INFUSING CRITICAL THINKING IN TEACHING EDUCATIONAL THEORY

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Abstract

This article addresses the problem of perceived lack of relevance reported by students enrolled in critical thinking courses that are peripheral to their main course of study. After an overview of the generally accepted ways of teaching critical thinking, and consideration of contentious issues related to each of them, the article examines a critical thinking course taught in a university School of Education to prospective teachers. It suggests that for these students a solution to the problem of perceived lack of relevance is the infusion of critical thinking into an educational context.

Introduction

Critical thinking is taught in many different kinds of university courses. In Australia it often appears as an introduction to informal logic, taught by philosophy departments as an entry point to their subject for their new undergraduate students. Because informal logic courses tend to focus on equipping students with skills in reasoning and the analysis of argument, they also have the function of being a kind of service course from which students in other university departments and faculties are seen to benefit. This perception of critical thinking is evident in Australia in schools of nursing, for example, which have embraced critical thinking as a way of inculcating in their students an attitude sometimes described as that of "the reflective practitioner" who is possessed of "problem solving skills".

However, undergraduates who have not specifically chosen to enrol in a degree in philosophy are often reluctant to engage with content which they perceive to be irrelevant or difficult and to have no direct immediate bearing on either their chosen course of study or their anticipated future profession. Student evaluation forms from nursing students who have been enrolled in critical thinking courses at Edith Cowan University, Perth, Western Australia frequently contain comments to this effect. The following are typical:

"The relevance of critical thinking was not made clear until later in the semester".

"I found this unit to be ambiguous and frankly boring ... I cannot find practical purpose in analysing language when I need to think quickly in my future career. But I have found my thinking is changed but for bad or good I cannot discern".

This article addresses the issue of perceived irrelevance of critical thinking by suggesting the contextualisation of thinking skills within specific subject matter. It argues that critical thinking can be successfully taught by infusing thinking skills, presented in an ordered, logical sequence, into content matter, using educational theory as an example.

Ways of Teaching Critical Thinking

In a recent paper Sophie Haroutunian Gordon (1998) drew attention to two issues in education: a current emphasis on teaching people to think and a problem as to what
should be done to bring this about. The teaching of thinking skills may occur in a variety of ways. First, they may be taught as skills within their own right under the label of critical thinking. There are two main schools of thought within the critical thinking movement. One view, exemplified in the work of John McPeck (1981, 1990) and Robin Barrow (1990) is that critical thinking is subject specific. On this view, there is no general kind of skill which can be labelled "critical thinking". Critical thinking skills differ, depending on the subject area in question. Therefore, there can be no transfer of critical thinking skills from one subject area to another and being an excellent critical thinker in, for example, mathematics, does not guarantee that one can display the same degree of excellence at critical thinking in, say, the sciences or literature. This view tends to be held by British writers on critical thinking although Victor Quinn (1994) opposed it and made the case for teaching critical thinking as a separate subject, identified as informal logic.

The alternative school of thought argues that critical thinking is a subject in its own right which can be taught quite separately from other subjects. The teaching of critical thinking as a set of general skills has been strongly supported by many North American philosophers, most notably, Robert Ennis (1989, 1990) and Harvey Siegel (1991).

However, the debate is not quite as clear cut as this account of the distinction suggests because Paul Hager (1991), writing in Australia, has pointed out that there is a degree of asymmetry between the views which each side holds on the nature of the questions which inform the debate. McPeck and his followers see these questions to be conceptual; Ennis and others of his persuasion see them to be empirical as well. Hager (p. 157) notes:

Ennis ... carefully distinguishes three versions of the subject-specific view, two of which are quite compatible with critical thinking being a largely general ability. In both of these versions of subject-specificity combined with generic critical thinking, there are significant empirical questions.

What this means is that Ennis et al. consider that we need research evidence to show whether abilities are transferred from one subject area to another - that is, this matter is one for empirical investigation, whereas McPeck sees claims about critical thinking to be purely concerned with establishing truth through processes of reasoning, in particular, through conceptual clarification and through knowledge specific to a particular domain (Melville Jones, 1997, p. 30).

