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The effects of argument mapping-infused critical thinking instruction on reflective judgement performance

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ABSTRACT

The current study compared the immediate (post-intervention) and long-term (6-months later) effects on reflective judgement (RJ) of an argument mapping-infused Critical Thinking (CT) training course versus CT training using hierarchical outlines (HO) and a no-CT training control condition in students scoring high and low on baseline CT dispositions. While previous studies have demonstrated effects of argument mapping (AM) training on CT outcomes, no AM study to date has focused on RJ outcomes and no study has examined if CT dispositions moderate the effect of AM training on RJ outcomes. AM is a method of diagrammatically representing arguments, designed to simplify the assimilation of an argument structure and facilitate analysis and evaluation of propositions and relations. Eighty-one undergraduate students scoring high and low on CT dispositions were randomly allocated to either an AM-infused CT training group, a HO CT training group or a no-CT training control group and were tested on RJ ability using the Lectical Reflective Judgement Assessment before, immediately after and 6-months after a 6-week intervention period. Results revealed a main effect of CT disposition, with higher CT disposition associated with higher RJ scores at all testing times. Students scoring low on CT dispositions, trained through AM, showed a significant increase in RJ performance from pre-to-post-testing. Conversely, students scoring high on CT dispositions, trained through AM, showed a decrease in RJ performance from pre-to-post-testing; whereas both the HO and control groups showed a significant increase in RJ performance from pre-to-post-testing. Findings are discussed in light of research and theory on RJ development and the best practices for CT instruction through AM.

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1. Introduction

The ability to metacognitively think about thinking (Flavell, 1976; Ku & Ho, 2010b) and the ability to apply critical thinking skills to a particular problem implies a reflective sensibility and the capacity for *reflective judgement* (King & Kitchener, 1994). Reflective judgement is a metacognitive process that is used in the context of critical thinking to judge and make decisions in a reflective manner. Critical thinking, in turn, is a metacognitive process that, through the use of a number of sub-skills (i.e. analysis, evaluation and inference; see Facione, 1990b), increases the chance of drawing a logical conclusion or solution (Dwyer, 2011; Dwyer, Hogan, & Stewart, 2012; Dwyer, Hogan, & Stewart, 2014).

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Though many diverse conceptualisations of CT exist (e.g. Bensley, 1998; Dewey, 1910, 1933; Dwyer, Hogan, & Stewart, 2011; Dwyer et al., 2012; Ennis, 1987; Glaser, 1941; Halpern, 2003, 2010; Paul, 1993) and debate is ongoing over its definition and the core skills necessary to think critically, one definition and list of skills stands out as a reasonable consensus conceptualisation of CT. In 1988, a committee of 46 experts in the field of CT gathered to discuss both a definition and the skills necessary to think critically. The report of the findings of this meeting, known as *The Delphi Report*, defined CT as:

> ". . .purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based" (Facione, 1990b, p. 3).

Furthermore, the Delphi panel overwhelmingly agreed, with a measure of 95% consensus, that *analysis, evaluation* and *inference* were the core skills necessary for CT (Facione, 1990b). The definition of CT provided by the Delphi Report was adopted by the American Philosophical Association and as a result, became the accepted definition for CT (Beckie et al., 2001; Sorensen and Yankech, 2008). At the same time, models of CT continue to develop and recent definitions of CT emphasise, for example, argumentation, verbal reasoning, hypothesis testing, judging likelihood and uncertainty and problem-solving (Halpern, 2003, 2010).

While different conceptualisations of CT have shed considerable light on the nature and meaning of critical thinking, at the same time, it is often acknowledged that CT skills require time to develop (Dawson, 2008a; Halpern, 2003; King & Kitchener, 1994; Kuhn, 1999). Moreover, there is no consensus as to how best develop CT skills. In order for CT to develop to a high level, related dispositions and metacognitive processes may be needed to support CT skill development and to aid in the successful application of CT to real-world problems. Reflective judgement is one such metacognitive process that can aid in the support, development and application of CT.

Like critical thinking, reflective judgement is an important skill for students to acquire and practice, because it may facilitate their ongoing acquisition and application of knowledge both inside and outside of school and university (Huffaker & Calvert, 2003; U.S. National Research Council, 2002). According to King and Kitchener (1994), reflective judgement (RJ) is an individuals' understanding of the nature, limits and certainty of *knowing* and how this can affect how they defend their judgments and reasoning in context. Moreover, RJ involves the ability of an individual to acknowledge that their views might be falsified by additional evidence obtained at a later time (King & Kitchener, 1994).

The ability to acknowledge levels of certainty and uncertainty when engaging in critical thinking is important because sometimes the information a person is presented with (along with that person's pre-existing knowledge) provides only a limited source of information from which to draw a conclusion. This is often the case when a person is presented with an ill-structured problem (King, Wood, & Mines, 1990), that is, a problem that cannot be solved with absolute certainty (Wood, 1993). In the context of uncertainty, a combination of critical thinking skills (i.e. analysis, evaluation and inference – as described by the *Delphi Report*; Facione, 1990b) and reflective judgement is often necessary in situations where one seeks to arrive at a reasonable conclusion or decide upon a reasonable course of action (Dewey, 1933; King & Kitchener, 2004; Wood, 1993).

Kuhn (2000) provides an important perspective on metacognition in this context. Specifically, Kuhn defines metacognition by reference to three types of knowing, which differ in terms of their declarative, procedural, and epistemological focus. The first form of metacognition, *metacognitive knowing*, refers to a type of declarative knowledge – the knowledge a person may possess in relation to cognition. The second form of metacognition, *metastrategic knowing*, involves procedural knowledge – a person's knowledge about cognitive processes and of their impact on performance. Finally, the third form of metacognition, *epistemological knowing*, refers to an individual's understanding of what knowledge and knowing are in general, and how one comes to know Kuhn and colleagues have argued that these metacognitive skills are the "intellectual skills most closely associated with critical thinking", given that it is "through such coordination processes that knowledge is acquired" (Kuhn & Weinstock, 2002, p. 18).

Consistent with Kitchener and King's (1981) and King and Kitchener's (1994) model of reflective judgement (RJ), Kuhn's perspective on metacognition is developmental in nature, in that "thought" and its associated processes can gradually become more and more open to self-awareness as one develops, and subsequently, more easily self-regulated. Notably, as metacognition develops a critical thinker can select and monitor the cognitive strategies they plan to apply, and according to Kuhn (1999, p. 18) "to be competent and motivated to "know how you know" puts one in charge of one's own knowing, of deciding what to believe and why and of updating and revising those beliefs as one deems warranted."

Also worth noting, the distinction between metastrategic and metacognitive knowledge skills can be likened to the differences between two components of long-term memory: procedural memory/knowledge (knowing how to do something – metastrategic) and declarative memory/knowledge (knowing something – metacognitive). These skills are important given the dependence of both CT and RJ on memory processes (Halpern, 2003; Maybery, Bain and Halford, 1986). Epistemological knowledge/understanding is a somewhat different type of knowledge as it refers to an individual's broader, philosophical understanding of knowledge. For example, according to Kuhn (1999), one must ask: *How does anyone know anything?* and/or *What do I know about my own knowing?* Notably, epistemological knowledge/understanding, as described by Kuhn, is most closely aligned with King and Kitchener's perspective on RJ, which pertains to an individuals' understanding of the nature, limits, and certainty of *knowing* and how this can affect how they defend their judgments and reasoning and modify their judgments and reasoning over time (King & Kitchener, 1994).

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