Developmental Psychology

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Online First Publication, September 3, 2012. doi: 10.1037/a0029870

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0012-1649/12/$12.00 DOI: 10.1037/a0029870

Engagement in Philosophical Dialogue Facilitates Children's Reasoning About Subjectivity

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Theories of learning have long emphasized the essential role of social factors in the development of early reasoning abilities. More recently, it has been proposed that the presentation of conflicting perspectives may facilitate young children's understanding of knowledge claims as potentially subjective—one of many possible representations of the world. This development in epistemological understanding has been proposed to be an important determinant of academic performance and is highly correlated with the ability to understand and produce sound argumentation in adolescents and adults. In a longitudinal study of children 7–8 years old, we assessed the effects of a 3-month philosophy class designed to engage children in dialogic interaction with peers. We examined the influence of this intervention on children's epistemological understanding and argumentation skills in 4 domains of knowledge: aesthetic, value, social, and physical. Participation in dialogic interaction in an elementary school classroom improved children's ability to construct their own and opposing arguments across domains and facilitated reasoning about the subjectivity of knowledge in the value domain.

Keywords: epistemological understanding, argumentation skills, cognitive development, philosophy education, dialogue

Coming to recognize that the mind influences the representation of knowledge and contributes to the formation of beliefs is a major cognitive milestone in childhood (e.g., Astington, Harris, & Olson, 1988; Flavell, Mumme, Green, & Flavell, 1992; King & Kitchener, 1994; Perner, 1991). By the age of 7 years, children begin to show explicit understanding that knowledge is open to a variety of interpretations (Kuhn, Cheney, & Weinstock, 2000) and that beliefs are not direct reflections of reality but rather mental representations of the world. A mature understanding of the subjectivity of knowledge facilitates the eventual coordination of the subjective and objective dimensions of knowledge and the ability to evaluate one's own claims and the claims of others (e.g., Kuhn et al., 2000).

Development of Epistemological Understanding and Argumentation Skills

Researchers have traditionally proposed stage-like developmental changes in children's understanding of knowledge (see Hofer & Pintrich, 2002, for a review). For example, Kuhn (1991) proposed three major levels of epistemological understanding. At the *absolutist* level, children believe that knowledge claims are the expression of an individual's belief and that the truthfulness of these claims may be evaluated by comparison to an external, objective reality. As such, knowledge is understood as the gradual accumulation of true facts. At the *multiplist* level, the objectivity of early childhood is replaced by a newfound subjectivity, in which knowledge is reconceptualized as a product of human minds and therefore open to interpretation. Multiplist strategies of reasoning include the recognition that people's varying exposure to different experiences may lead to differences in their knowledge and that it is therefore possible for people to hold conflicting beliefs about the same event (Taylor, Cartwright, & Bowden, 1991). Distinct claims are therefore interpreted as representing equally valid interpreta-

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Thomas E. Wartenberg is the author of a commercially available book that outlines the philosophy program used in this research but was not involved in data collection or analyses and only provided training to teachers and input on curriculum development. The study is not an endorsement of this particular curriculum.

The authors thank the parents and children of the Pioneer Valley Chinese Immersion Charter School in Hadley, Massachusetts, and the International School of Boston in Arlington, Massachusetts, who participated in the study. We are grateful to Kathleen Wang, Leigh Doherty, and the second grade teachers for their support and aid in recruiting participants and to Ariel Sykes and Nicole Giambalvo from the Mount Holyoke philosophy department for teaching the philosophy and art history classes. We also thank Tania Lombrozo for her comments on an earlier version of this article, as well as Brian Waismeyer and Joshua Abbott for their statistical support. Finally, we thank Angelina Hawley, Erin O'Connor, and Kerrie Pieloch for their help in conducting all aspects of this research, the psychology department at Boston College for contributing funds for travel, and the Squire Foundation for their support of the philosophy program.

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tions of a subjective reality. While explicit recognition of the subjectivity of knowledge claims has long been proposed by stage theorists as occurring around preadolescence (Kuhn et al., 2000), there is a growing body of evidence on children's early trust in testimony indicating that children are capable of discriminating the validity of knowledge claims well before the age of 6 years (e.g., Clément, 2010; Clément, Koenig, & Harris, 2004). Finally, the eventual integration of objective and subjective elements of knowing leads to the *evaluativist* level. Individuals at this level understand that the knowledge generated by human minds is nevertheless open to objective evaluation—each individual weighs the relative value of claims in light of available evidence (Kuhn et al., 2000).

