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'Not quite right': helping students to make better arguments

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This paper looks at the need for a better understanding of the impediments to critical thinking in relation to graduate student work. The paper argues that a distinction is needed between two vectors that influence student writing: (1) the word-level–sentence-level vector; and (2) the grammar–inferencing vector. It is suggested that much of the work being done to assist students is only done on the first vector. This paper suggests a combination of explicit use of deductive syllogistic inferences and computer-aided argument mapping is needed. A methodology is suggested for tackling assignments that require students to 'make an argument'. It is argued that what lecturers understand tacitly, now needs to be made a focus of deliberate educational practices.

Keywords: inference-making; critical thinking; argument

Introduction

When students write essays for assessment they are required to meet several demands. Their work must be grammatically sound, stylistically literate and well argued. At the highest levels of scholarship (honours level and postgraduate study) students should demonstrate some degree of independent thinking, and – if possible – some originality in their approach. Furthermore, students must meet the conventions for scholarly attribution. This includes skills in avoiding plagiarism by means of careful and accurate paraphrasing. Paraphrasing, in turn, requires skills in capturing the 'essence' of someone else's work by means of careful explanation: making subtle distinctions, carving out alternative positions, presenting the scope of arguments accurately. Achieving all this is no mean feat, and it is no wonder that increasingly more students need to avail themselves of dedicated learning assistance.

By far the greatest challenge, however, is demonstrating 'critical thinking'. Quite often this requirement goes unspecified in essay topics and is unstated by lecturers. It is assumed that students will 'think critically'. When it is explicitly mentioned as a requirement that students must meet, critical thinking is often stated in vague terms. For example, lecturers exhort in lectures that students should 'critically analyse' material, demonstrate skills in 'argumentation', 'question the material given in lectures', etc. The following essay topic from a master's course in International Business is a case in point:

> Michael Porter's schema of 'industry analysis is a powerful tool for managers to think strategically about the relationships their firm has with their external environment. Is the industry in which a firm for whom you have worked (you can disguise its identity if there are issues of commercial confidentiality or you can choose another company if you

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> feel that your employment experience does not help you with this question) 'attractive' or 'unattractive'? **In making your argument** you must address each of the 'five forces' identified by Michael Porter. The **second** part of the question is to **make an argument** about whether the current state of industry 'attractiveness' will stay as it is or whether it will change over the next 3–5 years. Take care to explain why you expect this outcome. [Bold in original. The purpose of underlining will be clear later]

In this example, the requirement to 'make an argument' is stated upfront – an unusual practice in essay instructions. In most cases, the requirement is left unstated. Often it is only in the feedback comments on essays that students become aware of their shortcomings. 'You described the issue, but you did not *argue* for your main point well enough' is a typical comment that a lecturer might provide on a student's work.

Although given much emphasis in the topic above, the notion of 'argument' is not made clear. As a result, students are left mystified, and – as a consequence – academics are frequently given work that fails to make the grade.

How can the concept of 'critical thinking' be made clear? There is much recent discussion in the academic literature on the nature of critical thinking (Davies 2006; Moore 2004; Tapper 2004). However, students are not interested in academic debates about the *concept* of critical thinking. They require immediate help with how to *do* it. Critical thinking is not a natural activity, even for native speakers of English. Critical thinking is *hard*. In one study, a diverse selection of 160 people attended structured interviews over an extended period to demonstrate their critical reasoning skills. The results indicated that the majority of people could not demonstrate an adequate understanding of what constituted reliable evidence for their claims (Kuhn 1991). This problem has greater significance for international students who often have inadequate English skills, and who are trained in educational cultures that – anecdotally at least – place less stress on 'critical thinking' (Samuelowicz 1987). This paper reviews the problems students' face in doing critical thinking and looks at some practical solutions.