Second, critical thinking skills may also be taught as a reflective exercise on how thinking occurs within and across the subject disciplines, an approach identified under the label of “infusion”. The infusion approach is usually associated with the work of Robert Swartz and D N Perkins (1989) and, more recently, Swartz and Sandra Parks (1994). Swartz suggested that the use of traditional curriculum materials could be restructured to infuse teaching for thinking into subject area instruction. Ingredients, to use his term, included reliability, causal explanation, argument analysis, use of evidence for inference and so on, which were highlighted in infusion teaching so that students became aware of the skill, understood it and, with practice, applied it in other contexts. Infusion cuts across the traditional subject boundaries so that thinking skills are taught across the curriculum (Swartz & Perkins, 1989, p. 88).

A contentious issue in the infusion approach relates to the logic of thinking skills. No sort of order or sequence is suggested and the question that arises is whether
thinking skills have to be taught in some sort of ordered sequence or whether they should be seen as necessarily connected to the subject matter content.

The first of these two possibilities would mean that infusion teaching would have to be based on the kind of logical sequence that is usually found in standard critical thinking courses. The thinking skills would proceed from simple to more complex, moving from the basic skill of understanding a single step of inference from reason to conclusion to the highly complex skill of full scale diagramming of long arguments and evaluating the strength of each step of inference within the argument. However, there does not seem to be any wish to develop such a hierarchy in Swartz and Parks’ approach.

The second possibility is that infusion teaching must contain thinking skills which are necessarily connected to the subject matter content. The order of presentation of material would thus dictate the order of presentation of the thinking skills. Swartz and Parks appear to recognise subject content as having a logic (1994, p. 534) but repudiate the view that certain types of thinking are not accessible at certain age levels (1994, p. 532). This denial suggests that they do not recognise an overall inherent logic in thinking skills, in contrast to other approaches which uniformly tend to recognise a logical sequence in the order of their presentation to students (Melville Jones & Haynes, 1999).

A third way of teaching critical thinking skills is through a programme of philosophy for children, which is a movement that was established in the United States through the work of Matthew Lipman (1980). The movement has spread to Britain, to Europe, to Australia, to Singapore and, most recently, to South America. Apart from Lipman’s work, the widest network which supports the advancement of philosophy for children is the Sophia foundation, with a secretariat based in Amsterdam and members from a dozen or more European countries. In its simplest definition, philosophy for children consists of two components:

- an introduction to a broad yet structured range of philosophical concepts and procedures provided by stories that model various aspects of inquiry.
- a methodology based on the community of inquiry which provides an environment in which philosophical dialogue can take place (Splitter & Sharp, 1995, p. 99).

As with other approaches to teaching critical thinking there are several substantive issues to be considered. In the case of philosophy for children these relate either to content taught or to method used. There are three identifiable problems in relation to content: the approach which philosophy for children takes to knowledge of great ideas and knowledge of great thinkers in philosophy; the problem of children’s rights; and the relationship of philosophy to other subjects. There are also two further problems in relation to method used: the conflicting interpretations of the notion of experience; and the problem of egalitarianism (Melville Jones, 1998). Each of these substantive issues is a contentious one and there are well established counter arguments to the claims which philosophy for children’s adherents make in relation to each of them.

Finally, a fourth approach to teaching thinking skills is through a particular way of encountering and comprehending the subject disciplines, which I shall identify as the framework approach. The framework approach, like the infusion approach, suggests that critical thinking skills are embedded in all of the subject disciplines. It
recommends, therefore, that such skills should be taught in context. A framework of critical thinking skills is made available to teachers to assist them in their reporting of student achievement in critical thinking skills. The framework also helps teachers formulate their understanding of critical thinking skills and assists them in their classroom planning.

The framework approach is not without its problems. It is an outcomes based approach which requires teachers to attest that their students have achieved, at a pre-designated level, the outcomes set out in the framework. Neither the content nor the strategies to be used to carry out this task are necessarily specified. This open-endedness may be a benefit to teachers, in that it allows degrees of latitude of choice which may serve to accommodate the needs of specific students. It may also be a problem if teachers lack expertise in a particular curriculum area, which may well be the case with critical thinking.

