entering a pre-school or readiness programme or 4-6 years. They have the ability in general to give one concrete answer using precise vocabulary. They do not spontaneously provide multiple answers, and do not demonstrate use of abstract thinking skills. The 11 and 12 year group demonstrated verbal reasoning skills equivalent to those required for entry into literacy, or 7 years. They are able to present multiple reasons, show some level of abstract reasoning and make use of accurate verbal expression.

Table 6.1
Comparison of TATE-ZC and TOPS scores for the test as a whole

Age Group	TATE-ZC mean score	TOPS mean score	TATE-ZC criterion and age equivalent	TOPS age equivalent for TATE-ZC score
7 yr	30	53	Concrete reasoning presented. Able to derive an answer from a picture and express it verbally. Entry into more formal education- Grade R (reception class equivalent to a pre-school preparatory year) 4-6 years	4.4 years Entry into a pre-school programme
8yr	34	60		4.9
9yr	42	67		5.8
10 yr	48	73		6.5
11yr	54	78	Able to see multiple reasons. Abstract reasoning presented. Accurate verbal expression Entry to formal learning and literacy 6-7 years	7.2
12 yr	56	83		7.5

Although it is with great caution that results on the TATE-ZC are compared with results on the TOPS, it is interesting to note that the comparison does tend to confirm the findings discussed. Table 6.1 presents the TATE-ZC and TOPS scores and age /criterion equivalents. Not only do the identified stages of the TATE-ZC criterion –based evaluation correlate with the TOPS age equivalents, but so do the TATE-ZC scores themselves.

An almost equivalent gap in achievement levels between the Zulu-speaking and the American children has been demonstrated using the Bender Gestalt test of visual-motor perception (Viljoen et al, 1994). In this test, American children reached maturity for this skill by the expected 9 years, whereas Zulu-speaking children reached the same level at 13 years. Although the original test had not been altered in any way, the researchers had been extremely sensitive to cultural difference in the administration of the test. In the TATE- ZC, what was achieved by the Zulu-speaking children at 12 years was achieved by American children at 7.

This demonstrates that even when as many cultural and linguistic aspects as possible are attended to, rural Zulu-speaking children still demonstrated limited performance in skills related to academic performance. In the instance of the TATE-ZC, we can say with a fair amount of confidence that the performance levels demonstrated are reliable, and not the product of an inappropriate test.

TATE-ZC results, indicating a significant development in thinking skills only every two years rather than annually, highlights that development of cognitive skills is slower for rural African children. In the study using the Bender Gestalt the rural Zulu-speaking children were shown to improve more slowly and continued to improve until 18 years, whereas the American children showed maximum improvement between 7 and 10 years when development was complete. Further with significant development taking place every 2 years, children of 12 would emerge from primary school with a level of thinking skill of a grade 4-5 year child (9-10 years). Postulating that this trend would continue through high school would imply that children in grade 12 would demonstrate thinking skills of a grade 7year old child. The direct relationship between ability to explain, make inferences and reason, orally and in literacy or in text, make the findings of the TATE-ZC critical for intervention programmes aimed at improving academic performance even at tertiary levels. What this indicates, is that there is a strong relationship between the level of reasoning developed at the pre-school level, where oral reasoning first emerges, and performance at universities where high level reasoning must be applied to high level content. It indicates that the ability to reason or understand events and causal relationships, must develop into a clear ability, to recognize and express multiple causal relations, at increasingly more difficult and complex levels of event organization, with a greater focus on internal and psychological causes (van den Broek, 1997), if children are to achieve academically.

6.2.2 Thinking skills and literacy

The implications of poorly developed thinking skills for inferencing in literacy as well as for academic progress, are well recognized (Hanson and Pearson, 1983; Shiro,1994; Winne, Graham and Prock, 1993). Answering questions about the text is an intrinsic part of the reading process, and the ability to deal with explicit information as well as implicit information is critical. The ability to focus on concrete or literal reasoning only, places severe limitations on the extent to which meaning can be derived.