While the development of epistemological understanding has been demonstrated to follow a predictable sequence of strategies, the timing and appearance of these strategies vary substantially depending on how understanding is assessed (see Hofer & Pintrich, 2002) and which domain of knowledge is considered (e.g., Kuhn et al., 2000). Kuhn and colleagues (2000) compared the development of epistemological understanding from age 10 to adulthood in five knowledge domains: preference (e.g., whether warm summer days or cool autumn days are nicest), aesthetic (e.g., whether one piece of art is better than another), social (e.g., whether people commit crimes for one reason or another), value (e.g., whether lying is always wrong or sometimes right), and physical (e.g., whether the brain works according to one theory or another). To assess epistemological understanding, experimenters introduced two characters who disagreed about a series of claims, and participants were asked whether only one character could be right or whether both characters' claims could possess "some rightness" (Kuhn et al., 2000). Those who answered that both could be right were then asked whether one character could be "more right than the other." A response that only one character could be right was scored as absolutist. A response that both characters could be right and that neither character could be more right was scored as multiplist. And a response that both could have some rightness and that one could be more right was scored as evaluativist.

Results provided initial evidence for domain differences in the progression of reasoning strategies about knowledge claims, and this finding has been reproduced in younger children (Wainryb, Shaw, Langley, Cottam, & Lewis, 2004). The large amount of variation in the development of epistemological understanding challenges the originally proposed stage-model. However, the distinctions that have been drawn between absolutist, multiplist, and evaluativist reasoning continue to provide a useful framework for examining children's shifting strategies when reasoning about the objective and subjective dimensions of knowledge claims.

Children's epistemological understanding has been proposed to be an important determinant of academic performance in a variety of educational and practical domains (Kuhn et al., 2000; Kuhn & Park, 2005; Kuhn & Udell, 2007). One cognitive skill that appears to be highly correlated with epistemological understanding is the ability to understand and produce sound argumentation (e.g., Mason & Boscolo, 2004). It has been proposed that the ability to consider the subjective element of knowledge may underlie the relationship between epistemological understanding and argumentation skills (Felton & Kuhn, 2001; Kuhn & Crowell, 2011; Kuhn & Udell, 2007). According to Kuhn and Udell (2007), unskilled arguers focus too heavily on providing sufficient support for their own claims, while ignoring the counterclaims of their opponent. Novices therefore fail to consider the dual objectives in argumentation: the need to evaluate the perspective of the interlocutor and the need to formulate a response that clarifies the merits of one's own position. This process of coordinating conflicting perspectives involves embracing the potential subjectivity of knowledge claims—a skill that is developing over the course of early childhood.

The Role of Dialogic Interaction

One factor that may be important to the development of children's beliefs about knowledge is engagement in dialogic interaction with peers. When engaging in dialogue and exploring potentially conflicting perspectives in a naturalistic context, children acquire evidence for the subjectivity inherent in knowledge claims. Dialogue-based pedagogy has therefore been proposed to encourage the development of knowledge about *how* to think critically, as well as *what* to think critically about (Felton, 2004; Kuhn et al., 1997; Reznitskaya et al., 2009). In a review of the literature on the educational importance of collaborative discourse, Galchan and Light (1982) concluded that cognitive benefits are most pronounced when students offer support for their own opinion and counterarguments against a conflicting claim through dialogue.

Until recently, however, little research has been conducted on how this type of collaborative discourse may be incorporated into educational contexts (Kuhn & Crowell, 2011; Nussbaum, 2008) and the effects of such a pedagogical framework on the development of reasoning about knowledge claims. A recent study by Kuhn and Crowell (2011) showed that adolescents at the middle school level who engaged in dialogic interaction over the course of multiple semesters and who were taught to produce relevant evidence for both sides of a topic improved in their ability to build a case based on evidence in written arguments. While results of this previous research demonstrated that argumentation skills can be fostered and assessed in the classroom, Kuhn and Crowell's method was not intended to be accessible to younger children. In contrast, the current study was based on a short-term, dialogue-based pedagogical intervention accessible to students as young as 7–8 years old. Unlike the intervention in Kuhn and Crowell's study, the intervention we introduced did not directly teach argumentation skills but simply exposed children to the presence of conflicting viewpoints among their peers.

Overview of Current Study

In the current study, we explored the effects of dialogic interaction on the development of argumentation skills and epistemological reasoning strategies in 7- to 8-year-old second graders. The particular intervention that was used to foster dialogic inquiry was a program called "Teaching Children Philosophy" (Wartenberg, 2009), which is one of several Philosophy for Children (P4C) programs designed to teach elementary school children to engage in philosophical discussion about children's literature (Lipman, 1981). Previous research has shown that having teachers solicit explanations from students (with some prompting for elaborative thinking) is essential for fostering collaborative discourse (e.g., Webb et al., 2008). This type of student-focused model is the central pedagogical technique used by P4C programs.

We administered two types of assessments in a pre- and posttest design: an argumentation skills task and an epistemological understanding task. We hypothesized that engagement in philosophical dialogue would lead to improvement in children's ability to support their perspective and consider opposing perspectives when confronted with conflicting claims (argumentation skills), and to a shift in reasoning strategies toward a greater proportion of multiplist or evaluativist responses (epistemological understanding).