I shall now describe an example of teaching critical thinking using the infusion approach combined with the kind of logical structure which is typical when critical thinking is taught as a separate subject. The example relates to a teacher education unit, EDP 1101, taught at Edith Cowan University.

The Content of EDP 1101

Teacher education students at Edith Cowan University are taught critical thinking skills within a compulsory forty-five hour unit of study which combines critical thinking and educational theory. The unit, EDP 1101, is taught to first year students. EDP 1101 is a unit which encourages students to evaluate their own educational experiences and to think critically and reflectively about the educational enterprise. Critical thinking comprises three consecutive hours of tuition for five weeks. The total instruction time is fourteen hours, one hour being taken up by a short test. There are four one hour lectures followed by five two hour tutorial sessions. In practice the tutorials usually end after an hour and a half since the mandated instruction time is forty-five minutes of each hour and the students tend to reach saturation point as far as absorption of the material is concerned.

The critical thinking section of the unit has been devised on the basis that critical thinking is a generally applicable skill in reasoning which is embedded in all other courses of study and can thus be taught in context as well. It is seen to enhance problem identification, problem clarification and problem solving. Awareness of the structure of argument, techniques for analysing and evaluating argument, and an attitude of mind which fosters consideration of spoken and written discourse from a logical point of view are all envisaged as attributes of the adept critical thinker (Melville Jones & Sheridan, 1999, p. 42). In these respects, the conceptualisation of critical thinking adopted relates closely to two of the tools and dispositions which Laurance Splitter (1995, p. 15) identifies as characteristic of philosophy generally, namely:

- the skills of argumentation (forming conclusions, identifying premises, deductive and non-deductive thinking, exposing poor reasoning, striving for consistency)
- a propensity to question and search for reasons, rather than simply accept what is given
The critical thinking module has thus been based on the assumption that critical thinking is a technical tool which provides students with the ability both to analyse the arguments of others and to construct their own sound arguments. Learning to use this tool effectively requires them to interpret meaning, to understand logical structure and to detect fallacious argument. It is therefore presented to some extent as a brief introduction to the study of informal logic, although some elements of formal logic are also included.

The rationale underlying the critical thinking module is that it fulfils three functions:

- It introduces the student to an awareness of the structure of argument
- It provides the student with techniques for analysing and evaluating argument
- It encourages an attitude of mind which enables the student to consider spoken and written discourse from a logical point of view

In earlier versions of the critical thinking module in EDP 1101, students did not engage readily with the material because it was not directly linked in to an educational context. Typical comments from students were:

"This unit was very good but critical thinking was a waste of time. It did not connect with the rest of the unit".

"Critical thinking seemed completely irrelevant to any teaching course".

"Critical thinking was a waste of time. It was not needed at all. Very boring and monotonous. It doesn't apply - as practically everyone at University has logic and common sense".

Therefore, in 1999 a different approach was adopted, which was designed to contextualise the material within an educational setting using a critical thinking framework. The skills taught, presented in logical sequence and in increasing order of difficulty, were identifying a step of inference from reason to conclusion; recognising logical structure; and evaluating the strength of an argument. Three examples will serve to show how this was done.

Example 1:

This example was used to teach the basic step of inference from reason to conclusion and to introduce some common English words signalling the stating of either reasons or conclusions, known technically as inference indicators. The title of the first chapter in the set text for the unit was used as an example of a conclusion, viz:

"So you want to be a teacher".

The question was then posed - "Why?"

Various answers were suggested as follows:
Amy "Because I want to work with children".

Ben "As the employment opportunities are good".

Chloe "In the first place it's a rewarding profession and in the second place it's a secure one".

Students were then asked to practise identifying common inference indicator words and to practise underlining conclusions in passages such as the following:

It's always hard for teachers to change their methods, their knowledge, their attitudes. They are mostly overworked anyway; and it is as much as they can do to go on teaching what they know in the ways they know. This is why so many well-meaning proposals for reform of the curriculum have failed.

Finally, students viewed the first half hour of the video "A Class Divided" and were asked to complete the following worksheet as they watched the teacher at work.

