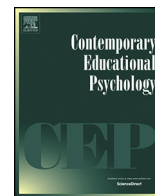




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Measuring epistemic thinking within and across topics: A scenario-based approach

Sarit Barzilai ^{a,*}, Michael Weinstock ^b

^a Department of Learning, Instruction, and Teacher Education, Faculty of Education, University of Haifa, 199 Abba Hushi Boulevard, Mount Carmel, Haifa 3498838, Israel

^b Department of Education, Ben-Gurion University of the Negev, Beer-Sheva 84105, Israel

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ABSTRACT

The topic-sensitive and multidimensional nature of epistemic thinking makes the assessment of how people think about epistemic matters an ongoing challenge. This paper reports the development and validation of a scenario-based assessment of epistemic thinking that is based on the conceptualization of epistemic development proposed by Kuhn and her colleagues. The objectives of developing the instrument were to improve the validity and reliability of the assessment of epistemic perspectives described by the model, to better represent the multidimensionality of these perspectives, and to better account for their topic-specific aspects. The multi-phase development process included cognitive interviewing, a pilot study, and a large-scale administration. Exploratory and confirmatory factor analyses generally supported the expected structure of three main epistemic perspectives (absolutism, multiplism, and evaluativism). However, validity and reliability were better in a biology scenario than in a history scenario. The results suggested that epistemic perspectives include the epistemic dimensions of certainty and source/justification as lower-order factors. Comparison of the biology and history scenarios revealed meaningful similarities and differences in epistemic thinking regarding the two problems. The theoretical and methodological implications of the proposed assessment approach are discussed.

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1. Introduction

Educational and psychological studies of what is popularly called “personal epistemology” (Hofer & Pintrich, 2002), “epistemic cognition” (Greene, Azevedo, & Torney-Purta, 2008; Kitchener, 1983), or “epistemic thinking” (Kuhn & Weinstock, 2002) investigate how everyday people—as opposed to trained philosophers—think about questions of knowledge and justification. Identifying or evoking reliable answers has been the challenge of measurement. Because of different views regarding the structure of epistemic thinking and the circumstances in which types of epistemic thinking occur, there is a lack of consensus about what should be measured and how it should be measured, despite areas of agreement about the basic construct. Most attempts to develop paper-and-pencil assessments of epistemic thinking have conceptualized epistemic thinking as a set of independent beliefs (e.g., Hofer, 2000; Schommer, 1990; Schraw, Bendixen, & Dunkle, 2002). The alternative approach, that people’s understandings of epistemic matters are interrelated and can

be viewed as integrated positions or perspectives (e.g., King & Kitchener, 1994; Kuhn, 1991), has been less often and less successfully addressed using quantitative measures.

This study focuses on the development and validation of a written assessment of epistemic thinking based on Deanna Kuhn’s conceptualization of the development of epistemic understanding (Kuhn, 1991, 2001; Kuhn, Cheney, & Weinstock, 2000; Kuhn & Weinstock, 2002). The theoretical framework developed by Kuhn and her colleagues outlines a developmental trajectory that describes key obstacles that need to be overcome in order to achieve mature epistemic understanding. This model argues that the core challenge of epistemic development is the challenge of coordinating the objective and subjective dimensions of knowing (Kuhn & Weinstock, 2002). The tensions of negotiating the objective and subjective aspects of knowing have been found to underlie performance in diverse areas such as juror reasoning, argumentation, and learning from multiple information sources (e.g., Barzilai & Eshet-Alkalai, 2015; Barzilai & Zohar, 2012; Kuhn, 1991; Mason & Scirica, 2006; Weinstock, 2011; Weinstock, Neuman, & Glassner, 2006). Thus this model contributes to the understanding of thinking in everyday problems and particularly to the understanding of how people deal with the diversity of knowledge. Although the model posits that education produces the types of epistemic change it describes, the conditions that support and sustain these changes have not been sufficiently explored.

* Corresponding author. Department of Learning, Instruction, and Teacher Education, Faculty of Education, University of Haifa, 199 Abba Hushi Boulevard, Mount Carmel, Haifa 3498838, Israel. Fax: +972-4-8240911.

E-mail address: sarit.barzilai@edu.haifa.ac.il (S. Barzilai).

Theoretical approaches that construe epistemic thinking as integrated positions or perspectives have mostly relied on interview techniques (e.g., Baxter Magolda, 1992; Belenky, Clinchy, Goldberger, & Tarule, 1986; King & Kitchener, 1994; Kuhn, 1991; Perry, 1970/1999; Weinstock & Cronin, 2003), and to a lesser degree on paper-and pencil assessments (yet see Galotti, Clinchy, Ainsworth, Lavin, & Mansfield, 1999; Krettenauer, 2005; Kuhn et al., 2000; Wood, Kitchener, & Jensen, 2002). Indeed, because of the complexity of epistemic thinking, researchers of epistemic development have explicitly stated that paper-and-pencil assessments cannot replace interviews but can only offer a rough indication of some aspects of people's epistemic positions (Kuhn et al., 2000; Wood et al., 2002). Nonetheless, although qualitative methods can indeed provide a much more detailed and nuanced portrait of epistemic thinking, there is a need to complement such methods with quantitative measures that enable assessment among larger and more diverse samples and in varied research settings that do not always allow for qualitative assessment. Furthermore, employment of multiple assessment methods can also help improve measurement reliability through triangulation of multiple data sources.