There are many definitions of 'critical thinking'. One is 'the examination and test of propositions of any kind which are offered for acceptance, in order to find out whether they correspond to reality or not' (The Critical Thinking Community 2004). Critical thinking is also described as a 'mental habit'. Testing propositions involves the ability to examine *inferences* from *given statements* to *given conclusions*. 'Inferences' are reliable cognitive 'links' from one proposition or statement to another. 'Argument' in the tertiary context involves the ability to make sound inferences and to examine them dispassionately. What is commonly called 'informal logic' is the academic study of these sound and unsound inferences.

In this paper, I am interested mainly in sub-linguistic inference-making as an instance of critical thinking (e.g., *if P then Q, if Q then R, therefore if P then R*). Clearly *inferences* are, to some degree, independent of language. Put another way, language is *sufficient* but not *necessary* for inference-making to occur (Walton 2005). Dogs, of course, make sub-linguistic inferences about their master holding a leash (i.e., they are about to go for a walk). Pre-verbal infants also make logical inferences about their mother's behaviour. Sub-linguistic inferences are an essential part of 'being critical'. I am not interested in any wider meaning of critical thinking, for example, rhetorical style or rhetorical writing conventions, although of course these too are important

(Atkinson 1997). The role that words and phrases such as 'therefore', 'it is argued that', etc., play is complex and involves both inferential and semantic aspects (Arapoff 1968). However, premise and conclusion indicator words can sometimes be present in student writing in the absence of any inferences or in the presence of poorly constructed inferences. We shall see an example of this shortly.

From text to argument

In the table below, the work of a postgraduate student is deconstructed in three ways: the original text (A) is first rewritten and the grammar is improved (B); the

Original text	A. As Conglom clearly indicated that it only focus on its profit without any emotion on involved in ELB, as long as ELB met its financial obligations ELB are save. When things turned bad, ELB are facing to close down. It forced the employees to only consider the financial returns. **Therefore,** there is no room for the employees to develop any new market or bulb, because it will not having good financial returns within a few years. [sic]
Error correction	B. . . . Conglom clearly indicated that *it was only focusing* on its profits. *It was not* going to be emotionally involved in ELB, as long as ELB met its financial obligations . . . When things turned bad, ELB *faced closure. Conglom would force* the employees *to consider only* the financial returns. **Therefore,** *there was no* room for the employees to develop any new *markets or lightbulbs,* because *it was not likely to have* good financial returns *over the next* few years.
Inference correction	C. *Only when companies have prospects of good market returns can they develop new markets and products and become involved with other companies.* (citation) *In the case of Conglom*, it was not going to have good financial returns over the next few years. *It was also clear that ELB was not performing well and was* facing closure. **Therefore,** there was no potential for the employees to develop any new markets or lightbulbs. *It was also clear that Conglom was not going to play an active role in its dealing with ELB.* As long as ELB met its financial obligations, *Conglom was not going to become involved in its operations. Instead it was going to concentrate* on its *own* profits.
Raw inference	D. Premise 1: If companies have prospects of good financial returns then they can develop new markets and products. (implied premise) Premise 2: Conglom was not going to have good financial returns over the next few years (reasons/support needed) Conclusion 1: **Therefore** Conglom was not likely to develop new markets and products. (invalid) Premise 3: Because Conglom was not likely to have good financial returns (from P2) it was not going to play an active role in ELB Premise 4: Conglom was not likely to have good financial returns over the next few years (from P2) Conclusion 2: **Therefore,** Conglom was not going to play an active role in ELB (valid).

grammatically rewritten version is then subject to changes which highlight the inference (C); in the final version the 'raw' argument is presented minus the supporting language structures. Note that editorial changes to the original are made in *italics.*

This student *is* trying to argue for something (i.e., he/she is not simply making an assertion). There is an attempt to draw inferences from given premises to conclusions. The use of 'therefore' is one way in which inferences are made.

While (B) is grammatically better than (A), it still does not 'feel right' and 'something appears missing' in the inference being made. (C) provides the 'missing' inferential link, a major premise unstated in both the original and the grammatically improved version: '*Only when companies have prospects of good market returns can they develop new markets and products and become involved with other companies'.* In the normal context of academic discourse conventions, support would be needed for the claim made. Hence, '(citation)' is added.