Poor readers are those who cannot answer inferential questions from the text. This may occur for a variety of reasons, but the significance of prior information or world knowledge is constant. Whereas some erroneous inferences may occur due to lack of background information (Pearson, Hanson and Gordon, 1979), other errors may occur due to inappropriate or ineffective use of prior knowledge (Spiro and Myers, 1984)

One way of facilitating reasoning is through the retrieval of stored schemata. The manner in which such schemata come to be stored in the first place is, therefore relevant. As discussed in chapter 3, Van den Broek (1997) refers to the fact that children recall events that are part of a causal chain two to three times as often as those events that are not. In addition, the more causal connections identified for an event, the more likely it is to be recalled, and hence stored as part of the child's schemata. Thus in the case of inferencing or solving problems, the more likely it will be that such a schemata will be applied to this new context. Creating the causal connections is in turn related to mother-child interaction, and the quality of verbal interaction occurring in the 'zone of proximal development' (Vygotsky, 1962). The extent to which the mother (or primary care-giver) creates the causal connections for the child by repeatedly and explicitly stating them, from infancy and beyond , will facilitate the process whereby the skill for creating causal connectedness becomes an automatic and independent process for the child.

Research has shown us that in the year before rural children enter school, there is six times more exchange of information between children, than between adult and child. In addition the incidence of information being given to children is just slightly more frequent than the number of times in which adults give instruction to the child (Liddel et al, 1994). The broader effects of socio-economic status (SES) and household size were also considered in this

research. Effects of increased household size were found to increase interaction between children, and decrease interaction between adult and child as well as number of school or literacy activities. Results indicated that better SES increased the number of school/literacy activities and games played by the children, and decreased the relatively high incidence of simple manipulation of objects, rather than use of the objects for representation and creative play.

All these factors may contribute directly and indirectly to the development of stored schemata available to rural Zulu-speaking children in creating causality and solving problems, and hence to performance in the current research, as well as overall inferencing for literacy.

6.2.3 Analysis of error patterns in the answers presented in the TATE-ZC

The specific ways in which schemata are *ineffectively* applied, are identified through analyzing error patterns in answers presented by children. Spiro and Myers (1984) outline a number of reasons as to why children answer questions ineffectively from written text, some of which have equal application to questions and answers presented orally in the TATE-ZC. They are

- An inability to determine which schemata to draw on
- Failure to combine existing schemata correctly
- Confused representation of knowledge
- Lack of appropriate strategies for retrieval of information from long-term memory.

The error response pattern of children to questions presented in the TATE-ZC show similar trends to findings from a study in which poor readers were asked questions in relation to written text (McCormick, 1992). This confirms that if children cannot reason effectively in oral discourse, it will affect inferencing for text, and place them in the category of 'poor readers'. In this study, errors were categorized, and sub-categorized.

Table 6.2
Application of categories and subcategories of error sources to the TATE-ZC

Category for oral presentation (for text)	Subcategory for oral presentation (for text)	Example from the TATE-ZC
A. Processing the Question (Reading the question)	A1. Didn't process the entire question, thereby cuing another question	*Q How do we know the man has a problem talking on the phone.(phone is in a noisy environment)* Maybe he had an accident *(Has answered the question- How do we know the man has a problem?)*
	A2. Misinterpreted the question	*Q The painter did not guard against the way the paint splashed down on the cars. What should he have done first?* He should clean the cars with paraffin (*Has answered the question in the category AP as if it was in the category DS)*
B. Selecting correct and sufficient cues from the question and the context.	B1. Selected correct, but incomplete information from the context to answer the question	*Q What should be done to make this place safe for children to play here.* It will play in another area
	B2. Misinterpreted the question, referring to an overall problem, not specific context.	*Q The boy has fallen and hurt his knee. What should he do.* Go home.
	B3 Selected the wrong cues from the context to answer the question	Q *One of the teams scored the winning goal. How do we know that?* By that they are not wearing the same things, and that the teams are not the same.
	B4 Selected the wrong cues from the question	*Q What made them go to the hall? (picture of a wedding celebration)* They were told to by these people
	B5. Answer suggested recall of information from a different question	*Q Why would you not shake hands with the painter?* Because he is making the school beautiful (previous question- Why is the painter painting the school?)
C. Selecting accurate and sufficient background information.	C1.Background information selected was an overgeneralization or reflected a faulty concept	Q *Why will the little boy not go to the hospital?* It is too far (*picture of a boy with a scratch on his knee)*
	B2. Information selected was not entirely incorrect, but did not reflect the more global or inclusive constructs representing the best answer	*Q The team that was defeated, lost the previous three games they played. What should they do so this does not happen in the future?* They can play harder
	B3 Did not use available background information in attempt to infer.	*Q One of the teams scored the winning goal. How do we know this?* They are happy