Therefore, the primary objective of the current study was to develop a more valid and reliable written assessment of Kuhn et al.'s model. Two additional objectives were to offer a measure that better represents the multidimensionality of people's epistemic perspectives and to better address their topic-specific aspects. Particularly, the assessment was designed with the aim of enabling measurement of epistemic thinking regarding ill-structured problems that can give rise to multiple solutions or arguments. Such problems can help reveal how people deal with the diversity and complexity of knowledge. Furthermore, asking respondents to reason about various ill-structured problems can also help address variability in epistemic thinking across topics and domains.

In the next sections we first present the theoretical framework employed in the current study. The challenges of measuring epistemic thinking are then discussed and the advantages and limitations of previous assessments of the Kuhn et al. model are described, leading to the considerations that guided the development of the current assessment.

1.1. Kuhn et al.'s model of epistemic development

Kuhn and Weinstock described epistemic thinking as “theory-in-action” (Kuhn & Weinstock, 2002, p. 134). This view suggests that individuals have tacit theories or perspectives regarding knowledge and knowing that come into play in the course of everyday knowledge judgments and construction. These “theories-in-action” inform the ways in which individuals undertake tasks but are also activated in and shaped by contexts, such as task conditions, content domains, and social and cultural values and practices (Kuhn et al., 2000; Kuhn, Iordanou, Pease, & Wirkala, 2008; Kuhn, Zillmer, Crowell, & Zavala, 2013; Tabak & Weinstock, 2008). This view of epistemic thinking differs from the construct of epistemological beliefs (Schommer, 1990). Rather than assuming that there are sets of relatively stable and generalizable beliefs about different dimensions of epistemology, the “theory-in-action” approach holds that epistemic thinking is about something and will emerge in multidimensional forms when people engage in thinking about specific knowledge claims and information sources. As will be described in more detail later, this view has consequently employed research instruments that assess epistemic thinking through reasoning about specific problems, in contrast to standard self-report belief surveys.

The developmental trajectory described by the Kuhn et al. model bears important similarities to the trajectories described by other models of epistemic development (for a comparison of these models see Hofer & Pintrich, 1997). However, the Kuhn et al. model was expressly constructed with the aim of clarifying and simplifying the

theoretical and empirical analysis of epistemic development in order to facilitate the “anchoring” of epistemic development in broader cognitive and social development (Kuhn & Weinstock, 2002). The Kuhn et al. model argues that the central task of epistemic development is the coordination of objective and subjective dimensions of knowing (Kuhn & Weinstock, 2002). Initially, epistemic understanding is dominated by the objective dimension. The objective dimension is then undermined and supplanted by a subjective view of knowing. The ultimate challenge of epistemic development is coordinating the objective and subjective dimensions of knowing so that neither overrides the other (Kuhn & Weinstock, 2002).

This progression is captured by three main epistemic positions or perspectives: An *absolutist* perspective that knowledge is objective, located in the external world, and certain; a *multiplist* perspective according to which the source of knowledge is the individual and knowledge is therefore multiple, subjective, uncertain, and cannot be adjudicated; and an *evaluativist* perspective that considers knowledge as constructed and acknowledges uncertainty without forsaking the need for and value of evaluating knowledge production. Kuhn and Weinstock have also outlined several interim positions (a more detailed presentation of the model is available in Kuhn & Weinstock, 2002; Weinstock & Cronin, 2003).

1.2. Multidimensionality of epistemic thinking

Researchers have argued that epistemic thinking concerns multiple issues or dimensions, such as the sources, justification, or certainty of knowledge (e.g., Chinn, Buckland, & Samarapungavan, 2011; Hofer & Pintrich, 1997; Pillow, 1999; Schommer, 1990). The degree of coherence and interrelatedness of these epistemic dimensions has been a topic of much debate in the personal epistemology literature (Hammer & Elby, 2002; Hofer & Pintrich, 1997; Schommer-Aikins, 2004). As originally conceived, the Kuhn et al. model emphasized the interrelatedness of multiple dimensions of individuals' epistemic perspectives without conceptualizing the dimensions as independent factors. However, there have been some attempts to empirically detail dimensions of epistemic understanding in the Kuhn et al. model (Feucht, 2011; Yoed & Levin, 2007). In a similar vein, several researchers have attempted to relate specific epistemic dimensions to the epistemic positions described by the Kuhn et al. model (Greene, Torney-Purta, & Azevedo, 2010; Hofer, 2001). For example, Greene et al. (2010) have proposed a model in which each epistemic position is described in terms of a profile of beliefs along three dimensions.

Yet, there have generally been few attempts to define development within epistemic dimensions according to the perspectives identified by the Kuhn et al. model. When designing the current assessment, we took into account multiple dimensions of epistemic thinking and conceptualized progression within these dimensions according to the Kuhn et al. model. However, although epistemic dimensions served as one of the touchstones of the current research, we approached them as interrelated aspects of people's “theories-in-action”.

1.3. Domain and topic-specific aspects of epistemic thinking

Multiple studies have documented considerable variability in epistemic thinking across and within knowledge domains. This has led several researchers to propose that epistemic thinking is multi-layered and includes general epistemic beliefs and domain-specific epistemic beliefs that are reciprocally interacting (Buehl & Alexander, 2006; Muis, Bendixen, & Haerle, 2006). These claims are supported by research that has shown that domain-specific beliefs are related to domain-general beliefs and that domain-specific beliefs are related across domains (Buehl & Alexander, 2006; Hofer, 2000; Muis et al., 2006). Research from recent years has revealed that

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