Method

Participants

A total of 41 second graders (ages 7 and 8) participated. Twenty-three children (age range: 7 years 0 months through 8 years 0 months, $M = 7$ years 5 months, $SD = 0.26$, at pretest; 14 girls) were from a single second-grade class at an international public charter school in Massachusetts, and most of these children were English–Chinese bilinguals (Group A). Eighteen children (age range: 7 years 1 month through 8 years 1 month, $M = 7$ years 5 months, $SD = 0.17$, at pretest; seven girls) were from a single second-grade class at an independent French–English bilingual school in Massachusetts, which matched the demographic criteria of the Group A charter school (Group B).

Materials and Procedure

Research design. Research was conducted over the course of a single academic year. The argumentation skills task was administered to Group A; the epistemological understanding task was administered to Groups A and B combined.

The 23 children in Group A were randomly assigned to either the philosophy or control intervention for the first semester and received the other intervention in the second semester. Eleven received the philosophy class in the first semester and 12 the philosophy class in the second semester. Each philosophy session occurred once a week for a 12-week semester and was taught by an instructor trained in the Teaching Children Philosophy method who read a preselected picture book aloud to the children. An art history intervention served as the control intervention for the argumentation skills task. The same teacher taught both the philosophy and the art history classes for each group, and art history and philosophy classes were identical in length and frequency. Teachers (and all school staff) were blind to the hypotheses of the study.

The 41 children tested on epistemological understanding consisted of the 23 children in Group A (all of whom had received the philosophy intervention in either the first or second semesters) and the 18 children in Group B who were given no intervention and who served as the control group.

Philosophy intervention. Books were chosen on the basis of their philosophical content, and together represented many of the standard fields of philosophy—epistemology, metaphysics, ethics, aesthetics, existentialism, philosophy of mind, political philosophy, and philosophy of language. For example, epistemology was introduced as children read *I Know the Moon* (Anderson, 2001), in which several characters argue for their own concept of the moon. Metaphysics was introduced as children read *Let's Make Rabbits* (Lionni, 2010), in which a rabbit cut out of paper and a rabbit depicted in a drawing eat a real carrot and thereby become real themselves. Children were introduced to ethics as they read *The Giving Tree* (Silverstein, 1964), in which a tree gives selflessly to her human friend until she has nothing left. They were introduced to aesthetics as they read *Emily's Art* (Catalanotto, 2001), in which a girl enters an art contest and then wonders how the judge knows which piece of art is the "best." Dialogue about the issues followed, prompted by the instructor's open-ended questions. At the beginning of each philosophy class, children were introduced to six rules for discussion: (a) state your position, (b) figure out if you agree or disagree, (c) present a real example, (d) present a counterexample to a claim that has been proposed, (e) offer a revised version of the claim, and (f) support your position (for a detailed description of the methods and book modules, see Wartenberg, 2009).

Art history intervention. The art history class was designed to be as similar as possible to the philosophy class, but without any dialogical interaction. The class read a children's book each week about a well-known artist (e.g., Leonardo da Vinci, Henri Matisse) and then created an art project inspired by the artist of the week.

Argumentation skills task. The argumentation skills task was administered over three time points: a pretest administered 1 week prior to the first semester (Time 1), Posttest 1 administered 1 week after the end of the first semester (Time 2), and Posttest 2 administered 1 week after the end of the second semester (Time 3). Testing took place in 20-min, one-on-one sessions with an experimenter who was blind to the child's group (philosophy first or second semester). All sessions were audio recorded.

The argumentation skills task was adapted from an assessment originally designed by Valle, Tighe, and Hale (2009). In the task, children are presented with a four-page illustrated book depicting conflicting claims chosen for their relevance for young children. Each page represents a conflicting claim from one of four domains of knowledge: (a) aesthetic (e.g., rock music is better/classical music is better), (b) value (e.g., children should/should not be allowed to have candy in school), (c) social (e.g., children learn more from family/friends), and (d) physical (e.g., there is/is not life on other planets). On each page, children were presented with both sides of the conflicting claim. The following is an example from the value domain:

> Some school lunchrooms offer soda and candy to students. Some people say that soda and candy should be sold in the lunchroom at school. They think that kids should decide what they eat and drink. Other people say that soda and candy should not be sold in the lunchroom at school. They think that parents should decide what kids eat and drink.

Children were asked to report the side with which they agreed. Children were then asked the following four questions: (a) "Why do you agree with that side?" (*own argument*), (b) "Can you be sure that you are right?" (*certainty*), (c) "Is it possible you could learn something new that would make you change your mind?" (*falsifiability*), and (d) "What would someone from the other side say if he or she were trying to convince you that he or she was right?" (*opposing argument*). The order of presentation of the four knowledge claims was randomized, and three versions of each book were created, one for each order. To avoid practice effects, we arranged for one third of the children to receive each version at each time point, so that each child received a novel set of claims

at each of the three testing sessions. Pilot testing showed that the three versions of the task were highly correlated and yielded no difference in performance, $F(2, 20) = 0.012$, $p = .99$.

