Transforming teacher training programmes in order to improve critical thinking and language abilities

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Dr Mirna Nel

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University of Warschaw, Poland
Aims of the presentation

Individual and collective efforts: research project:

“Improving critical thinking and language abilities in Higher Education”
The NWU campus....
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 (Dr Mirna Nel)
3. To report on the correlation between critical thinking and language abilities (Dr Mirna Nel)
Orientation

• SAQA (1995): Higher education institutions to achieve 12 critical cross-field outcomes.

• Two of these outcomes refer to the cultivation of critical thinking abilities and language ability

  Cultivation of cognitive capacity has prominence

  • to critically evaluate information
  • to use science and technology effectively and critically
  • to solve problems
  • to make decisions using critical and creative thinking
Orientation

• Importance of critical thinking for life-long learning, economic growth and international competitiveness (Pithers & Soden, 2000; Barnes, 2005)

• Cognitive skills pivotal to teacher effectiveness (Birjandi & Bagherkazemi, 2010; Elizabeth, May & Chee, 2008; Korthagen, 2004).

• Important role of teachers in nurturing critical thinking skills (Sonn, 2000; Espeland & Shanta, 2001; Gyalam & Le Grange, 2005; Potterton, 2008)
• Capacity to use language is essential to execute critical thinking (McPeck, 1990, Pienaar, 2001; Paul, 2004; Donald, Lazarus & Lolwana, 2010)

• Importance of language ability for critical reasoning, working through information and academic success at Higher Education (Lun, Fischer & Ward, 2010)
orientation

• Poor performance: Third International Mathematics and Science Study (TIMMS), TIMMS-R and PIRLS (2006)

• A National Benchmark Test : 2008 by HESA (Higher Education South Africa) with first year students at South African universities.

• Only 50% of first year students at various universities of South Africa are proficient in English as academic language.
Research premise: Teacher education is a key factor in enhancing learners’ critical thinking skills and language abilities. In order for teachers to nurture these abilities, they should themselves possess well developed critical thinking abilities and language abilities.
North-West University: Vaal Triangle campus scenario

- Mostly second language learners
- Many lecturers are second language speakers
- Many classes are double medium
- Learning material generally in English
- Bridging course for all students
  - English or Afrikaans academic literacy (semester course)
  - Reading abilities (semester course)
Research questions

• To what extent are the critical thinking and language abilities of pre-service teachers developed?
• To what extent is there a correlation between critical thinking and language?
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
Critical thinking dispositions/attitudes

A spirit of inquiry
Open-mindedness
Inquisitiveness
Truth-seeking
Fair-mindedness
Confident in reasoning
Systematic
Analytical

(Facione, 2010)
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
Behavioural critical thinking habits

Critical thinking

- Making comparisons
- Scrutinizing knowledge before consumption
- Responsible deliberation
- Argumentation
- Generating original approaches
- Non-compliance

Daniels, 1998; Bailin et al., 1999; Cheung et al., 2002; Tsui, 2002
critical thinking

- Variables impacting on critical thinking:
  - Knowledge base
  - Socio economic environment
  - Instructional practices
  - Culture
  - Language
The development of critical thinking implies.....

- Cognitive resources
- Attitudes
- Habits of mind

Critical thinking
Critical thinking and language ability

- Sloppy language - vague, general, indistinct, imprecise, inaccurate: it leads to thinking of the same sort (Chaffee, 1985).
- The “sloppiness” in language use that Chaffee refers to is very evident in the students’ written and verbal arguments.
- In most instances when the question, instruction or discussion topic requires critical thinking mere facts are reported in a parrot-like or telegram style and concepts are not clearly argued and explained.
Critical thinking and language ability

- This parrot-like reporting is also apparent when critical reading is required.
- Elder & Paul (2004:36) affirm that the typical university student cannot deeply comprehend what he or she reads.
- This problem is more noticeable with students receiving teaching in their second language.
Critical thinking and language ability

- Although English language learners may be limited in expressing their understanding and ideas in English, this doesn't mean that they lack critical thinking skills (Yu Ren Dong, 2006)
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*
- Native English speakers gain more sophisticated vocabulary and grammatical knowledge and increase their literacy skills. ESL learners must catch up with a moving target.
Nature of the research

• Exploratory and dualistic in nature

1. Follow-up pilot study to confirm and strengthen the results of a pilot study with a groups of first year pre-service teachers at the same university (2006)

