The critical thinking and language abilities of prospective teachers: turning the tide

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Aims of the presentation

Individual and collective efforts: research project (2010-2012) :

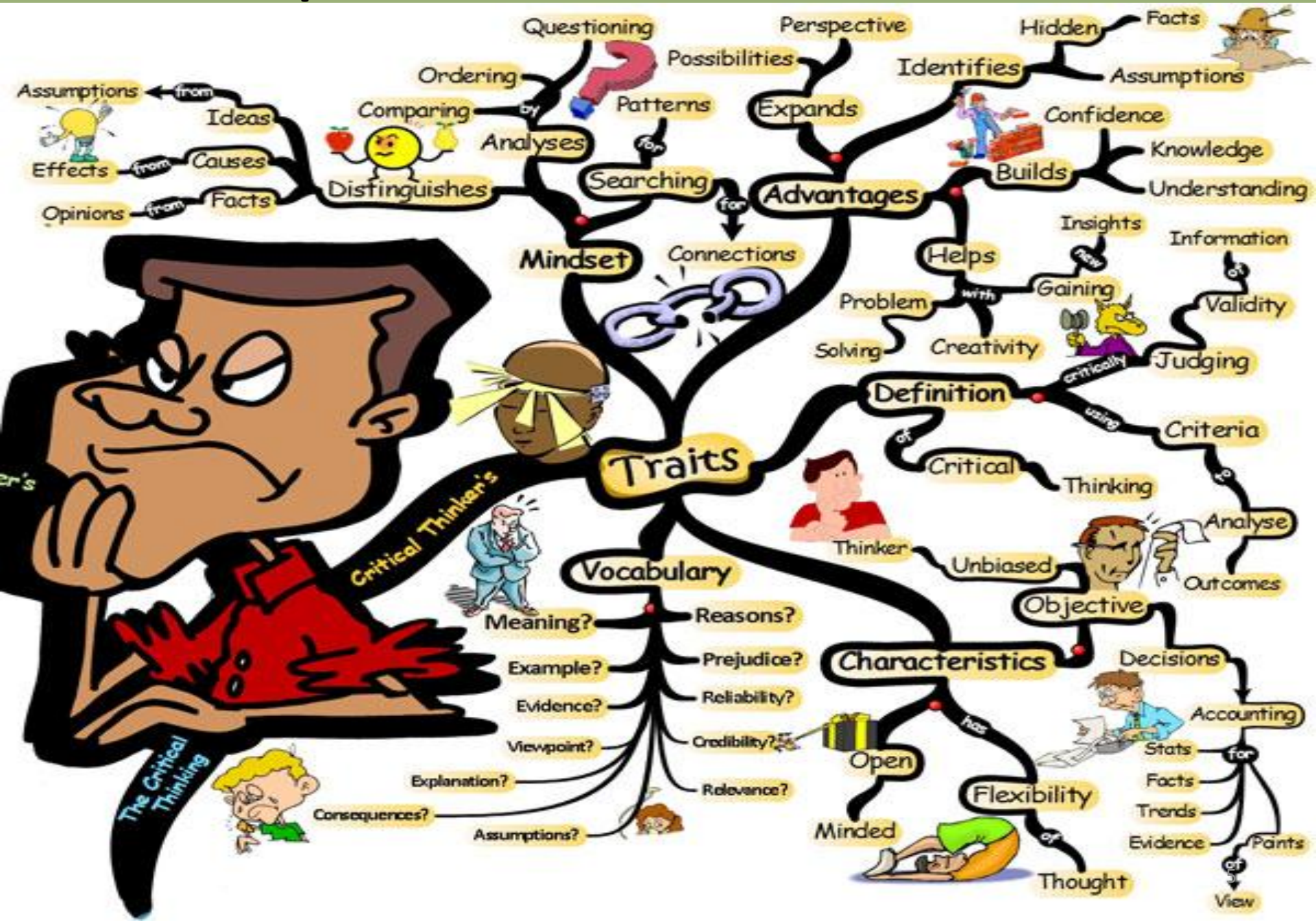
“ Improving critical thinking abilities of prospective teachers”

Aims of the presentation

1. Pre-test results for the critical thinking abilities of a cohort of first year BEd-students.
2. Pre-test results for the language abilities of a cohort of first year BEd-students.
3. To report on the correlation between critical thinking and language abilities.
4. To highlight the merits of the Feuerstein Instrumental Enrichment Programme for improving critical thinking abilities.