Coding responses. Questions assessing the child's *own* and *opposing arguments* were scored from 0 to 4. Zero points were awarded in cases where no answer was provided (e.g., "I don't know"). One point was awarded if the child simply chose a side or repeated the claim provided in the book (e.g., "Children should not have candy in school because parents should decide what they eat"). Two points were awarded if the child used the word *evidence* or *proof*, or recognized the need for evidence by citing some form of irrelevant supporting information (e.g., "Children should not have candy in school because there is proof that parents should decide what they eat," or "Children should not have candy in school because school is for learning math"). Three points were awarded if the child provided relevant but anecdotal evidence from personal experience (e.g., "Children should not have candy in school because once I got a tummy ache from too much candy"). The full 4 points were awarded if the child supported the chosen side with relevant, nonanecdotal evidence (e.g., "Children should not be allowed to have candy in school because parents know what is good for their kids, and they know that sugar will make kids crazy, and they won't be able to sit still in class"). Thus, children could receive up to 16 points for the *own argument* questions and 16 points for the *opposing argument* questions, yielding a total of 32 possible points. Two trained raters blind to the child's assigned group independently scored responses. Interrater reliability was high, with a mean of 95% agreement ($r = .91$). All remaining disagreements were resolved by a third party.

Questions assessing children's *certainty* and their beliefs about *falsifiability* were scored from 0 to 2. One point was awarded when responses indicated lack of absolute certainty, and 1 point when children endorsed the potential falsifiability of their chosen claim. Children could therefore receive up to 2 points for each of the four knowledge claims, yielding a total of 8 possible points for these items.

Epistemological understanding task. Epistemological understanding was assessed once at the beginning and once at the end of the academic year. Two groups were compared: those who received a one-semester philosophy intervention during that academic year (Group A) and those who received no intervention (Group B). Testing took place in 15-min one-on-one sessions with one experimenter. All testing sessions were audio recorded.

An adapted version of Kuhn et al.'s (2000) epistemological understanding task was administered. Children were shown vignettes in which two characters (puppets) take opposing sides of a conflicting claim. Children were asked whether "only one character could be right" (absolutist [A] response) or whether "both could have some rightness." Children who chose the "both" response were then asked whether "one may be more right than the other" or whether "both are equally right" (a multiplist [M] and an evaluativist [E] response, respectively).

Four domains of knowledge (aesthetic, value, social, and physical) were represented, with three vignettes from each domain. We did not include the domain of personal preferences from the original assessment tool developed by Kuhn et al. (2000) because maturity in this domain does not include a later evaluativist strategy (Kuhn et al., 2000). Children therefore provided a total of 12 responses, with each answer coded as representing one of three epistemological strategies. An absolutist answer (A)—the least mature answer—was given a score of 1, a multiplist answer (M) was given a score of 2, and an evaluativist answer (E)—the most mature answer—was given a score of 3. Since each domain contained three items, scores could range from a total of 3 to 9 for each domain.

We assessed epistemological understanding by analyzing the mix of children's strategies for each domain, indicated by a three-letter string that notes the combination of A, M, and E strategies employed across the three items. There were a total of 10 possible combinations of strategies that children could employ for the three items each domain: AAA, AAM, AAE, MMA, AME, MMM, MME, EEA, EEM, and EEE. Additionally, we also calculated the predominant or modal response for each domain. For example, a child was considered to have used a predominantly absolutist strategy for a given domain when two out of three items were answered with an absolutist strategy. In the rare cases in which a child answered each of the three items in a domain with a different response (AME) and therefore no pattern predominated, the participant was considered to be employing a predominantly multiplist strategy (in line with the original coding scheme proposed by Kuhn et al., 2000). This pattern accounted for fewer than 5% of participant responses.

Results

Argumentation Skills Task

Performance on the argumentation skills task was analyzed by two two-way analyses of variance (ANOVAs). Preliminary analyses showed no effect of or interactions with knowledge domain, and this was therefore not included as a factor in the final analyses. The first ANOVA was a Group (philosophy first semester, art history first semester) × Time (Time 1, Time 2) repeated-measures ANOVA with total score (out of 32) as the dependent variable. Time 1 served as the pretest and Time 2 served as the posttest for both groups. The second ANOVA was identical except that here we compared performance between Times 2 and 3.

