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ABSTRACT

A study investigated the critical reasoning skills of a group of 111 Australian adult tertiary students who were practicing adult vocational and further education teachers and trainers, using the recently developed Critical Reasoning Test (CRT). It examined some variables that might be expected to affect critical reasoning scores. These tertiary teachers' mean CRT score was found to be only at or below the "average" levels of other professional, non-teacher normative samples. No significant between-group CRT mean differences were found for these students' year of course, graduate/non-graduate status, age, or gender. In conclusion, the effective teaching-learning of the skills and dispositions underlying critical reasoning does not appear to be progressing well in at least some areas of tertiary education. Such evidence suggested that more attention should be given to facilitating this important area of student learning in universities in the new millennium. (YLB)

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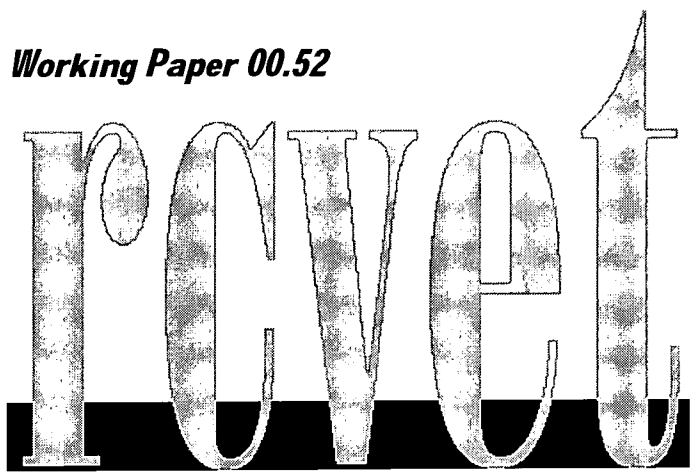

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The importance of facilitating critical reasoning in the new millennium: some new evidence

Bob Pithers

ABSTRACT

Critical reasoning is seen to be a generic, transferable entity and an important outcome of most tertiary education courses currently available. This study investigated the critical reasoning skills of a group of Australian adult tertiary students who were practising adult vocational and further education teachers and trainers, using the recently developed Critical Reasoning Test (CRT). It examined some variables that might be expected to affect critical reasoning scores. These tertiary teachers' mean CRT scores were found to be only at or below the "average" levels of other professional, non-teacher normative samples. No significant between-group CRT mean differences were found for these students' Year of Course, Graduate/Non-graduate status, Age or Gender. In conclusion, the effective teaching-learning of the skills and dispositions underlying critical reasoning does not appear to be progressing well in at least some areas of tertiary education. Evidence such as this suggests that more attention should be given to facilitating this important area of student learning in universities in the new millennium.

INTRODUCTION

Critical reasoning is usually seen to be an important skill that needs to be taught at all levels of the educational systems in Australia, Great Britain and North America. In Australia, for instance, this skill has come to be seen as one of the major generic competencies (Mayer, 1992); capable of generalisation across a broad range of educational contexts and work environments. It is government policy that teachers in the area of tertiary education as well as in other areas of education, should teach and facilitate their students 'good' thinking or reasoning skills to enable them to solve the problems they will face at work and in life. An important component of this scenario is that the teachers themselves should be capable of critical reasoning. Furthermore, that they should be able to teach this skill-based competency to their students.

Critical reasoning may be an essential ingredient of effective teaching in the new millennium, especially for graduates who move to workplaces where they are exposed to much technological, social, economic and workplace change; where they are expected to think "smarter" than before. Very little appears to be known, however, about whether tertiary teachers have and are able to use the critical reasoning skills that they are expected to teach. Worldwide the assessment and evaluation of critical thinking it has been noted has

been neglected, although there has been attention directed at its teaching and learning in some published material (eg., Kennedy, Fisher and Ennis, 1991). A readily accepted definition, together with the appropriate assessment and evaluation of critical thinking remains problematic. Problems of practical difficulty also involve how to validly, reliably, time- and cost-effectively measure the concept critical reasoning or thinking.

The term as it is currently used in the research literature, often broadly reflects Ennis' (1993) definition as reasonable, reflective thinking focussing on action or belief. This is a definition which excludes creative thinking. Conceived of in this fashion, critical thinking is composed of dispositions and skills or abilities. Attitudes or dispositions are affective, whilst skills are seen to be metacognitive in nature. These sets of factors appear to be involved in identifying the problem and assumptions that surround it, clarifying and focussing, understanding and applying inference, inductive and deductive logic, as well as judging the validity and reliability of sources of information (Kennedy et al., 1991).