Orientation: motivation and rational

Conceptual framework: the critical thinker



.....critical thinking

- Multi-dimensional nature (Kong & Seng, 2006)

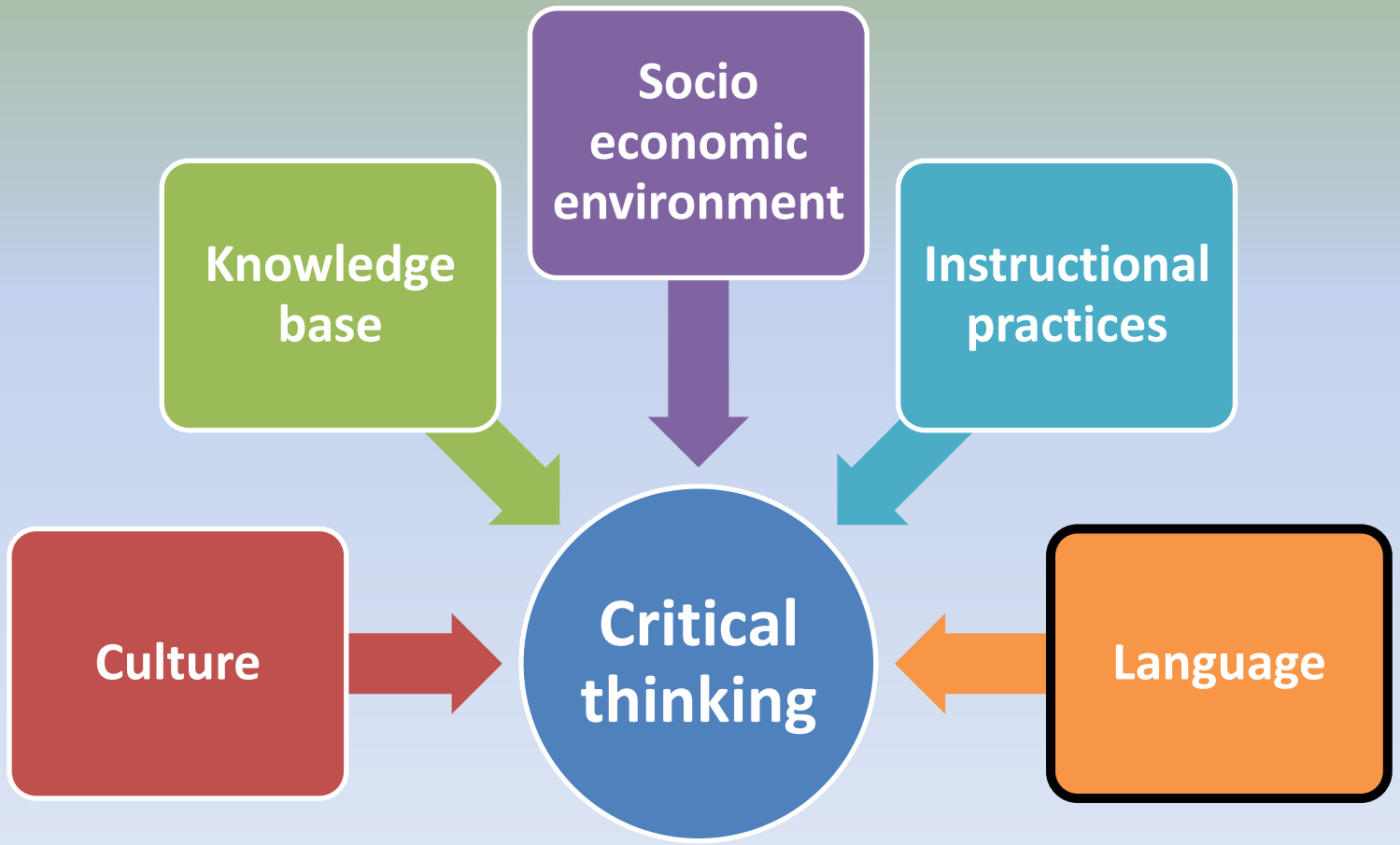
1. Dispositions and attitudes.
2. Interrelated cognitive and meta-cognitive skills and strategies.
3. Behavioural critical thinking habits.