2. Set foundation for an intended comprehensive research project improving the critical thinking and language abilities of pre-service teachers
Aim: To determine critical thinking abilities and language abilities of pre-service teachers; relationship

Method:
- Literature study
- Quantitative empirical investigation

Data Collection:
- The Watson Glaser Critical Thinking Appraisal
- TALL-test

Population and sample:
- Purposive sampling: 2008 & 2010 First year pre-service teachers at the NWU Vaal Triangle campus (N = 89), (N = 123)

Statistical Techniques:
- Descriptive statistics
- Inferential statistics
The Watson Glaser Critical Thinking Appraisal

• No suitable SA test to determine critical thinking abilities
• Spanning more than 50 years of development and refinement.
• British English: standard English
• Culturally neutral: weather, scientific facts, experiments – topics: to elucidate strong feelings or prejudices-familiar scenarios
• Other items: controversial topics - political, economical, social: definite feelings or prejudices: from newspapers and magazines
Watson Glaser Critical Thinking Appraisal

• 80 test items – complete in 50 minutes
• Significant component of narrative text: may present obstacles to success through reading ability or language fluency if not the first language of students.
• 5 subtests:
  - Inference, recognition of assumptions, deduction, interpretation, evaluation of arguments
Watson Glaser Critical Thinking Appraisal

- **Reliability:** *Split-half reliability:* 0.566 (2008); 0.701 (2010); *Guttman split-half reliability:* 0.567 (2008); 0.685 (2010)

- **Validity:**
  
  **Face:** relevant content, falls in the scope of rapport. Operations and processes required are relevant to critical thinking.
  
  **Content:** the test measures the capabilities required by the academic instructional programme of prospective teachers.
  
  **Criterion-related:** has been widely used to predict course grades and academic performance.
  
  **Construct:** a good measure of the theoretical construct “critical thinking” when compared to other critical thinking tests and literature.
Tag and TALL tests

• TAG (Toets vir akademiese geletterdheid) (Afrikaans) and Tall (Test of academic literacy levels) (English)
• Universities – first years
• Aim: To determine if they possess the necessary broad academic skills in order to complete their studies successfully. The test is based on the construct of academic literacy
• Reliability – proved very reliable with a Cronbach Alpha of more than 0.85
TAG and TALL tests

- Validity – the test assesses the following important skills that underpin the construct academic literacy:
  - academic vocabulary,
  - comprehension of text,
  - interpretation of visual information,
  - difference between main point and supporting detail,
  - cause and result and fact and opinion,
  - the function of text type,
  - simple numerical computations,
  - relations between different parts of a text,
  - ability to argue and define.
TAG and TALL tests

• The eleven things that the test determines are:
  • Is your academic vocabulary good enough?
  • Can you see how metaphors, for example, are used to describe issues?
  • Can you see how a text is compiled and linked together?
  • How comfortable are you with different types of language or text? (Scientific language makes use of a wide range of descriptions, diagrams, instructions, tables, arguments, etc.)
  • Can you interpret graphic information and understand a diagram?
TAG and TALL tests

• Can you distinguish between the main idea and supplementary detail, cause and effect or fact and opinion?
• How easily do you complete simple calculations without the help of a calculator?
• Can you classify issues and compare them?
• Do you know how to make deductions from information and then apply them to other case studies?
• Can you define an issue, argue a case and present evidence?
• Can you see what the greater meaning of something is that you have learnt?
Based on the skills addressed in the TAG/TALL tests to determine academic literacy, we argue that academic literacy *inter alia* comprises:

- Good language ability
- Effective critical thinking skills
## Data analysis (2008)

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<tr>
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<th>Mean (16)</th>
<th>Std Deviation</th>
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Data analysis : Group 1 (Afr. – 2008)

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Sig.  p < 0.05
# Data analysis (2010)

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<th>Minimum (16)</th>
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<th>Mean (16)</th>
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<td><strong>45.54</strong></td>
<td><strong>7.66</strong></td>
<td><strong>85</strong></td>
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</table>
Interpretation of results: critical thinking (2008 & 2010)

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

1. Participants did not excel in the critical thinking
2. Apparent average ability to execute critical thinking
3. Some individual students appear to execute critical thinking abilities with success.
4. Absence of willingness, dispositions and behavioral habits to engage in critical thinking.
5. Execution of critical thinking processes equally poor in all language groups
Interpretation of results: critical thinking (2008 & 2010)

6. Cognitive and meta-cognitive skills to execute critical thinking not yet fully developed

7. 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)

8. Language a handicap to make public ideas in a language that is not your own

10. Cultivating critical thinking is not yet fully compatible with education reality.

11. 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 (2008 & 2010)


13. Results could point in the direction that teacher training needs to focus stronger on equipping teachers with knowledge and skills on how to nurture critical thinking.
Interpretation of results: critical thinking (2008 & 2010)

Students cannot apply the intellectual standards of

- clarity, accuracy, relevance, logicalness, precision, depth

...to the elements of reasoning...