Ennis' (1993) idea of critical thinking or reasoning, involved broad components which are seen to be generalisable across various domains; components such as "weighing the credibility of evidence", being "open minded", and "drawing warranted conclusions cautiously". Others have argued, however, that critical reasoning is subject specific with each subject having its own type of reasoning (eg., McPeck, 1990). In practice, various evaluation instruments have been used to assess critical thinking and reasoning such as reflective-judgement scales, self-report questionnaires, diary reports, interview scales and various performance tests. One reasonably recent standardised test, developed by Smith and Whetton (1992), however, does appear to have promise for the examination of critical reasoning with adults in the area of adult, tertiary education. This is the Smith-Whetton Critical Reasoning Test (CRT), which claims to assess vocationally relevant critical reasoning skills. The theoretical conceptions underpinning the CRT are clearly linked with Ennis's definition of critical thinking. The aspects of critical reasoning tested in the CRT, are the skills of analysis, evaluation, planning, valuing evidence and the dispositions of thinking critically and decision making on the basis of evidence and reasons. These factors broadly correspond to the skills and dispositions outlined by Ellis as the major ingredients of critical thinking.

The CRT, therefore, was used to measure the thinking skills of a group of tertiary teachers and trainers in the present study. It was assumed that tertiary teachers with stronger critical thinking skills might be at an advantage when it came to teaching these skills. It was hypothesised that a group of selected tertiary teachers would have a significantly higher level of critical reasoning skills than the more general CRT non-teacher norms; secondly, that graduate students would have a significantly higher CRT mean score than non-graduates; thirdly, that Stage 2 or 3 students would have a significantly higher mean CRT score than Stage 1 students, that is given that University type courses do develop generic critical thinking and lastly, it was thought that there might be no significant CRT mean score differences in the sample because of gender or age level.

METHOD

Sample

The sample was composed of 111 teachers of whom 53 were women and 58 were men. All of these individuals were at a university studying for an educational qualification at degree or post-graduate diploma level. Their ages ranged from 24 to 57 years with a mean age of 38 years. There were 49 individuals in Stage 1 of their university education course and 62 individuals in Stages 2 or 3. Of the total sample, 89 teachers were non-graduates whilst 22 were university graduates in disciplines other than education. All of the non-graduates held an appropriate trade or business certificate or diploma and were completing an undergraduate degree in education. The graduate students all held a degree in a domain other than education. For ethical reasons all of the subjects who made up this sample of convenience were all volunteers. They were all teachers in adult and further education whose experience averaged approximately four years.

Instrument

The Critical Reasoning Test (CRT) is composed of two major subtests: Verbal and Numerical. The CRT Verbal subtest (Australian Verbal edition) was used in this study. It purports to measure the intellectual skills relevant to the processing and interpretation of new information (Smith and Whetton, 1992). The test also includes questions which require the testee to recognise that insufficient information has been provided for a definitive judgment, similar to many real-life situations. The CRT Verbal subtest consists of 56 questions which must be completed in 20 minutes. The questions all relate to scenarios in which two trainee junior managers within a fictitious company are faced with various situations requiring critical reasoning.

The Verbal subtest is divided into three sections. The first section, Analysis, requires information to be derived from a formal document provided. Evaluation, the second section, requires new information to be assessed in terms of its significance for current beliefs. The third section, Assumptions, asks the test taker to read a number of comments and assess the statements which follow, deciding whether or not they indicate an assumption held by the person making the comment. The CRT authors reported internal consistency reliability estimates ranging from .67 to .78 for the Verbal scale. The British normative representative sample presented in the manual is based on samples of 353 and 143 people, further education college students (in 16 Colleges) and first-level managers, respectively. This normative sample was used for comparative purposes as their are no Australian norms presently available.

Procedure

The test was administered in small groups of 5 to 15 individuals according to the recommended test procedure in the manual. Participants were given six minutes for each of Sections I and II and eight minutes for Section III.

RESULTS

The overall sample mean score (comparative normative sample data in brackets) was 33.8 (33.9); the standard deviation was 6.3 (6.7). A two-factor Analysis of Variance (ANOVA) applied to Year of Course (for non-graduates only; Stage 1 vs Stages 2/3) and Level of academic qualification (Graduate vs Non-graduate) indicated no significant main effect for either factor ($F=1.24$, $p>.05$; $F=3.00$, $p>.05$, respectively; Alpha level was set at .05 for all tests of significance). The interaction effect was also not significant ($F=.4$, $p>.05$).

The results of the analysis also revealed that there was neither a significant main effect for Gender ($F=.9$, $p>.05$) nor a significant interaction effect ($F=.36$, $p>.05$).

DISCUSSION

It was found using the Smith-Whetton Critical Reasoning Test (CRT) that, on average, the tertiary teachers in the sample only scored at an "average" level (ie., 49th percentile, see Smith & Whetton, 1992) when compared to non-teacher norms based on first-line non-graduate retail managers. It was predicted that experienced tertiary adult vocational teachers, including some at degree level, all attempting an education degree course or a post-graduate qualification in education would have had a comparatively higher relative mean critical reasoning score. There were no significant differences between the mean CRT scores for graduates compared to non-graduates. Nor were there any significant differences found for gender or age.