Core critical thinking skills:interrelated cognitive and meta-cognitive skills

Ennis, 1992; Paul, 1993; Pithers & Soden, 2000; Cheung et al. 2002; Vandermensbrugghe, 2004; Barnes, 2005; Halx & Reybold, 2005; Halpern, 2007; Facione, 2009

.....critical thinking

- **Variables impacting on critical thinking:**



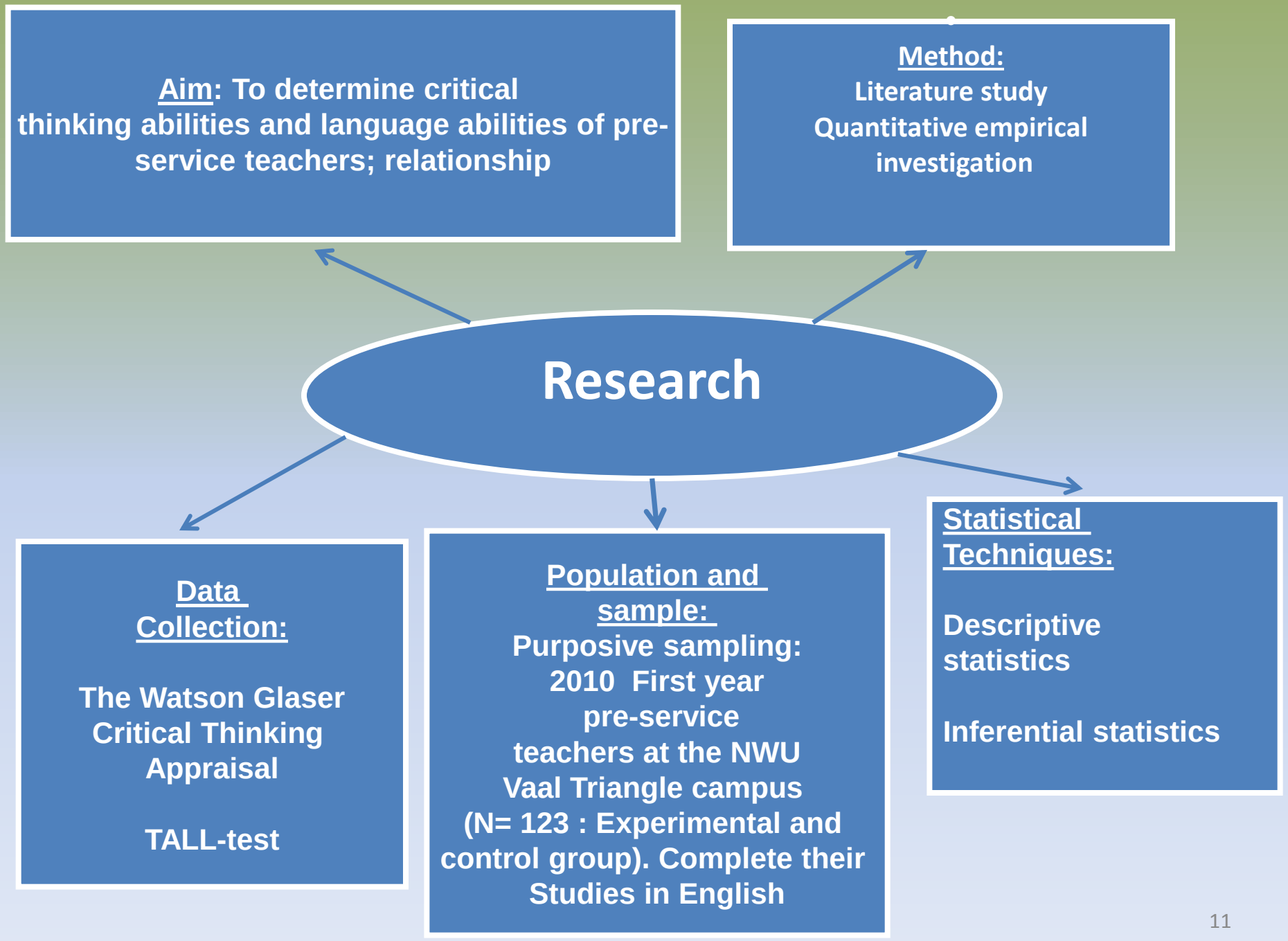
Conceptual framework: language ability

- CUMMINS
  - *BICS*: Basic Interpersonal Communication Skills are skills needed for everyday conversations using informal, colloquial language.
  - *CALP*: Cognitive Academic Language Proficiency is the formal, more sophisticated command of language schools use, which is necessary for success at school.
  - ***English Second language learners lack the CALP required to carry out higher cognitive operations in English***

Nature of the research

- Explorative and dualistic in nature

1. Follow-up study to confirm and strengthen the results of two pilot studies with a groups of first year pre-service teachers at the same university (2006, 2008).
2. Set foundation for an intended comprehensive research project improving the critical thinking abilities of prospective teachers.