Note that while (B) is *grammatically* clearer than (A), (C) is *logically* clearer than (B), and (D) is the clearest of all, logically speaking. The difference between (B) and (C) is not, strictly speaking, a matter of language. Indeed, the language problems exhibited in (A) have been largely overcome in (B). However, (B) has significant problems: the argument is quite unclear.

(D) is provided as the final stage in the process. It shows the 'raw inferences' as a pair of deductive syllogistic inferences. The first is an invalid argument form, 'denying the antecedent' – known as modus tollens – the second is a valid form, 'affirming the antecedent' – known as modus ponens. This is a very clear way of representing academic arguments. However, it is a form of representation that is not acceptable in the tertiary context – outside its specific uses in mathematics and logic courses. Most courses require students to articulate their arguments in coherent prose. Hence, (C) is preferred.

The move from (A) to (D) can be seen in terms of a continuum from 'influences of grammar' (A) to 'influences of inferences' (D). Both clearly affect writing style. The move from (A) to (D) can be seen as vectors on a *grammar–inference* graph (see Figure 1). Students make different kinds of errors. These include micro-level mistakes, such as incorrect or missing articles and prepositions (word-level problems); and macro-level mistakes such as lack of agreement between noun and verb, conflicting tense usage or scrambled syntax (sentence-level problems). Students can have greater or lesser need for help along this continuum. This might be called a *word–syntax vector.*

A student could be competent on *one end* of an axis and not another (i.e., good at correcting syntactical mistakes but poor at identifying and correcting their own word-level errors). A student could also be competent on *one axis and not the other,* that is, they might be reasonably good at writing grammatical sentences and less competent on the other axis (i.e., less capable of providing the inferential links between premises and conclusions).

English/English as a Second Language (ESL) teachers mainly help students *along one axis only,* that is, the shaded section of Figure 1. They assist with the *grammatical* or semantic role played by terms such as 'therefore'. However, an appreciation of the unique *logical* role played by such connectors, and the lack of attention given to this function – by language teachers and linguists alike – is a long-held concern (Arapoff 1968; Horn 1969). Outside informal logic classes (given to a very small proportion of the university student population) not enough is being done to help students to make

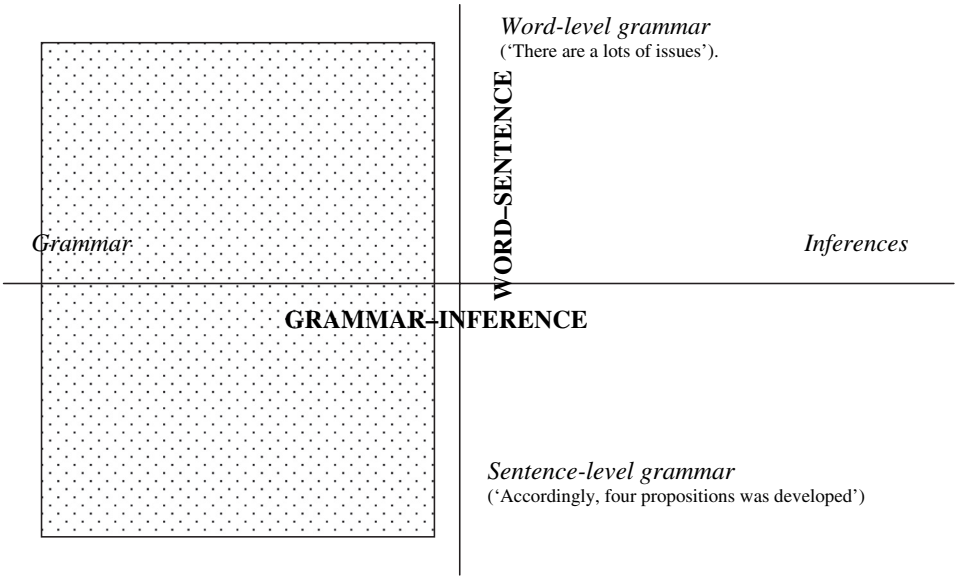

Figure 1. The grammar–inference and word–sentence vectors.