D. Integrating conext cues with background knowledge. (Integrating text cues)	D1 Too heavy reliance on background knowledge- dimissal of text information in favour of prior knowledge	*Q Why don't the people pay for the food they are eating? (wedding scene)* Because they are poor, they have no money
	D2 Too heavy reliance on context information- literal response given with no inference drawn	*Q Why would the boy not stand on a cardboard box?* The boy is short. *Q Why would you not shake hands with the painter right now?* Because he is in the picture
E. Accuracy of verbal responses (Writing responses to accurately reflect the intended answer)	E1 Words used lack semantic preciseness	*Q How do we know these people are at a wedding?* The lady is wearing something on her head
	E2 Lack of specificity in verbal response	*Q One of the boys brought R5.00 to school, but now he only has R2.00. What should he do about the money he has lost?* He can use all of it
	E3 Answer is not fully developed	*The taxi driver lost his way to Durban station and his passengers missed the train. What should he have done so he did not get lost?* He must ask

An accurate count of the number of errors per category was not the focus of this research, but an informal calculation was made. The majority of errors in the TATE-ZC were made in four main categories:

- Errors due to problems with the analysis of the question, e.g. the answer to a question in the scale Avoiding the Problem, would be presented as Determining the Cause, demonstrating lack of attention to the need to process questions analytically.
- Errors due to giving literal not inferential responses, demonstrating a high level of concrete thinking.
- Errors due to language in terms of clearly identifying the referent, demonstrating a high level of pre-supposition in thinking style.
- Errors due to a failure to pick up the critical cue or 'rule' in the context, in which the relationship between the two events in the context is clearly recognized and expressed, demonstrating limited abstract inferential thinking. This last feature is what would have earned the child 4 points (maximum) per question, and is what is required of children from grade 5 (10years) for adequate academic performance.

It is interesting to note that the majority of errors when text in involved, fell into categories which were more directly related to text and writing, but could be based on verbal reasoning problems.

The main categories into which errors fell for inferencing in text were:

- Integration of text and background information (Category D above)
- Ability to write intended responses
- Recall of text cues.

The main sub-categories into which errors for text fell were:

- Over reliance on background information
- Underdeveloped written response
- Answers unrelated to main points in the selection
- Answers too specific to reflect global constructs.

The error analysis emphasizes yet again, the great need to develop abstract thinking skills in oral language, as a precursor to effective literacy and learning.

6.2.4 Thinking skills and academic performance

A review of the findings showing lack of significant correlation between academic performance and the scores on the TATE-ZC for any of the age groups is cause for some speculation. It indicates that when scores for all the children are ranked, children who perform best academically do not necessarily perform best for thinking skills and vice versa. The similar pattern of performance of Zulu-speaking children on the TATE-ZC and Bender Gestalt (Viljoen et al, 1994), as well as previous findings of the reliability of the TATE-ZC uphold the overall reliability of the test itself. What is of concern is that there are children who are performing relatively well on the TATE-ZC, but are not demonstrating this academically. These children need to be followed up individually, and a deeper analysis of SES, regularity of school attendance, distance child lives from school, social environment in terms of other stressors, attitude to schooling and education, as well as teachers attitudes to education and to the particular child, may provide some explanation for this finding.

If one considers the broad findings of Unicef-Unesco Monitoring Learning Achievement Project, levels of academic achievement amongst the grade 4 pupils are considerably lower than the expected range of school marks. This indicates that high marks for the children on school work, while following a normal distribution for the class, should in the majority of cases be clustered around the lower end of the distribution. This may contribute to some extent to improving the correlation between TATE-ZC findings and academic performance.