Figure 1 displays mean combined *own* and *opposing argument* scores for each domain. Consistent with our hypothesis, there was an interaction between group and time, $F(1, 21) = 5.49$, $p > .05$, $\eta^2 = .21$, with children in the first semester philosophy group demonstrating significantly greater improvement than those in the

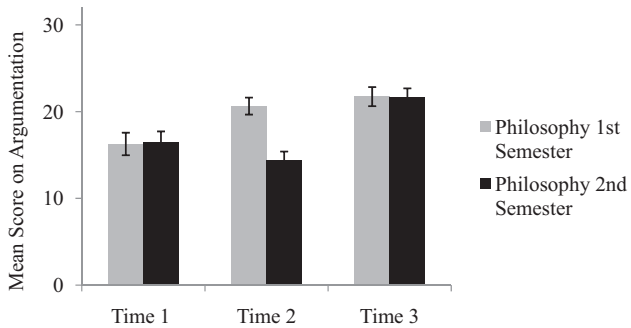

Figure 1. Mean score (out of 32) on argumentation skills for children receiving philosophy intervention either semester.

first semester art history group following the first semester intervention. We conducted one-way ANOVAs using Bonferroni adjusted alpha levels of .025 per test (.05/2) to analyze simple effects at each time point. There was no difference in argumentation skills between the philosophy and control group at Time 1 (pretest), $F(1, 23) = 0.01$, $p = .96$, $d = 0.02$. At Time 2, there was a significant effect of group, with the first semester philosophy group outperforming the first semester art history control group, $F(1, 23) = 10.06$, $p < .01$, $d = 1.33$. A paired-samples t test on children's scores at Time 1 and Time 2 revealed that the scores of the philosophy group increased significantly from pretest to posttest, $t(10) = -2.59$, $p < .05$, $d = 0.75$ while the scores of the control group remained stable, $t(11) = 0.957$, $p = .36$, $d = 0.37$.

The repeated-measures ANOVA for Time 2 to Time 3 revealed a main effect of time, $F(1, 21) = 24.56$, $p < .001$, $\eta^2 = .54$, and a significant interaction between group and time, $F(1, 21) = 13.30$, $p < .01$, $\eta^2 = .39$, with children in the second semester philosophy group demonstrating significantly greater improvement than those in the second semester art history control group following the second semester intervention. A one-way ANOVA conducted to analyze simple effects at Time 3 (long-term posttest for the first semester philosophy group and posttest for the second semester philosophy group) revealed no difference between groups, $F(1, 21) = 0.01$, $p = .95$, $d = 0.03$. These results demonstrate that the improvements seen in the first semester philosophy group did not decline following a subsequent semester without further philosophy training.

To examine these improvements further, we conducted a two-way Group × Time (Time 1, Time 2, Time 3) repeated-measures ANOVA to analyze children's responses to each of the two argument types individually. Because own and opposing argument questions assessed performance on distinct argumentative skills—producing arguments that support one's own views and producing arguments that support alternative perspectives (see Mercier, 2011)—we were particularly interested in assessing whether the philosophy intervention targeted one skill over the other or both equally.

Responses to both types of questions paralleled the overall pattern of performance on the task. While scores on responses supporting the child's own argument were generally higher than those on responses supporting the opposing argument at both pre- and posttests ($M = 9.52$, $SD = 3.18$, and $M = 6.83$, $SD = 3.88$, respectively, at pretest), performance on both types of responses showed similar patterns of improvement ($M = 12.13$, $SD = 2.47$, and $M = 9.52$, $SD = 3.95$, respectively, at Time 3). There was a significant effect of the philosophy intervention on children's own arguments, $F(2, 42) = 7.01$, mean square (MS) $= 45.15$, $p < .01$, $d = 0.92$, and opposing arguments, $F(2, 42) = 6.99$, $MS = 44.68$, $p < .01$, $d = 0.69$. However, there was no effect of the intervention on children's certainty or beliefs about the falsifiability of their views, $F(2, 42) = 1.278$, $p = .27$, $d = 0.14$.

Epistemological Understanding Task

To determine whether there were group differences on the epistemological understanding task at pretest, we used participant scores (0–9) to conduct a mixed design, one-way ANOVA, with one between-subjects factor (combined first and second semester philosophy groups [Group A] vs. the no-intervention control group [Group B]) and four within-subject factors (aesthetic, value, social, and physical domains). There were no differences between groups in any of the domains at pretest: aesthetic domain, $p = .437$, $d = 0.24$; value domain, $p = .679$, $d = 0.13$; social domain, $p = .604$, $d = 0.15$; and physical domain, $p = .183$, $d = 0.42$. Scores in the value domain were lower for both groups ($M = 4.10$, $SD = 1.25$) compared with the rest of the domains (aesthetic domain, $M = 5.93$, $SD = 0.61$; social domain, $M = 5.76$, $SD = 1.11$; and physical domain, $M = 5.68$, $SD = 1.01$), $p < .01$, with the majority of children's responses in the value domain indicating a predominantly absolutist strategy mix (33 out of 41 children). For each of the other three domains, children's responses indicated a predominantly multiplist strategy mix (34 out of 41 children in the physical domain, 36 out of 41 children in the aesthetic domain, and 31 out of 41 children in the social domain). In no domain did the majority of children begin with a predominantly evaluativist strategy mix. Table 1 shows the frequency of each strategy mix for both the no-intervention and philosophy intervention participants, as well as the most frequent strategy used in each of the four domains at pretest.

