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Do children express curiosity at school? Exploring children's experiences of curiosity inside and outside the school context[☆]Tim Post^{*}, Juliette H. Walma van der Molen

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1. Introduction

In the last decade, the stimulation of children's epistemic curiosity in primary school has gained much attention (e.g., Engel, 2011; Jirout & Klahr, 2012; OECD, 2015; Pellegrino & Hilton, 2012; Spencer, Lucas, & Claxton, 2014). Epistemic curiosity is the desire to seek and acquire new intellectual information (Berlyne, 1954; Loewenstein, 1994; Piotrowski, Litman, & Valkenburg, 2014). International education policies increasingly promote the implementation of school curricula that aim to teach children about the epistemological importance of curious thinkers to society (National Research Council, 2012; Osborne & Dillon, 2008; Spencer et al., 2014). Such understanding is believed to entail not only factual knowledge about (scientific) discoveries made in the past, but also an understanding of the nature of knowledge-development itself and the social interaction that it requires (Fouad, Masters, & Akerson, 2015; Osborne & Dillon, 2008; Trevors, Muis, Pekrun, Sinatra, & Muijselaar, in press). To this end, education policy-makers increasingly call for investigative approaches to learning in primary school that engage children with discussions about knowledge-development or current socio-scientific issues. Such interactions may teach them about the tentative nature of scientific ideas and the epistemological importance of curious questions and ideas (Abd-El-Khalick, 2012; Kashdan, 2004; Lucas, Claxton, & Spencer, 2013).

In addition to fostering children's conceptions about the importance of curious question asking for the development of knowledge in general, researchers increasingly advocate the educational value of developing children's *own* epistemic curiosity (Baehr, 2013; Claxton, 2007; Claxton & Carr, 2004; Engel, 2011; Engel & Randall, 2009; Jirout & Klahr, 2012; Pellegrino & Hilton, 2012; Ritchhart, 2002; Tamdogon, 2006). Decades of developmental studies have shown that children's epistemic curiosity forms a key driver of their intellectual development (Chouinard, 2007; Cook, Goodman, & Schulz, 2011; David & Witryol, 1990; Kashdan & Roberts, 2004; Kashdan, Rose, & Fincham, 2004; Loewenstein, 1994; Piaget, 1952; Spielberger & Starr, 1994). Within educational settings, children's epistemic curiosity is associated with wonderment (Opdal, 2001; Pluck & Johnson, 2011), question-asking (Jirout, 2011; Jirout & Klahr, 2012), and explanation-seeking behavior (Arnone & Grabowski, 1992; Berlyne, 1954; Litman, Hutchins, & Russon, 2005). Epistemic curiosity is believed to enhance children's persistence with learning (Metz, 2008; Simon, 2001; von Stumm, Hell, & Chamorro-Premuzic, 2011) and to improve children's memorization of information (e.g., Gruber, Gelman, & Ranganath, 2014; Hassan, Bashir, & Mussel, 2015; Jepma, Verdonschot, Van Steenbergen, Rombouts, & Nieuwenhuis, 2012; Kang et al., 2009). Thus, researchers suggest that primary education should not only aim at developing children's *understanding* of how knowledge is developed, but also at fostering their *willingness* to express and pursue their own epistemic questions and ideas about subject matter to improve their own learning (Lucas et al., 2013; OECD, 2015; Pellegrino & Hilton, 2012; Spencer et al., 2014).

However, despite the seemingly widespread agreement on the importance of curiosity-eliciting educational content and pedagogy in primary schools, it seems that most primary school teachers devote little time to fostering children's curiosity (Engel, 2011, 2013; Engel & Randall, 2009). Research suggests that teachers often feel uncomfortable with stimulating children to express curious questions about topics that the teachers themselves often do not know the answers to (e.g., van Aalderen-Smeets, van der Walma, and

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Asma, 2011; Ramey-Gassert, Shroyer, & Staver, 1996; Ricketts, 2014; Schoon & Boone, 1998; Van Booven, 2015). Furthermore, in many countries, children are generally taught that there is just one correct answer to teachers' questions and that alternative explanation seeking – by being curiously minded and critically reflective – is disruptive to teacher-directed instruction (Claxton, 2007; Claxton & Carr, 2004; Rojas-Drummond et al., 2017). It seems likely that such everyday school practices will, over time, lead children to develop misconceptions about the educational value of being curious and may guide them away from their natural habit of questioning and exploring (Marx & Harris, 2006; McCombs, Daniels, & Perry, 2008). This reality is clearly not in line with the assumption that children's curiosity is vital to meaningful and complex learning and that, therefore, curiosity-eliciting learning activities should be made an integral part of children's education.