inferences. Lack of understanding about principles of inference-making explains why many students have trouble constructing clear arguments. It also explains why graduate student work is 'not quite right' (although lecturers may have trouble pinpointing what it is exactly about student work that is deficient). Lack of attention to inference-making in the educational curriculum would seem to be the cause of the problem. This omission is not insignificant. Critical thinking is a *skill;* indeed it is as much a skill as being a competent tennis player or second language user (van Gelder 2004). To be proficient requires *long-term, deliberate* and *dedicated* practice. One study estimates that competence at such a skill requires around 10 years of practice at four hours per day (Ericsson and Charness 1994).

Teachers assist students to make judicious use of argument connector language, for example, 'Therefore', 'So', 'Hence', 'Thus', but these terms are frequently misused (Davies 2003). Advice from language teachers to include such phrases assists students with problems at the *grammar* end of the grammar–inference axis. Such advice leads to only an *impressionistic* sense that an argument is being made. We have just seen an example of this. The student has inserted 'therefore' into the paper. However, the connector, by itself, does not establish a tight inferential link.

Implications for teaching graduate writing

I want to suggest a methodology for teaching inference-making. However, I want to first isolate four main reasons why the inferential dimension of student writing is being given little attention.

The generalist–specifist debate

Some view 'critical thinking' as a *genre-specific,* and *discipline-related* skill (as opposed to a *generic* skill). One proponent of this view in recent discussions on this issue is John McPeck (Moore 2004, 13). McPeck claims that critical thinking is something one acquires only in studying the language and methods of specific subjects. There is no need to explicitly use generic means – such as the use of syllogistic patterns – to teach it (McPeck 1981, 1990). Like others, I believe the specifist approach to be flawed (Quinn 1994). I argue elsewhere that the 'debate' between the 'specifists' and the 'generalists' commits the fallacy of the false alternative (Davies 2006).

The rejection of critical thinking as a skill

Some claim that critical thinking is not a 'skill' but merely a set of *public practices* of critical inquiry (Bailin 1995). According to Bailin, 'the notion of teaching critical thinking separately is incoherent. And even the notion of infusion (of general principles into different subject areas) is problematic as it seems to imply that critical thinking is something different from subject matter'. However, there are empirical studies involving 'infusion' of critical thinking into discipline areas. They show that the more generic critical skills are 'infused', the better the educational outcomes (Ikuenobe 2001, 2003; Solon 2001, 2003). This suggests that critical thinking *is* a skill that can be taught. The method to be described shortly (see Sections 'A formal procedure for teaching students to argue' and 'Argument mapping' below) if implemented properly, also demonstrates that critical thinking can be taught.

Teaching the teachers

Critical thinking is a specialist skill. University teachers, and ESL professionals, have an inadequate grasp of the *explicit* skills of argument-making. This is not to suggest that they are not good at arguing; rather, they are not always adequately informed regarding the *skills of what constitutes argumentation* (in the same way, someone can be skilled at driving without understanding vehicle mechanics). This being the case, they *cannot* adequately teach argument-making, even if they wanted to. Few ESL teachers are trained in informal logic; the same can be said for most lecturers. They might 'know it when they see it' (they have a tacit understanding), but – when pressed to explain what they require (to a student who is receiving bad grades for assessed work) – they are often far from clear. Exhorting students to 'make their points more clear', 'be critical', 'take a stand and argue for something', is bewildering and unhelpful advice.

