Chapter 5
Re–Conceptualizing Calibration Using Trace Methodology

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ABSTRACT
In this chapter, the authors challenge the traditional differentiation between metacognitive monitoring and control in text-based self-regulated learning (SRL). Building on Pieschl (2009), the authors presented a case for conceptualizing and measuring calibration as the interaction between metacognitive monitoring and control under the assumption that learners adjust metacognitive judgments as they monitor and control their learning both within and between trials. To this end they describe three separate but related measures of calibration – assessment, internal, and strategic calibration – to address such questions as what kind of test will be given; how will I perform on such a test; and what can I do to improve my performance, respectively. Each type of calibration is mutually exclusive; however, overall calibration accuracy relies on the hierarchical interplay among all three types. Finally, they provide examples of how trace data for each type of calibration may be collected in a multimedia-learning environment.

INTRODUCTION
Relationships between the accuracy of metacomprehension judgments and effective self-regulated learning (SRL) are a pivotal feature of the SRL literature (e.g., Glenberg, Sanocki, Epstein & Morris, 1987; Maki & Serra, 1992; Winne, 1997). Metacomprehension judgments are learners’ relative (socially or norm-referenced) and absolute (criterion-referenced) judgments of text comprehension. All SRL models are fundamentally concerned with metacognitive control as this is the mechanism by which actions, based on predictions about metacognitive performance, forge the self-regulation process (e.g., Boekaerts, Pintrich & Zeidner, 2000; Pintrich, 2000; Winne & Perry, 2000; Zimmerman, 2000). Thiede, Anderson and Therriault (2003) illustrate the importance of metacomprehension to SRL by providing evidence of a statistically detectable positive correlation

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between metacomprehension judgment accuracy and SRL performance. Unfortunately, it is equally clear that learners, in general, are notoriously poor judges of the accuracy and extent of their learning (for a review, see Thiede, Griffin, Wiley & Redford, 2009). For example, a recent study by Thiede, Griffin, Wiley and Redford (2009) found that average judgment accuracy measured by gamma coefficients in more than 34 studies and 57 experiments over the last 28 years was .27.

This paper provides a unique perspective on the formulation and measurement of metacomprehension judgments. We posit such fine grained measurement of multiple intervals in the judgment process allows educators to pinpoint and correct heuristic biases resulting in judgment inaccuracy and thus provide effective support and guidance to improve students’ self-evaluation and learning process.

Multiple contextual and cognitive factors associated with metacognitive judgment have been proposed in the metacomprehension literature including: test-judgment grain size alignment (Dunlosky, Rawson & Middleton, 2005), immediate vs. delayed recall (Thiede & Anderson, 2003), prior assessment experiences (Moore, Lin-Agler & Zabrucky, 2005), deceptively simple text (Lin, Zabrucky & Moore, 2002; Weaver & Bryant, 1995) and ineffective study strategies (Griffin, Wiley & Thiede, 2008; Thiede, Griffin, Wiley & Redford, 2003). As well, multiple factors outside of the learners’ direct control have been identified, such as self-esteem and locus of control (Garner & Alexander, 1989), individual interest (Lin & Zabrucky, 1998), test anxiety (Miesner & Maki, 2007), and working memory span (Griffin, Wiley & Thiede, 2008). In line with Winne and Perry (2000) we label the former factors “state” and the latter “trait”. State factors are differentiated from trait by the possibility for relatively simple and short term manipulation. In contrast, individual traits are expected to be stable within context and resistant to researcher manipulation.

In the following chapter we concentrate primarily on state factors, as this data is most relevant to the learning technology we introduce and discuss in this chapter. However, we acknowledge the interdependence of learners’ traits and states and intend to focus future research on measuring both factors. The scope and intent of the current chapter does not allow us to comprehensively review all state correlates of metacomprehension inaccuracy; instead, we concentrate on a selected review of interventions in the cognitive and educational psychology literatures theorized to improve calibration within our proposed theoretical model and traditional measures of calibration. Specifically, we investigate the links between heuristic cues and metacomprehension calibration (e.g., Linderholm, Zhao, Therriault, & Cordell-McNulty, 2008; Rawson & Dunlosky, 2002; Rawson, Dunlosky, & Thiede, 2000).

We propose the trichotomous calibration model (TCM) wherein intermediate judgments made throughout the learning process are considered as requisite for metacomprehension calibration. Specifically, in line with Pieschl (2009) we argue that traditional calibration can be further deconstructed into three parts: (1) assessment calibration; (2) strategic calibration; and (3) internal calibration. Assessment calibration refers to the match between learners’ ability to interpret the learning context to estimate the depth, complexity, and coverage of an upcoming assessment and actual qualities of a task. Strategic calibration concerns the match between learning strategies a learner surveys and then chooses, relative to needs for developing knowledge and skills perceived to be required by the task. Strategies are defined here as the aggregate of two or more actions (tactics) enacted to achieve a predefined end. Lastly, internal calibration refers to the accuracy of metacomprehension judgments of future performance based on learners’ assessment prediction. Contingent on assessment prediction accuracy, learners accurately calibrated in all three forms will be better positioned to maximize metacomprehension judgment accuracy. Over time, feedback
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