- inferences, assumptions, interpretations, evaluations

...to develop intellectual traits...

- confidence in reason, open-mindedness, inquisitiveness, analytic
Interpretation of results: critical thinking

- Unreflective thinker
- Beginning thinker
- Practicing thinker
- Advanced thinker
- Master thinker

Paul & Elder, 2005
## Interpretation of results: critical thinking

<table>
<thead>
<tr>
<th>Test results</th>
<th>2008 &amp; 2010</th>
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</thead>
<tbody>
<tr>
<td>Same tendency noticed between the 2008 and 2010 results:</td>
<td><strong>Inference most problematic</strong>: problems with comprehension: could maybe not relate to the information provided in the test. Lack experiences and understanding of issues.</td>
</tr>
<tr>
<td>1. Inference (most problematic)</td>
<td></td>
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<tr>
<td>2. Deductions</td>
<td><strong>Recognition of assumptions: best score.</strong> Application of analysis appears to be less problematic.</td>
</tr>
<tr>
<td>3. Interpretations</td>
<td></td>
</tr>
<tr>
<td>4. Evaluations</td>
<td><strong>Interpretations</strong>: problems with comprehension and expressing meaning</td>
</tr>
<tr>
<td>5. Recognition of assumptions (least problematic)</td>
<td><strong>Evaluation &amp; deduction</strong>: difficulty in assessing and interpreting credibility of statements</td>
</tr>
</tbody>
</table>

Inference most problematic: problems with comprehension: could maybe not relate to the information provided in the test. Lack experiences and understanding of issues.

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

- Same sample that did Watson Glaser = N=89 (Afrikaans and English)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean %</th>
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</thead>
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<tr>
<td>TAG AND TALL (100)</td>
<td>89</td>
<td>11</td>
<td>76</td>
<td>39.96</td>
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</tbody>
</table>
Group 1: Afrikaans students (2008)

<table>
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<tr>
<th></th>
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<th>Minimum</th>
<th>Maximum</th>
<th>Std dev</th>
<th>Mean %</th>
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<td>11</td>
<td>67</td>
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## Group 2 – English students (2008 & 2010)

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<td>TALL 2008</td>
<td>49</td>
<td>13</td>
<td>76</td>
<td>4.98</td>
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<td>TALL 2010</td>
<td>85</td>
<td>21</td>
<td>91</td>
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## T-test (2008)

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<tr>
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<th>Mean</th>
<th>Mean difference</th>
<th>F</th>
<th>Sig</th>
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<tr>
<td>TAG = AFR</td>
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<tr>
<td>TALL = ENG</td>
<td>49</td>
<td>38.51</td>
<td>3.215</td>
<td>1.65</td>
<td>0.201</td>
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</table>

**Significance: p < 0.05**
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

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<th>Evaluation</th>
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<tr>
<td>2008 Pearson correlation coefficient</td>
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<td>0.299**</td>
<td>-0.026</td>
<td>0.238*</td>
<td>0.152</td>
<td>0.414**</td>
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<td>Sig. (2-tailed)</td>
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<td>2010 Pearson correlation coefficient</td>
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<td>0.365**</td>
<td>0.500**</td>
<td>0.388**</td>
<td>0.301*</td>
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<td>Sig. (2-tailed)</td>
<td>0.009</td>
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** Correlation significant at 0.01 level;  * Correlation significant at 0.05 level
Limitations

• A 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 and could assist in identifying factors needed for cultivating these abilities.
• Limited focus on cognitive and meta-cognitive skills.
• Triangulation of data: discussions with lecturers on handling cognitive and language tasks.
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:

1. enhance critical thinking abilities and language abilities : explicit teaching

2. guide on how to infuse critical thinking into their lessons

3. to model good critical thinking practices

4. reasoning – focus during teaching and learning

5. purposeful questioning

6. illustrate with examples
The way forward

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

• Intervention is currently in progress to improve critical thinking and language abilities
• Examine academic performance in relation to language ability and critical thinking
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Thank you