Posttest data were further analyzed by calculating change scores for each domain. Seven children in the philosophy group and three in the control group scored at ceiling (answering at least two of three items with an evaluativist response) at pre- and posttest in a particular domain and were therefore excluded from our analysis of change scores. No child scored as evaluativist at pretest in all four domains, and thus no children were fully excluded. Instead, we excluded individual domain responses that were at ceiling. The total number of children included in the posttest analysis thus varies slightly across domains. The number of data points that were dropped due to a ceiling effect from each group was roughly equivalent across groups (7.6% in the philosophy group and 4.2% in the control group). Table 2 shows the number of remaining cases included in the posttest analysis for each domain after participant data were excluded.

Change scores were calculated for each item assessing children's performance at posttest. A child was given a score of 1 for each item in which the response indicated an *improvement* in the strategies used (e.g., moving from an absolutist strategy to a multiplist strategy on any individual item). A score of 0 was given for each item in which there was no improvement. Because there were three items in each domain, a total change score between 0 (*no improvement on any item*) and 3 (*improvement on all three items*) was calculated for each participant in each of the four domains.

One-way ANOVAs, with group as the between-subjects factor, were conducted for each domain with change scores as the dependent variable. Results appear in Figure 2. There was no effect of group for the aesthetic domain, $F(1, 38) = 0.67$, $p = .42$, $d = 0.28$; the social domain, $F(1, 39) = 2.40$, $p = .13$, $d = 0.51$; or the physical domain, $F(1, 39) = 0.14$, $p = .71$, $d = 0.11$. The frequency of each strategy mix for these three domains appears in Table 3. There was, however, a significant effect of group for the value domain, $F(1, 38) = 19.64$, $p < .001$, $d = 1.48$: children who received the philosophy intervention showed a greater shift toward more mature strategies ($M = 1.33$, $SD = 0.80$) than did those who received no intervention ($M = 0.35$, $SD = 0.49$). This shift in the strategy mix for the combined philosophy group in the value domain from pre- to posttest is illustrated in the figure in the Appendix. While the majority of children responded with a predominantly absolutist strategy at pretest (19 out of 21

Table 1
Frequency of Each Strategy Mix and Predominant Strategy Type on Epistemological Understanding at Pretest

	Aesthetic domain		Value domain		Physical domain		Social domain	
Strategy mix	Control	Philosophy	Control	Philosophy	Control	Philosophy	Control	Philosophy
AAA	0	0	10	12	1	0	1	1
AAM	0	1	2	2	1	1	1	4
AAE	0	1	2	5	1	1	0	1
Predominantly absolutist	0	2	**14**	**19**	3	2	2	6
AMM	2	3	1	1	5	8	2	0
AME	0	2	1	1	2	1	3	4
MMM	14	13	1	0	6	7	7	9
MME	1	1	0	0	2	3	3	3
Predominantly multiplist	**17**	**19**	3	2	**15**	**19**	**15**	**16**
AEE	1	2	1	0	0	0	0	1
MEE	0	0	0	2	0	2	1	0
EEE	0	0	0	0	0	0	0	0
Predominantly evaluativist	1	2	1	2	0	2	1	1

Note. Each letter in the strategy mix refers to the type of epistemological strategy employed (A = absolutist, M = multiplist, E = evaluativist). The predominant strategy with the highest frequency for each domain is shown in bold type. AAA, AAM, AAE, AMM, AME, MMM, MME, AEE, MEE, and EEE = 10 possible combinations of strategies that children could employ for the three items each domain.

children in the philosophy group and 14 out of 17 in the control group), approximately 63% of children in the philosophy group who had responded with a predominantly absolutist strategy at pretest shifted to a predominantly multiplist or evaluativist strategy at posttest. In contrast, all but two children in the control group maintained the same predominant strategy.

Discussion

There are few pedagogical techniques that have been shown to support the development of critical thinking skills and epistemological understanding in very young children. The study reported here demonstrates that children as young as 7 or 8 can improve their argumentation skills and epistemological understanding as a function of engagement in dialogue. These findings contribute to the growing theoretical understanding of how dialogic inquiry and naturalistic exposure to conflicting beliefs may foster the development of these important cognitive skills.