<table>
<thead>
<tr>
<th>Reason 1</th>
<th>Conclusions</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue eyed people are better than brown eyed people</td>
<td>Blue eyed people</td>
<td>Brown eyed people</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reason 2</th>
<th>Conclusions</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown eyed people are better than blue eyed people</td>
<td>Brown eyed people</td>
<td>Blue eyed people</td>
</tr>
</tbody>
</table>

Example 2:

This example was used to teach the notion of validity and logical structure in reasoning, using *modus ponens* as an exemplar. A timely news release from the State Minister for Education, published in the main daily newspaper, was used for the purpose of contextualisation. The passage read as follows:

**SCHOOLS TO MAKE KEY DECISIONS**

Thirty State schools are to be handed greater powers under a devolution trial which could lead to parents hiring staff and principals having more control of budgets.
The trial, expected to start in term two or three, is the latest move by the Education Department to transfer key decision-making responsibilities from central office to schools.

The scheme was initially scheduled for last year but was put off after principals said they could not cope with the big changes. Over the next few weeks all principals will be asked if they want to take part in the trial and only those willing to participate will be selected.

It is understood that powers that could be transferred include the ability for school councils, comprising parents and community members, to hire teachers, determine class sizes and what specialist programs are offered. Staff salary budgets are unlikely to be included ("The West Australian", March 26, 1999, p. 9).

Students were introduced to the notion of validity and shown two examples of standard modus ponens arguments as follows, the second being deliberately chosen to demonstrate that validity is only "half the story" in sound argument.

<table>
<thead>
<tr>
<th>Reason 1</th>
<th>Reason 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>If it is fine we shall go on a picnic</td>
<td>If this animal is a pig then it can fly</td>
</tr>
<tr>
<td>Reason 2</td>
<td>Reason 2</td>
</tr>
<tr>
<td>Today is turning out to be fine</td>
<td>This animal is a pig</td>
</tr>
<tr>
<td>Conclusion</td>
<td>Conclusion</td>
</tr>
<tr>
<td>We shall go on a picnic</td>
<td>It can fly</td>
</tr>
</tbody>
</table>

They were then shown a contextualised version of modus ponens using the newspaper announcement, as follows.

<table>
<thead>
<tr>
<th>STAFF MEETING TO DISCUSS A SCHOOL POLICY ISSUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal: calls the meeting and informs staff of the issue.</td>
</tr>
<tr>
<td>Reason 1</td>
</tr>
<tr>
<td>If enough staff and parents are interested then we will offer to take part in the trial.</td>
</tr>
<tr>
<td>Staff: discuss the issue and advise the principal.</td>
</tr>
<tr>
<td>Reason 2</td>
</tr>
<tr>
<td>All staff are interested and know of many parents who would also be interested.</td>
</tr>
<tr>
<td>Conclusion</td>
</tr>
</tbody>
</table>
The school will take part in the trial.

Practical consequences, such as the School Council being able to hire teachers, determine class sizes and determine what specialist programmes would be offered were shown to follow.

The fallacious form of *modes ponens* which involves affirming the consequent was also illustrated, first with an ordinary example, and then contextualised, as follows:

**Reason 1**
If he goes out in the rain he will certainly catch a cold.

**Reason 2**
He has caught a cold

**Conclusion**
He must have gone out in the rain

**Reason 1**
If enough staff and parents are interested then we will offer to take part in the trial.

**Reason 2**
The staff consider that the school should take part in the trial.

**Conclusion**
The staff are interested and know of parents who would be interested.

Students were also given practice in identifying valid and fallacious forms of *modus ponens*, using examples such as

If a child is four it is old enough to learn to read. Jenny is four so Jenny is old enough to learn to read.

If a country increases in wealth then it increases in power.

Indonesia is increasing in power. Therefore, Indonesia is increasing in wealth.

To conclude the contextualisation, when students were shown the second half of the video "A Class Divided" they were asked to complete the following worksheet which related to the teacher's work with adults.
Reason
Brown eyed people are better than blue eyed people

Conclusions
Blue eyed people

Logical structure
Recast the teacher's comments in the form of an "If ... then ..." claim (eg "If you have blue eyes then you don't smell good"). State how a conclusion is being forced on to the audience. Why does it seem particularly unethical for a teacher to use language and logic in this way?