Teaching critical thinking

Until recently, there has been no good way to teach critical thinking. Teaching critical thinking in the past has involved dull expositions of syllogistic structures that bear little relation to real-world texts (*If Socrates is a man and all men are mortal, then Socrates is mortal* is a standard argument given in informal logic classes). This has, not unreasonably, prompted the specifist approach to critical thinking, and the move away from generic critical skills. Specifists, such as McPeck and Moore, argue

that generic training is of little use to students in adapting to the critical and argumentative requirements of their disciplines. They contend that the *genre of the discipline* is necessary and sufficient for the inculcation of critical thinking. Moore's recent comment is an indication of this attitude:

> I do not wish to suggest that this type of discourse [generic, universal 'critical thinking' models] is not a valid one for our students to learn about, only that it is a mistake to see it as the model for other discursive forms that they will need to engage with, both in their studies, and later in their professional lives . . . to [do so] is pedagogically ill-conceived. (Moore 2004, 13)

We can be more sanguine about the role of teaching syllogistic inference patterns. When used in a very focussed way (as described in Section 'A formal procedure for teaching students to argue' below) it can assist students greatly. The specifist approach throws the (critical) baby out with the (generic) bathwater. Criticisms of traditional ways of teaching critical thinking – noting the irrelevance of teaching syllogisms from informal logic – has been superseded. Recent work in computer-aided argument mapping (CAAM) has breathed new life into the teaching of critical thinking that will have major implications for how the skills are taught. I discuss this method below (see Section 'Argument mapping').

Using deductive inference patterns to teach students to argue

Much can be done to improve students' ability to make arguments. One of these ways is the *explicit use* of deductive syllogisms. This requires an understanding of informal logic on the part of the instructor. It is a method that can be used to immediate effect in essay writing. Another way is the use of CAAM (van Gelder 2000). I discuss the first of these methods below. In Section 'Argument mapping' I will look at how recent argument-mapping techniques can supplement this approach.

A formal procedure for teaching students to argue

I suggest the following six-step procedure (the last two being the most important):

1. Make the issues clear by *underlining noun phrases* in the essay task (*the analysis phase*).
2. *Use a graphic representation* to indicate the areas that one has to cover – this eventually mirrors the parts of the essay (*the representation phase*).
3. Flesh out the issues into things to discuss (*the issues phase*).
4. *Determine where one stands* on the different parts of the question, that is, *research* the issues (*the research phase*).
5. Construct a deductive argument form to use in one's answer (*the argument phase*).
6. Dress the raw inference pattern in prose (*the writing phase*).

Only the first four parts of this procedure are generally covered by academic learning advisors. The final two points are generally ignored, or treated superficially. This results in badly argued student work such as that we have seen.

The analysis phase

The sample essay task given earlier has had the nouns phrases underlined. This constitutes *the analysis phase.* Isolating these noun phrases is a very useful exercise, especially (but not only) for non-native speakers of English. Many students gain poor grades for assignments simply because they have missed out on covering one or other main point. Underlining and listing the noun phrases can avoid oversights, especially with complex assignment topics.

The representation phase

Students can then move into *the representation phase* (see Figure 2). This involves a graphic representation of the parts of the essay. Points 1, 2 and 3 in the underlined list apply to the first box, point 4 applies to the second box, and so on.

The next step is to note what is required in each of the sections. The first box calls for an essentially *descriptive* account of Porter's Five Forces theory. The second and third boxes ask the writer to make a judgement *on the basis of an argument.* The fourth box requires evidence for the arguments in the second and third boxes. Initial clarity on how the topic will be represented greatly assists students. It enables the structure of the response to mirror the essay requirements.

The issues phase

Students then move into *the issues phase.* This is equivalent to 'brainstorming'. I outline issues that might be discussed in only one part of the essay topic below.