Aim: To determine critical thinking abilities and language abilities of pre-service teachers; relationship
Method:
Literature study
Quantitative empirical investigation
Research
Data Collection:
The Watson Glaser Critical Thinking Appraisal
TALL-test
Population and sample:
Purposive sampling:
2010 First year pre-service teachers at the NWU Vaal Triangle campus
(N= 123 : Experimental and control group). Complete their Studies in English
Statistical Techniques:
Descriptive statistics
Inferential statistics

The Watson Glaser Critical Thinking Appraisal: content and reliability and validity

TAG and TALL tests: content and reliability and validity

The Feuerstein Instrumental Enrichment Programme(FIE)

- 15 pencil and paper instruments aimed at improving cognitive capacity.
- Focus on improving deficient cognitive functioning through mediation.
- Not based on any subject knowledge.
- Implemented with great success internationally and nationally, but not yet with pre-service teachers at university level in South Africa.

The Feuerstein Instrumental Enrichment Programme (FIE)

- All students tested at beginning of the year with the WGCTA.
- At the end of the 1st semester: re-tested
- During the second semester: implementation of FIE started with students who performed extremely low (below 40 out of 80) (n = 40) on the WGCTA in both test occasions. They were approached individually and had the choice to willingly take part or not in the research. In total only 11 students were willing to complete the 8 weeks of intervention.
- One FIE instrument: Organisation of Dots implemented for 8 weeks, 1 hour per week. The intervention continues during 2011.