Example 3:

This example was used to teach the skill of evaluating reasoning, that is judging the degree of support which a reason provides for a conclusion which is drawn from it, on a five point scale of nil, weak, moderate, strong or deductively valid. Ordinary language examples were provided as well as contextualised examples which were based on lesson plans. One illustration will serve as a demonstration, using a degree of strength of "strong".

Ordinary language example
The major contagious diseases have been conquered and medical science will soon find effective cures for the degenerative diseases

Strong
When this happens life expectancy will increase dramatically

Contextualised example: lesson plan showing the reason-conclusion relationship expressed in terms of a strategies-objectives relationship
# LESSON PLAN

<table>
<thead>
<tr>
<th>Subject</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic</td>
<td>Vertebrates</td>
</tr>
</tbody>
</table>

Year 7 Date 11 March, 1998 Time 1.00 - 1.20

**Teacher's Intention**

Provide practice in classification, categorisation and develop thinking skills

**Learning Objectives:** On completing this lesson students should be able to:

1. Identify vertebrates
2. Distinguish between examples of vertebrates and invertebrates
3. State the essential characteristics of vertebrates

**Students' Prior Knowledge**

Students are accustomed to formulating hypotheses and gathering data to test them

**Preparation**

Prepare cards, pictures, concrete examples of vertebrates and invertebrates

**Methods of Achieving Objectives**

<table>
<thead>
<tr>
<th>Time</th>
<th>Teacher's Strategies</th>
<th>Students' Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 mins</td>
<td>Say &quot;I have an idea in mind and I want you to guess what it is. To help you, I will present you with some words. The words which I say are &quot;yes&quot; contain the idea and the words which I say are &quot;no&quot; do not contain the idea.</td>
<td>Students compare the characteristics of the &quot;yes&quot; examples. Contrast with the &quot;no&quot; examples.</td>
</tr>
<tr>
<td>5 mins</td>
<td>Development. Present the data.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>frog - yes snail - no</td>
<td></td>
</tr>
<tr>
<td>2 mins</td>
<td>shark - yes earthworm - no</td>
<td></td>
</tr>
<tr>
<td>1 min</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
whale - yes spider - no

Ask: "What is the idea I had in mind?"
Accept range of answers
Obtain general agreement on the concept - provide more examples if necessary (eg dog/caterpillar; lobster/boy)

Students formulate and test hypothesis
Students describe the essential characteristics of the idea

Evaluation
Students' Achievement of Objectives

STRATEGIES (REASONS)
Strong
OBJECTIVES (CONCLUSIONS)

Conclusion

A formal evaluation of the unit EDP 1101 will be conducted at the end of the semester. This evaluation will provide a comparison with earlier, similar evaluations of first year education students, who have been taught critical thinking and responded with adverse comments, specifically concerning perceived irrelevance. Answers to fifteen questions relating to content, resources, lecturers' skills and assessment will be sought from all students enrolled in the unit. As well, specific comments on the critical thinking component will be requested. Until the results of this data gathering are known, no conclusions can be drawn as to the success or otherwise of the infusion approach, based upon a logical sequence of critical thinking skills, which has been described in this paper. Informal, anecdotal records, however, suggest that present students are more accepting of the relevance of critical thinking than previous students have been, relevance being perceived both to their teacher education course and to their future profession. Perceptions of irrelevance in the particular version of the infusion approach used in EDP 1101 do not appear to be a problem in the conduct of tutorial classes. Cautious optimism might therefore suggest that teaching thinking skills as described may be useful for consideration by other higher education teachers.

In a further research study, these students will also become part of an ongoing, longitudinal study which is designed to determine any correlation, or causal correlation, between adeptness at critical thinking, as measured by a test administered in EDP 1101, and teaching proficiency, as evaluated in a specially designed format by mentoring teachers during a ten week assistant teacher practice in students' fourth (and final) year of their teacher education course.
References