The question thus arises how we could bridge this gap between theory and practice. Unfortunately, scientific progress has been generally slow in this regard. While Maw and Maw (1964) were among the first to develop a measuring procedure for teachers to assess curiosity in children, it was only recently that researchers such as Jirout and Klahr (2012) and Engel (Engel, 2011, 2013; Engel & Randall, 2009) brought a renewed urgency to its scientific investigation (see also Luce & Hsi, 2014). For the last 60 years, curiosity research has been mostly negligent of the formal education context and focused primarily on the study and measurement of curiosity in adults. Or, when studies did concern children, mostly focused on their curiosity behavior in isolated or artificial laboratory settings (e.g., measuring the extent to which a child investigates a particular toy). Most notably, there seems to be a lack of understanding of what children *themselves* think of curiosity. Many researchers and policy-makers have attempted to define curiosity *for* children, but curiously enough, in our review of the literature, we did not come across any studies that investigated children's *own* conceptions of what it means to be curious, either in or outside of the school setting.

In our view, these shortcomings hinder the effective development of curiosity-focused lesson content and pedagogy. Our lack of insight into children's general (mis)conceptions, feelings, and experiences of curiosity at school prevents us from classifying what aspects of their curiosity are generally underdeveloped and may thus hamper their potential curiosity engagement in the classroom. As has been well-established in the learning-sciences, in order for any educational change to occur, we should first understand children's pre-existing knowledge concepts and experiences about the topics or issues at hand, before we can effectively build-up their awareness, knowledge, skills, or attitudes (e.g., Bransford, Brown, & Cocking, 2000). In our view, this approach applies to the development of any pedagogy, and thus also to fostering children's curiosity.

Therefore, in the present study, we attempted to gain a better understanding of children's pre-existing concepts and experiences about 'being curious learners' at school and at home. Our goal ultimately is, of course, to design educational interventions and to set up teacher professionalization and we are aware of the importance of teacher-pupil and parent-child interactions in the development of children's epistemic curiosity. However, in order to effectively develop such curiosity-focused lesson content and pedagogy, for the present study, we deemed it necessary to focus specifically on children's *own* perceptions and experiences of curiosity.

In the following section, we first provide a brief overview of the main perspectives that have been postulated to describe the concept of 'curiosity' and we will touch on some of the methodological issues that have been raised to stimulate and measure children's curiosity behavior. Subsequently, we present the rationale of the present study and our research questions.

1.1. Defining, measuring, and promoting curiosity

Traditionally, curiosity is described in terms of behavioral characteristics. Berlyne (1954, 1960, 1978) was the first to classify four types of curiosity behavior: *perceptual* curiosity (i.e., aroused by novel visual, auditory, or tactile experiences and reduced by exploration), *epistemic* curiosity (i.e., a desire for intellectual engagement or acquiring knowledge), *specific* curiosity (i.e., a desire for specific knowledge or information), and *diverse* curiosity (i.e., aroused by boredom or stimulation seeking). Berlyne's multi-dimensional view of curiosity received much attention in subsequent research (e.g., Byman, 2005; Kashdan et al., 2009; Litman, 2008; Loewenstein, 1994) and encouraged others to characterize more 'specialized' curiosity behaviors, such as *scientific* curiosity (e.g., Jirout & Klahr, 2012), *information-seeking* curiosity (e.g., Litman & Spielberg, 2003), and *cognitive, physical and social* curiosity (e.g., Litman & Pezzo, 2007; Reio, Petrosko, Wiswell, & Thongsukmag, 2006).

These efforts have resulted in many curiosity behavior descriptions and related measurement instruments. However, many of these curiosity descriptions were later criticized for showing poor psychometric validity and reliability, containing too much conceptual overlap (Grossnickle, 2014), or requiring too demanding, complex or subjective measuring procedures (Mussel, 2010; Woo, Harms, & Kuncel, 2007). For instance, Silvia (2006) notes that behavioral observation measures of curiosity often show positive correlations with respondents' IQ levels or teachers' perceptions of students' intellectual status, rather than measuring curiosity per se. Furthermore, many scholars equate 'interest' with 'curiosity' and thus perceive curiosity as possessing cognitive, affective, and character variables (Ainley, 2006; Baehr, 2013; Kashdan & Silvia, 2009). Others have indicated that many self-report measures include item descriptions of states and traits of curiosity that are too abstract, such that respondents – especially children – find it difficult to understand and self-assess such descriptions (Chambers & Johnston, 2002; Jirout & Klahr, 2012).

In addition, no widely accepted conceptualization yet exists of what exactly causes children to be curious (Grossnickle, 2014). Berlyne (1954, 1960, 1978) suggested that curiosity could be best understood in terms of both state aspects (i.e., evoked by situational determinants) and trait aspects (i.e., relatively stable aspects that are explained by individual differences). Berlyne viewed curiosity as a psychological drive that is predominantly caused by environmental conflict (e.g., experiences of complexity, novelty, and surprise). Loewenstein (1994) suggested that curiosity is produced by unpleasant feelings of knowledge deprivation that motivate information-seeking behavior to diminish such feelings (see also Jirout & Klahr, 2012). Deci (1975), on the other hand, suggested that curiosity might be caused by the degree to which a person perceives himself or herself to be competent to bridge a particular knowledge gap.

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