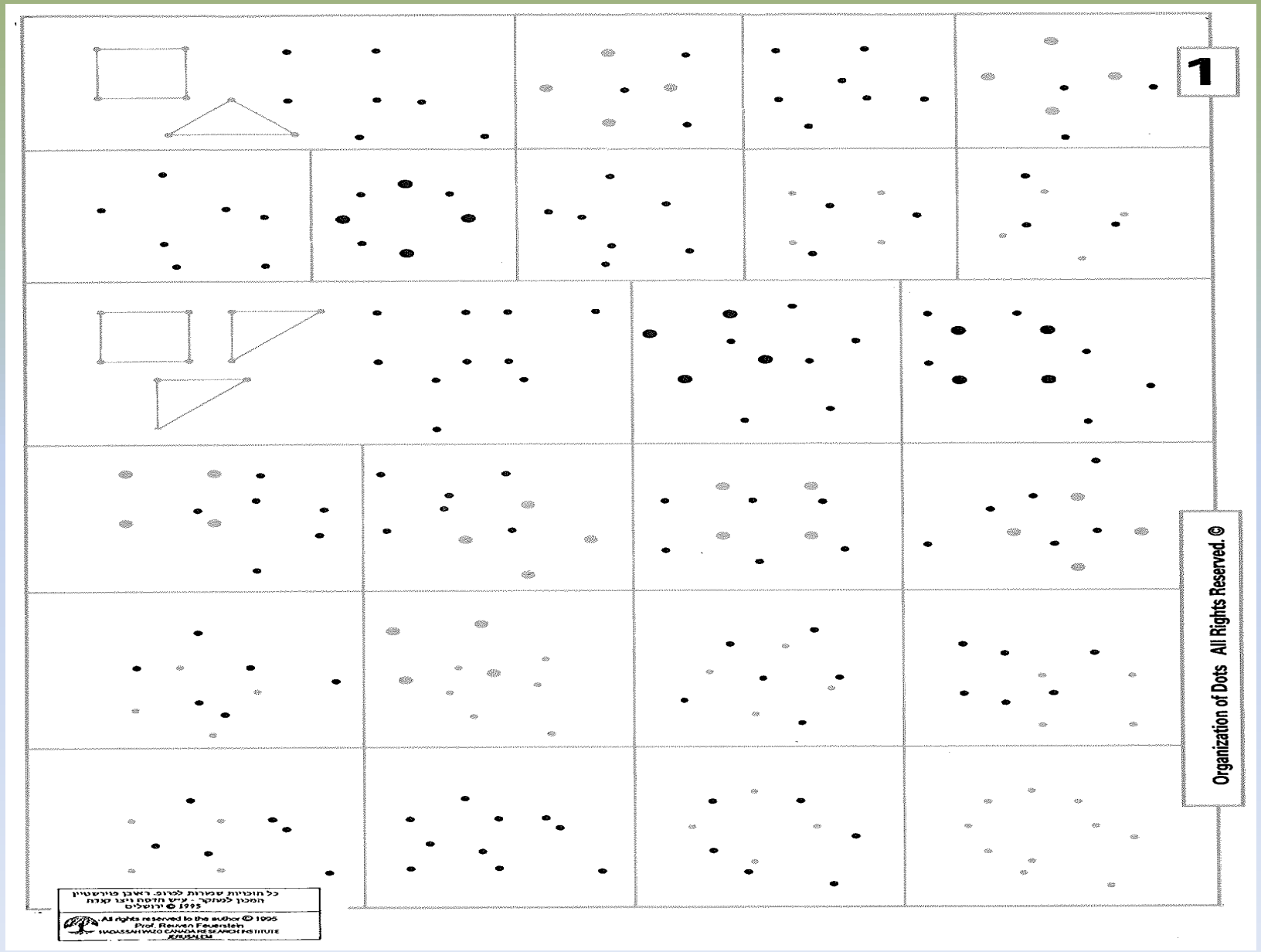
The FIE programme

A few of the deficient cognitive functions addressed through the FIE programme	
Blurred, sweeping and impulsive perception	Lack of planning behaviour
Lack of precision and accuracy	Lack of monitoring behaviour
Lack of appropriate verbal tools	The need to justify solutions or responses
Working with multiple sources of information simultaneously	
Trial and error responses	
Defining problems	
Inability to distinguish between relevant and irrelevant data to solve problems	
Lack of spontaneous comparative behaviour	

Elements of a plan

1. Define goals
2. Look at what we have
3. What strategy shall we use?
4. Where shall we start?
5. What are the rules?
6. Check our work

The FIE programme



Data analysis and interpretation

Comparisons of the different test results within each group are reported.

Comparisons of the different test results across groups are reported.

Data analysis: Inference

Critical thinking skill	N	Raw score mean	Std dev	t	Sig (2 tailed) *p*	Cohen's *d*	Effect in practice
				1 + 2			
Inference 1 (Pre)	11 74	*5.64* 6.92	2.42 2.38	-1.218 1.240	.251 .217	0.529	Medium
				1 + 3			
Inference 2 (Middle)	11 74	*6.92* 6.45	2.38 2.25	-.282 3.260	.783 .001	0.194	No
				2 + 3			
Inference 3 (Post)	11 74	*5.82* 5.58	2.27 2.60	1.023 2.162	.330 .032	0.09	No
Sig $p < 0.05$							

Data analysis: Assumptions

Critical thinking skill	N	Raw score mean	Std dev	*t*	Sig (2 tailed) *p*	Cohen's *d*	Effect in practice
				1 + 2			
Assumption 1 (Pre)	11 74	*8.64* 10.00	2.73 2.00	-.380 .699	.712 .485	0.498	Medium
				1 + 3			
Assumption 2 (Middle)	11 74	*9.00* 9.73	2.93 2.65	-1.295 1.162	.224 .247	0.249	Small
				2 + 3			
Assumption 3 (Post)	11 74	*9.82* 9.58	2.60 2.36	-1.243 .360	.242 .719	0.092	No
Sig $p < 0.05$							

Data analysis: Deduction

Critical thinking skill	N	Raw score mean	Std dev	*t*	Sig (2 tailed) *p*	Cohen's *d*	Effect in practice
				1 + 2			
Deduction 1 (Pre)	11 74	*7.00* 8.38	2.44 2.40	-1.633 .035	.134 .972	0.566	Medium
				1 + 3			
Deduction 2 (Middle)	11 74	*8.18* 8.36	1.47 2.55	.516 .766	.617 .445	0.071	No
				2 + 3			
Deduction 3 (Post)	11 74	*6.45* 8.09	1.86 2.08	.319 .757	.010 .451	0.788	Large
Sig $p < 0.05$							