We have demonstrated a clear impact of dialogic interaction on children's argumentation abilities when the subjective dimension was built into the task: children were presented with two sides of a conflicting claim and asked to consider both perspectives. Following the intervention, children demonstrated greater skill in their capacity to generate an argument, and this improvement was maintained following a subsequent semester without further training. These results provide support for the impact of exposure to dialogic interaction on argumentation skills in very young children. Importantly, children not only improved in their ability to provide evidence for their own perspective but also improved in their ability to generate compelling arguments for the opposing view, demonstrating their capacity to attend to the subjective element in generating a novel argument. Whether these findings are domain general or domain specific remains to be determined, and future research should investigate the extent to which these skills transfer to unrelated subjects. For example, it remains to be seen whether improving argumentation skills in one domain (e.g., literature) will transfer to improved argumentation skills in another domain (e.g., chemistry).

In the epistemological understanding task, in which children's willingness to view claims in each domain as *potentially* subjective were assessed, the effect of dialogic interaction appeared most clearly in the value domain. Here children who received the philosophy training demonstrated a striking shift from a general unwillingness to entertain multiple perspectives to accepting that people *could* in fact hold opposing perspectives. This result is particularly surprising because previous research has indicated that the value domain is one of the last areas in which children come to incorporate the subjective dimension (Kuhn et al., 2000; Wainryb et al., 2004). In fact, a variety of studies examining children's conception of value judgments regarding issues of morality have demonstrated that these issues are often interpreted by young

Table 2
Number of Participants in Each Domain Following Exclusion of Those Scoring as Evaluativist at Pretest

Group	Aesthetic domain	Value domain	Social domain	Physical domain
Philosophy	21	21	22	21
Control	17	17	17	18

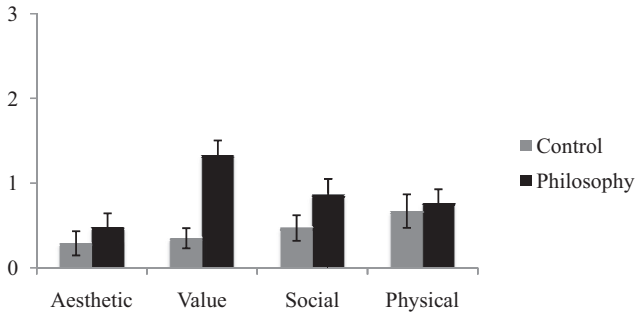

Figure 2. Mean change in predominant strategy on epistemological understanding task. Time 1 = pretest administered 1 week prior to the first semester; Time 2 = Posttest 1 administered 1 week after the end of the first semester; Time 3 = Posttest 2 administered 1 week after the end of the second semester.

children as being nonsubjective, nonrelative, nonarbitrary, and prescriptive across contexts, regardless of individual circumstances (see Turiel, 1998, for a review).

In response to these findings, some researchers have suggested a categorical distinction between factual information and value judgments (e.g., Wainryb, 1991). For example, it has been proposed that because values tend to focus on how the world "should be," beliefs about values may not represent an external reality in the same way as empirical facts. Despite these claims, a recent study conducted by Krettenauer (2004) demonstrated that epistemic development in the domain of moral judgments is highly correlated with and structurally analogous to epistemic development regarding empirical knowledge and may therefore be reasonably compared with epistemic progress in empirical domains.

Given this finding, why did the philosophy intervention have such a focused and dramatic effect on the value domain? Moral psychologists have emphasized the essential role of dialogue and debate for the development of moral reasoning in childhood and adolescence (Bloom, 2010; Haidt & Bjorklund, 2007), and it is possible that there is something specific about this domain that makes it particularly susceptible to dialogic interaction. However, some of the topics used in the value domain (e.g., whether children should be able to choose what they eat and drink) do not properly fall under the category of moral reasoning in the traditional sense. Further, previous research examining the role of dialogue has demonstrated effects in areas that are unrelated to reasoning about values. For example, research conducted by Kuhn, Iordanou, Pease, and Wirkala (2008) suggested that dialogic interaction aids in the development of skilled scientific thinking as well (see also Sandoval & Reiser, 2004).

We suggest that the most promising explanation for the localized maturation in the value domain relates to the level of children's epistemological understanding prior to the philosophy intervention. The value domain was the one domain of knowledge in which most participants relied upon predominantly absolutist reasoning strategies at pretest (see Table 1). The progression from absolutist to multiplist reasoning is predicated upon the discovery of the subjective element of knowledge, and the philosophy intervention specifically targets the addition of subjectivity by having students engage in dialogue with one another. Thus, it is perhaps not surprising that the greatest impact of the philosophy intervention was to initiate the movement from absolutist to multiplist responses. Because coming to terms with the subjective nature of knowledge claims is a necessary precursor to epistemic maturity, we interpret this shift as indicating substantial progress in the early development of epistemic cognition. It may be the case that the intervention was simply unable to initiate the epistemological shift from multiplist to evaluativist reasoning strategies so early on in development—perhaps due to some other developmental con-