- Is your industry 'attractive' or 'unattractive' and why? (evidence/argument needed)
- To what extent can Porter's 5 Forces Model be applied in your firm/industry to explain the above? (refer to each of the forces)

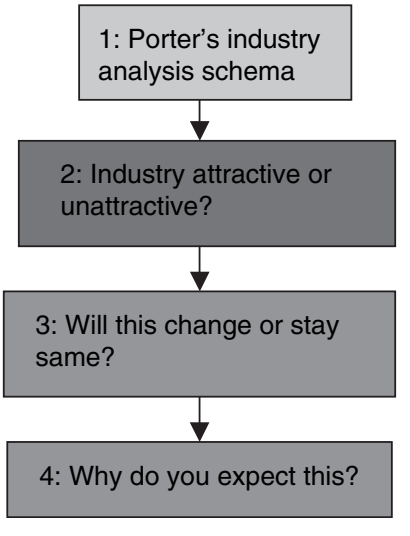

Figure 2. Representing the essay parts.

- Which of the five forces is more appropriate and why? (evidence/argument needed)
- What do different theorists say about Porter's schema regarding attractiveness/unattractiveness? Agree/disagree?

This issues list can be as long and detailed as required. This process ensures that students do not miss crucial aspects of the topic. The issues listed arise from class discussions, lecture material and the student's own reading.

However, more is needed than simply listing issues that must be discussed in the essay. The student also needs to canvas *points of view* on the topic. The students may not yet have a point of view on the topic themselves, and may not be aware of the views of others. The literature will inform and enlighten the student's own opinion. This brings us to the *research phase*.

The research phase

The research phase involves 'standing on the shoulders of giants'. Students use published material from refereed journal articles and academic books to establish the various distinct and often conflicting points of view on the topic. It is from these points of view that one can eventually derive one's own response. Naturally, good information literacy skills are needed. A simple way of finding various responses to the issues raised is to phrase the key issues as *research questions* with parallel *search statements*. In this example, this is best done by narrowing down the topic and writing an essay about a particular industry (e.g., the software industry in Thailand). In the normal course of events, the student will find a useful collection of academic material that provides evidence-based and/or well-argued points of view on the topic. Students will, of course, be influenced by this material. The process of reading and re-reading the material will inform their own thinking, and the process will be *iterative* (the more they read the more their opinion will subtlety change).

A student can now arrive at his/her *own* point of view. Recalling the essay question earlier, the student is required to *make an argument*: (a) that the industry chosen is 'attractive' or 'unattractive'; and (b) that this state of attractiveness or unattractiveness will stay as it is or change over the next 3–5 years. This stage requires some careful thinking. Suppose, as a result of initial research, and some careful thinking, the student decides the following:

a. Porter's Five Forces is only **marginally important** for explaining the attractiveness of the software industry in Thailand.
b. The attractiveness of their industry will **NOT** stay the same over 3–5 years.

These statements are opinions based on the current state of the student's knowledge of the topic (which has been influenced by their reading and experience). Unless revised further, these claims will eventually become the *thesis statements* of the writer with respect to the major parts of the essay question.

Naturally, the statements require evidential support. To support them the student moves further into the research phase. This is when the student should – using the research questions they have now devised – peruse the literature in more

detail. This is when the student finds that the possible positions available on each of the research questions are much more complex than initially thought. In helping to decide whether the literature is useful or not, students should divide a piece of paper into six columns. They should write their thesis statements on the top of the page. The six columns should be headed as follows:

- YES
- Yes, BUT
- Yes, but
- No, BUT
- No, but
- NO

'YES' indicates that the writer being studied *completely agrees* with their proposed thesis statement(s). 'Yes, BUT' indicates that the writer *mainly* agrees with the position they wish to defend; however, he or she has some major disagreements. 'Yes, but' indicates that they mainly agree with the statement but have minor disagreements. 'No BUT' indicates that overall the writer disagrees but they also have major agreements with some aspects, and so on. This provides detailed material the students can use for their own argument.

Attention to differing perspectives on the topics is useful for another reason. The students know that while they must present a clear and coherent argument themselves, they must also answer the objections and concerns of those writers who disagree with their argument. An academic essay must do more than present an opinion. It must argue for it.