Data analysis: Interpretation

Critical thinking skill	N	Raw score mean	Std dev	*t*	Sig (2 tailed) *p*	Cohen's *d*	Effect in practice
				1 + 2			
Interpretation 1 (Pre)	11 74	*8.45* 9.08	2.11 2.42	-.539 .099	.602 .921	0.260	Small
				1 + 3			
Interpretation 2 (Middle)	11 74	*8.73* 9.04	1.79 2.53	-.112 2.628	.913 .010	0.122	No
				2 + 3			
Interpretation3 (Post)	11 74	*8.55* 8.11	1.80 2.06	.260 2.454	.800 .015	0.214	Small
Sig $p < 0.05$							

Data analysis: Evaluation

Critical thinking skill	N	Raw score mean	Std dev	t	Sig (2 tailed)	Cohen's *d*	Effect in practice
				1 + 2			
Evaluation 1 (Pre)	11 74	*9.45* 9.80	1.21 2.75	-.112 -.914	.913 .362	0.127	No
				1 + 3			
Evaluation 2 (Middle)	11 74	*9.55* 10.19	1.75 2.45	-.139 1.262	.892 .209	0.261	Small
				2 + 3			
Evaluation 3 (Post)	11 74	*9.36* 9.24	1.91 2.58	.282 2.284	.783 .024	0.047	No

Sig $p < 0.05$

Data analysis: Total raw score

Critical thinking skill	N	Raw score mean	Std dev	t	Sig (2 tailed)	Cohen's *d*	Effect in practice
				1 + 2			
Evaluation 1	11 74	*39.18* 44.18	7.25 7.55	-1.419 .310	.186 .757	0.663	Medium
				1 + 3			
Evaluation 2	11 74	*41.91* 43.77	4.48 8.31	-.421 2.965	.683 .004	0.224	Small
				2 + 3			
Evaluation 3	11 74	*40.00* 40.61	5.29 7.06	1.559 2.492	.150 .014	0.086	No

Sig $p < 0.05$

Data analysis: Across groups

Critical thinking skill	N	Raw score mean	Std dev	*t*	Sig (2 tailed) *p*	Cohen's *d*	Effect in practice
Assumptions				**Pre-test**			
Experimental	11 74	8.64 10.00	2.73 2.00	-2.003 -1.594	**.048**	**0.498**	**Medium**
Total raw score	11 74	39.18 44.18	4.48 7.55	-2.054 -2.120	**.043**	**0.662**	**Medium**
Deduction				**Post test**			
	11 74	6.45 8.09	1.86 2.08	.016 .018	**.016**	**0.788**	**Large**

Sig $p < 0.05$

Interpretation of results: critical thinking

Experimental	Control
1. Poor pre-test results.	1. Obtained better pre-test results than the experimental group.
2. Improvement in the second test in all 5 critical thinking skills (not statistically significant).	2. Improvement in second test only in one of the skills (**evaluation)**. Not statistically significant.
3. Lower results obtained for all skills in post-test than in test 2, except for **assumptions.** No statistical significance**,** except for **deduction.**	3. Lower results obtained for all skills in post test than in test 2 as well as overall performance. Statistically significant lower results for: **inference, interpretation, evaluation.**
4. Post-test results still better than pre-test results for all 5 critical thinking skills, although not statistically significant.	4. Post-test results statistically significant lower than pre-test results for **inference, interpretation** and **overall test score.**
5. No statistically significant difference noted between the two groups during the post-test.	5. Lowest result obtained for assumptions in the post-test (no statistical significance between post-test and pre-test and post-test and test 2.
6. Statistically significant difference noted between the pre-test results: control group performed better than the experimental group.	

Interpretation of results : critical thinking

In the absence of a local norm group, results are interpreted with caution.

1. Pre-test results: Participants did not excel in the execution of critical thinking.
2. Apparent average ability to execute critical thinking
3. Some individual students appear to execute critical thinking abilities with success.
4. There could be an absence of willingness, dispositions and behavioural habits to engage in critical thinking.