6.2.5 Thinking skills and gender

Results presented in Table 5.19 indicate that boys performed significantly better than girls for the test as a whole and for three of the five thinking skills (DC, DS, AP). This was also found for grade 1 children, on a measure of receptive vocabulary (Pakendorf, 1996), but was not a significant issue in the development of visual-perceptual skills (Viljoen et al, 1994). This very small sample of tests does indicate that, unexpectedly, on the language based tests the boys are out-performing the girls. Explanations given for such findings usually revolve around the status of the 'boy-child', who joins the male dominated adult Zulu society, self-perception of sex-role and attitude of teachers to boys and girls. If this was proven to be true, intervention should focus extensively on enhancing the aspirations and self concepts of the girls, because of the strongly held belief that :'When you educate a man, you educate one person. When you educate a woman, you educate the nation.'

6.2.6 Thinking skills- the source of the problem

The final question for consideration in this section, is the extent to which cognitive style in terms of being oral or literate, field dependent or field independent (chapter 2, 2.3, 2.4) impacted on scores obtained by the children on the TATE-ZC.

A recent study, confirming that field independent thinkers achieve better across all academic subjects than field dependent thinkers, has suggested that the particular skills which make a person field independent, need to be identified and organized into an intervention programme, aimed at remediating the 'deficiencies' in field dependent thinkers. The special requirements of field dependent students in terms of teaching materials, teaching methods, methods of evaluation and motivational aspects of learning, also need to be addressed (Tinajero and Paramo, 1997). The controversial nature of such direct recommendations in terms of cultural boundaries always present in the South African context, must be embraced if educational achievement, with its accompanying economic prospects for rural people, is to play a role in transforming society.

From the above, it can therefore be assumed that a field dependent cognitive style has impacted on rural children's performance on the TATE-ZC. For the present study an analysis of the error patterns may be said to typify field dependent thinking, and may give some clue as to the components of the remedial programme suggested above. An attempt is made to

relate information processing features of field dependent thinkers, discussed by Tinajero and Paramo (1997) with error patterns noted (McCormick 1992).

This is not a complete list of ways in which field dependent thinking may manifest, and impact upon the way children answer questions orally or in text, but it may provide a baseline from which to launch a remedial programme. The efficacy of such a programme is enhanced by findings, that, not only is cognitive style related to inferential comprehension (Pitts and Thompson, 1984), and is therefore a mediating variable, but that inferential comprehension can be improved through a training program resulting in the development of a more analytic cognitive style (Hansen and Pearson, 1983).

Table 6.3
Relationship between information processing features of field dependent thinkers and error patterns for TATE-ZC

Information processing feature of field dependent thinkers	**Errors from TATE-ZC**
Pay attention to different aspects of information	Background information selected was an overgeneralization or reflected a faulty concept Did not use available background information in attempt to infer. Too heavy reliance on background knowledge- dismissal of text information in favour of prior knowledge
Encode information differently	Too heavy reliance on background knowledge- dismissal of text information in favour of prior knowledge Words used lack semantic preciseness Lack of specificity in verbal response
Comprehend differently	Background information selected was an overgeneralization or reflected a faulty concept
Think differently- does not use prior information effectively	Too heavy reliance on text information- literal response given with no inference drawn
Take a global view of information, don't see ambiguities or subtleties	Answer is not fully developed

A feature of language typical of the oral tradition that was present in the answers of children in the TATE-ZC was use of additive language rather than subordinated sentences.

Thus despite the fact that most children are exposed to some extent to television, and some are exposed to story telling (Liddel et al, 1994), there is still a tendency to use language from the oral tradition and for children to demonstrate at least some field dependent thinking. With no recorded evidence of story reading being a part of the lives of rural children, this may be an appropriate point of intervention.

6.3 SUMMARY

This chapter presented an integration of results in terms of children's performance on the TATE-ZC and how this relates to text-based inferencing as well as academic performance in general. Origins of the problem were noted in the early laying down of schemata, and how limited number of schemata and/or ineffectual use of schemata affect reasoning and problem solving. Origins of the problem were also sought in terms of cognitive style and the impact of being part of the oral tradition and a field dependent thinking style. Discussion on the superior performance of the boys provided strong recommendations for enhancing the performance of girls as nation builders of the future.