The argument phase

With the research done, the thesis statements devised, and evidence for the thesis statements adequately derived from the literature, the student can move into *the argument phase.* This involves using a *deductive syllogistic argument* form to guide the connection between the premises and conclusions. A 'sound' argument, in part, is a valid *deduction with true premises*, for example:

If A then B

Not B

Therefore not A

Note that it does not matter what 'A' or 'B' is (indeed 'A' and 'B' can be nonsense words). The argument is still valid. A *valid* argument is an argument where the conclusion follows logically from the premises (i.e., the conclusion is *necessarily* derived from the premises) (The Critical Thinking Community 2004). Valid arguments are good, of course, but valid arguments also occur with *false* premises, for example,

All things made from plants are good for you

Tobacco is made from plants

Therefore, tobacco is good for you.

Clearly, more is needed than a valid argument for an argument to be 'good'. A sound argument also needs *true premises* (in the example above, the first premise is *false* yet the conclusion follows logically from the premises, that is, the argument is valid).

There are many valid deductive argument forms. Good informal logic texts provide a veritable shopping list of good and bad argument structures (Copi 1978). For example, *If A then B, if B then C, therefore if A then C* is also a valid argument. So is the argument: *If A then B, A, therefore B.* But the argument: *If A then B, not A therefore not B* is not a valid argument. Indeed, it is a fallacy (the conclusion does not follow logically from the premises). This can be seen by using substitutions for 'A' and 'B':

> If Fido is a man then Fido is mortal
>
> Fido is not a man (he's a dog)
>
> Therefore, Fido is not mortal.

Clearly, it does not follow that Fido is not mortal from the premises given.

The student needs to choose a valid argument pattern to guide the argument they wish to make, and the premises must be true (or at least plausible). The student's thesis statement might then be expressed as an argument (note that ABC are placeholders for supporting factors that need to be mentioned):

> P1: If Porter's industry analysis is to adequately explain the attractiveness of the software industry it needs to ABC.
>
> P2: Thailand's software industry *is not* ABC or *does not* indicate ABC (evidence needed).
>
> Therefore: Porter's industry analysis does not adequately explain the attractiveness of the Thai software industry (support needed).

The writing phase

The *writing phase* requires putting 'clothes' on the basic argument form. This requires not only the use of what might be called 'connector words and phrases', that is, phrases commonly used in English to *express* an inference. It also requires inferences themselves. Teachers provide useful language structures for students as a way to model good 'critical thinking'. However, as noted earlier, while language structures are important for *articulating* inferences in English, they do not necessarily provide inferential links.

The argument expressed above can be refined in prose, with an increasingly narrowly articulated research focus, and the use of references to support the points made (The example references given below are fictional, and for illustration only):

> Porter's five forces industry analysis has been used as a conceptual tool for more than 10 years (Franklin 1999; Jones 2000). Its relevance is undisputed in modern industrial western societies (Harrison 1997). However, while it has been applied to a number of industries it has not been extensively used in the industrial sector in developing countries such as Thailand (Higgins 2002). In this essay it will be argued that while Porter's five forces, especially the third, are important for most industries, they are not

> crucial in explaining the attractiveness of the software industry in Thailand. For Porter's forces to be crucial in explaining attractiveness, they need to be (. . .) However for the software industry, this is not the case due to ABC. Therefore, It will be claimed that Porter's forces are of only limited relevance to the software industry in Thailand. The essay is structured as follows: . . .

By following the method suggested, even weak students can 'make an argument' that is compelling. The *inferential* as well as grammatical axes have been satisfied and the work now 'seems right' to the reader.

Argument mapping

New developments have taken place in teaching critical thinking; namely, the technique of CAAM. This has been pioneered in Australia by van Gelder and has been demonstrated to improve academic performance under experimental conditions (van Gelder, Bissett, and Cumming 2004). How could such new developments assist in teaching students to argue? A simple argument using CAAM software is shown in Figure 3.