Interpretation of results : critical thinking

5. Cognitive and meta-cognitive skills to execute critical thinking not yet fully developed
6. Supports results of similar studies with pre-service teachers and in-service teachers in SA: inability to apply critical thinking skills (Grosser & Lombard, 2004; 2008; Scholtz *et al.* 2008)
7. Language could be a handicap to make public ideas in a language that is not your own

Interpretation of results : critical thinking

8. Group does not meet language requirements necessary for critical thinking : serious implications for academic performance
9. Cultivating critical thinking is not yet fully compatible with education reality.
10. It appears as if schools (teaching practice of teachers) need to do more to prepare learners for the execution of critical thinking.

Interpretation of results : critical thinking

11. Merits of FIE need to be explored further: latent potential for improving critical thinking skills is to some extent evident after the 8 weeks –
12. Hopeful that we might be able to turn the tide! More time needed to conclusively conclude that FIE can enhance critical thinking.
13. Disturbing: normal class teaching: no purposeful efforts to enhance and reinforce the application of critical thinking abilities.

Interpretation of results : critical thinking

14. Cognitive overload theory of the working memory (Paas, Renkl & Sweller, 2003): prevents effective cognitive processing of information.
15. Results could point in the direction that teacher training needs to focus stronger on enhancing critical thinking during lecturing.

Interpretation of results: critical thinking

Test results: both groups	2010
1. Inference (most problematic) **2. Deductions** **3. Interpretations** **4. Evaluations** **5. Recognition of assumptions (least problematic)**	***Inference most problematic***: problems with comprehension: could maybe not relate to the information provided in the test. Lack experiences and understanding of issues addressed in the test.
	Recognition of assumptions: best score. Application of analysis appears to be less problematic.
	Interpretations: problems with comprehension and expressing meaning.
	Evaluation & deduction: difficulty in assessing and interpreting credibility of statements.

TALL results

	N	Minimum	Maximum	Std dev	Mean %
TALL 2010	85	21	91	16.37	43.5

Interpretation of results: language ability

1. Means show that the academic literacy skills of students are generally poor
2. Confirms reports from lecturers that students
   - Cannot cope with understanding and interpreting English texts
   - Struggles with interpreting higher cognitive level instructions (e.g. evaluate, analyze, discuss critically, etc.)
   - Do not have adequate vocabulary
   - Concept comprehension within certain contexts are problematic

Interpretation of results: language ability

3. Poor English ability accounts for lower critical thinking performance (Campbell, Adams & Davis, 2007)

4. Problems in studies where learning material and textbooks are mainly in English

Correlation coefficients

		Inferences	Recognition of assumptions	Deduction	Interpre-tation	Evaluation	Total
Pearson correlation coefficient	2010	0.349**	0.365**	0.500**	0.388**	0.301*	0.594**
Sig. (2-tailed)	2010	0.009	0.006	0.000	0.003	0.026	0.000

** Correlation significant at 0.01 level ; * Correlation significant at 0.05 level

Limitations

- A critical thinking test instrument constructed for South African conditions would be the ideal.
- No norm group for South African pre-service teachers.
- Small group of students which limits the generalizability of results.
- However: the research indicates shortcomings in the field an could assist in identifying factors needed for cultivating these abilities
- Limited focus on cognitive and meta-cognitive skills. Also take into consideration critical thinking dispositions and attitudes.
- Triangulation of data: discussions with lecturers on handling cognitive and language tasks – more holistic picture.

Conclusion

- Critical thinking is an educational **ideal** and not an educational **option**.
- Myriad of factors that contribute to the failure of nurturing critical thinking.
- Learners have the **moral right** to be taught how to think critically (Norris, 1985:4). Teachers have the **moral responsibility** to prepare themselves to guide learners to think critically (Kong & Seng, 2006).
- Challenge to teacher education: critical thinking and language ability appear not to receive adequate attention and opportunities to be nurtured at school level.

.....conclusion

Challenge to teacher education:

1. enhance critical thinking abilities and language abilities : explicit teaching
2. guide students on how to infuse critical thinking into their lessons
3. to model good critical thinking practices
4. reasoning – focus during teaching and learning

The way forward

Results of this study strengthened the results of the first two pilot studies which indicated that efforts are needed to improve the critical thinking abilities and language abilities of pre-service teachers

- Intervention that is currently in progress to improve critical thinking and language abilities and will continue during 2011.
- Examine academic performance in relation to language ability and critical thinking.

Acknowledgements

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