Graduate tertiary teachers or so it had been expected, should have had significantly higher mean scores on the CRT than non-graduates. That is if in a graduate education the sort of multi-aspect, broad-based metacognitive reasoning skills proportedly measured by the CRT were taught and learned. Another outcome of this study was that there was no significant difference between the samples' CRT mean scores based on year (Stage) of present education degree course. A significant effect had been predicted here, based on the assumption that the course development of generic critical reasoning competencies ought to underlie the teachers' cognitive development. Certainly an important assumption of the work of Ennis (1993), Smith and Whetton (1992), Sodden (1994) and other workers in this area is that the sort of abilities and dispositions reflected in the CRT are learnable.

It was noted that the teachers' overall CRT sample mean was lower than that of a normative group of British non-teacher engineering supervisors and junior managers (33.8 vs 37.5, respectively) which have recently become available. The tertiary education teachers' lower mean CRT scores raises some concerns as presumably it is these individuals who have to be able to pass on via their curricula and teaching, the critical thinking "spirit" that is needed as a prerequisite for their students to learn 'good' thinking. As expected, there were no significant differences found between the mean CRT scores of female and the male teachers in the sample. There were also no significant differences between mean CRT scores for four age ranges tested.

The metacognitive skills or abilities (eg. drawing inferences based on information) and the dispositions (eg. drawing conclusions cautiously) reflected in the CRT and other similar critical thinking tests are presumed to be learnable. The question, therefore, is why then are they not reflected in the comparative outcomes reported about the normative data, stage of course and graduate vs non-graduate data. There may be many explanations for the failure to find hypothesised between-group differences. Some of the more important ones may be that firstly, the CRT does not measure the kind of critical reasoning that tertiary teachers have and apply and/or critical thinking may be context specific. Secondly, the sample of tertiary teachers may have been somehow not representative of what would be found using other teachers or a larger sample. Thirdly, the teachers in the sample did not command a level of critical reasoning beyond the comparative manager normative sample or up to the level of the engineering normative sample. Finally, critical reasoning may not have been taught or effectively taught during the university courses undertaken. Perhaps their lecturers do not have advanced critical thinking skills; maybe these skills and dispositions are taught but not effectively learned or perhaps, they are not applied or transferred to the CRT scenarios.

Nevertheless, there is a fairly extensive body of literature now available which suggest that some knowledge and skills an individual has may serve to help, hinder or have no observable effect on the acquisition of new knowledge and skill (eg., Chi, Glaser & Farr, 1988). The CRT does attempt to assess reasonably integrated and basic skills such as deriving documentary information, identifying assumptions, assessing the worth and applicability of new information, testing cautiously inferences made against provided information or the lack of it and so on. These are the sorts of integrated broad-based skills a tertiary education teacher might be expected to have, a university expected to teach and a student to learn. An assertion could be made that critical thinking is actually based on a range of logical inferences not defined and tested by the CRT. Nevertheless, it is worthy of note that the CRT was constructed to examine a range of critical reasoning skills and dispositions all of which are linked to or developed from earlier research in this area.

A psychometric test such as the CRT, undoubtedly has its problems but it is also possible that, at least in some university courses, students' critical reasoning is not being further measurably developed. The evidence from this study, given the CRT's basic validity, can be used to support this view point. A reasonable overall conclusion is that the tertiary teachers in the present research, may not be being effectively taught or are not learning the generic critical thinking skills measured by the CRT and other similar psychometric tests. University curricula and teaching, especially in education, should reflect the planned development of critical reasoning within a domain or discipline and its application to the workplace. As well, university teachers should, given that they use critical reasoning themselves, try to make these generic critical reasoning skills and dispositions quite explicit during their teaching. They should then attempt to assess these just as readily as they assess specific subject matter content. It is this writer's contention, based on consideration of the CRT, the results of this study and typical subject matter taught to tertiary education students (as well as how it is taught), that many teachers need help through staff development with the development and quite explicit use in teaching of critical reasoning. This is the case especially with those more generic aspects of critical reasoning which

might lead, at least on some occasions, to positive student adaptation during their further tertiary education and at work.

Generic, metecognitive skills and dispositions relevant to disciplines which underpin professional expertise appear to be basic to individual vocational adaptability and progress. This adaptability and the critical reasoning which underpin it are not only basic to an individual's professional contribution but also in the end, important for continued national development. If this small contribution to research in this area suggests anything it is that the field of critical reasoning is one which requires a lot more research, with a range of methodologies and measures, especially in the area of tertiary education. Critical reasoning certainly is emerging as a specific area of university student learning which needs to be addressed and more effectively taught and assessed in the new millennium.

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