Argument mapping is to arguments what roadmaps are to verbal directions. They make the complex simple. The software uses a flowchart format. Arrows distinguish reasons from objections. Premises are represented by boxes. Conclusions are shown at the apex. Premises can be displayed visually to show the *reason* or *inference* to desired conclusions. Premises can be supported by various means, for example, 'common knowledge' (the box with people in it), or no grounds at all. Other kinds of support for premises can be indicated, e.g., statistical evidence, expert opinion, definitional support, and so on. Lack of grounds are indicated by question marks, as in the example given. The software also allows *grounds* for premises to be weighted

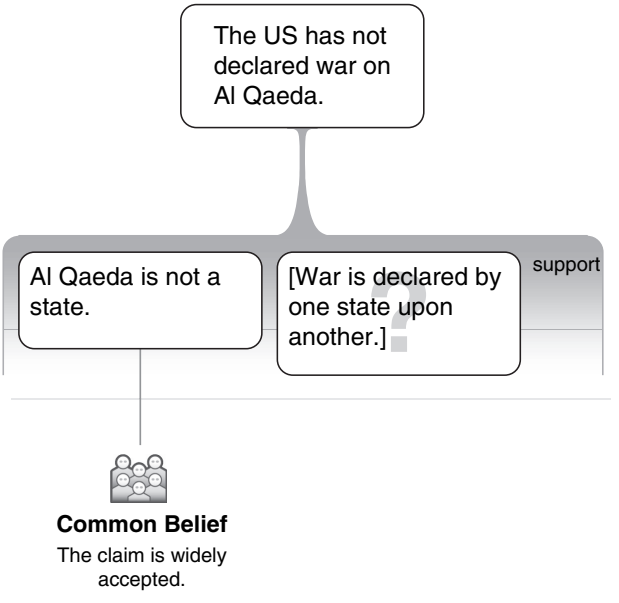

Figure 3. An argument map.

with differing degrees of plausibility. Arguments of any degree of complexity can be represented in this format. (I once saw an argument for the proposition: 'JFK was killed by a conspiracy' covering many pages.)

Armed with this technology, students could plot their own arguments – and conduct training exercises using other peoples' arguments (from 'Letters to the Editor', academic articles and textbooks) – to build up critical thinking skills. Moreover, students like doing it and feel that it helps. A pilot study at the University of Melbourne with a group of 50 students in the undergraduate subject 'Australian Economic History' resulted in outstanding evaluation results (overall 4.45/5) from students to the statement: 'The argument mapping methodology enhanced my understanding of this subject' (Davies 2008). Using argument mapping, students can see instantly whether their arguments pass muster under critical examination. They see at a glance whether their premises are, in fact, *supporting* their conclusion; whether they have *grounds* for their premises; how *plausible* these grounds are; and so on.

The software does not help students think of or write arguments in response to essay questions. This needs to be done using the method described earlier in this paper. It does, however, enable them to *represent* arguments visually. This ensures that the inferences are not clouded by surrounding text that normally envelope arguments. The method described earlier and the CAAM approach naturally support and complement each other. Plotting other peoples' arguments visually assists students in understanding good and bad arguments (sound and unsound premises, valid and invalid argument forms). This, in turn, assists students in understanding inference-making. The method also provides students with a systematic procedure for devising an argument in response to a given task. This is helped by being able to visually represent the arguments they have devised.

Conclusion

There is much to gain by adopting the practice of *explicitly* teaching inferential patterns. This practice is important for students for whom the cultural expectations of 'being critical' and 'making an argument' are not well ingrained in their respective educational cultures (i.e., international students studying overseas). This paper makes a distinction between the *word–syntax* vector and the *grammar–inference* vector. I suggest a methodology for students to use when confronted with an essay topic requires them to 'make an argument'. In conjunction with new ways of teaching argumentation (CAAM) the methodology described will assist students to confront assignments with confidence, not bewilderment. Argument-making skills need to be explicitly taught. What lecturers understand tacitly need to be made a focus of deliberate educational practices.

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