Table 3
Frequency of Each Strategy Mix and Predominant Strategy Type on Epistemological Understanding at Posttest

	Aesthetic domain		Physical domain		Social domain	
Strategy mix	Control	Philosophy	Control	Philosophy	Control	Philosophy
AAA	0	0	0	0	0	1
AAM	1	0	2	2	0	0
AAE	0	1	1	0	1	1
Predominantly absolutist	1	1	3	2	1	2
AMM	1	0	6	3	6	4
AME	0	0	2	5	1	2
MMM	13	18	3	6	5	6
MME	1	1	3	3	4	4
Predominantly multiplist	**15**	**19**	**14**	**19**	**16**	**16**
AEE	0	0	1	1	0	1
MEE	0	1	0	0	0	2
EEE	1	0	0	1	0	1
Predominantly evaluativist	1	1	1	2	0	4

Note. Each letter in the strategy mix refers to the type of epistemological strategy employed (A = absolutist, M = multiplist, E = evaluativist). The predominant strategy with the highest frequency for each domain is shown in bold type. AAA, AAM, AAE, AMM, AME, MMM, MME, AEE, MEE, and EEE = 10 possible combinations of strategies that children could employ for the three items each domain.

straint. Further longitudinal research will be necessary to address these remaining issues.

Our findings support broad claims regarding the role of social factors in learning and reasoning and provide evidence that exposure to contrastive beliefs in the context of collaborative discourse may impact the development of early reasoning about subjectivity (de Vries, Lund, & Baker, 2002; Kuhn et al., 2008; Mercier, 2011; Moshman, 2011; Nussbaum, 2008). Our results indicate that exposure to dialogue leads to enhanced argumentation skills and changes in epistemic cognition. It may be the case that dialogic interaction leads to the early maturation of epistemological understanding, which in turn leads to improved argumentation skills. However, it is also plausible that experience with argumentation leads to a greater sensitivity to the value of evidence, which mediates the interpretation of knowledge claims as being potentially subjective. These factors may also be interacting with one another bidirectionally. Further research will be necessary to clarify the particular direction of causality.

While the philosophy intervention was carefully designed to cover a broad range of topics, it is possible that improvements in epistemic cognition may have been tied to the philosophical *content* of the discussions, rather than *type* of inquiry introduced. In other words, it could be that the results were due to direct instruction in epistemology, rather than the dialogic nature of the intervention. Would the results have been different if the same dialogic attention had been applied to issues in the field of history or science, for example? While the current research was not designed to examine this question, we do not believe that the observed improvement was the result of the particular philosophical content discussed in the classroom. First, the teaching materials consisted of popular children's books that were selected to be both relevant to the philosophical theme and to be typical of the type of children's literature that the students would have been exposed to at home. The philosophy intervention therefore did not aim to expose children to novel material. Further, because all classroom discussions were led by students, children engaged with ideas and topics about which they were already familiar. Therefore, while the current study cannot definitively rule out any contribution of the philosophical content, we feel that it is unlikely to have accounted for the majority of the progress. Future research will be necessary to distinguish between the relative contributions of content and dialogue for epistemic progress.

Although the maturity of children's epistemological understanding has been shown to have far-reaching implications for academic performance (Buehl & Alexander, 2005; Kuhn et al., 2000; Mason & Boscolo, 2004), there have been few proposals for practical means for advancing children's ideas about subjectivity. Kuhn and colleagues have shown that dialogical interaction supports the development of epistemological understanding and argumentation skills (Felton & Kuhn, 2001; Kuhn & Crowell, 2011; Kuhn et al., 2008; Kuhn & Udell, 2007), and the current studies provide additional evidence of this link in an embedded pedagogical context and with a much younger population.

Our research may also have some practical implications for classroom practices, in which teacher-fronted, monological methods have remained the dominant pedagogical strategies for elementary education (Alexander, 2003; Cazden, 2001). The current results contribute to the growing body of research that supports the integration of content-based instruction with other classroom practices that more closely resemble the type of dialogical discourse that characterizes participation in the scientific community (Duschl & Osborne, 2002; Lehrer, Schauble, & Lucas, 2008). In these contexts, students are encouraged to ask questions, justify their own reasoning, and evaluate the reasoning of other individuals. When provided in addition to teaching strong content knowledge, this style of inquiry has been shown to support learning and promote maturation of metacognition in the development of scientific thinking (Kelly & Crawford, 1997; Polman & Pea, 2001), and the current work extends these effects to very young children's beliefs about the subjectivity of knowledge in other domains as well. Additional longitudinal research examining the benefits of introducing dialogic inquiry as a complement to more traditional techniques in elementary education is necessary to explore the potential long-term benefits for critical thinking skills and academic achievement.

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(*Appendix follows*)

Appendix

Strategy Mix for Value Domain

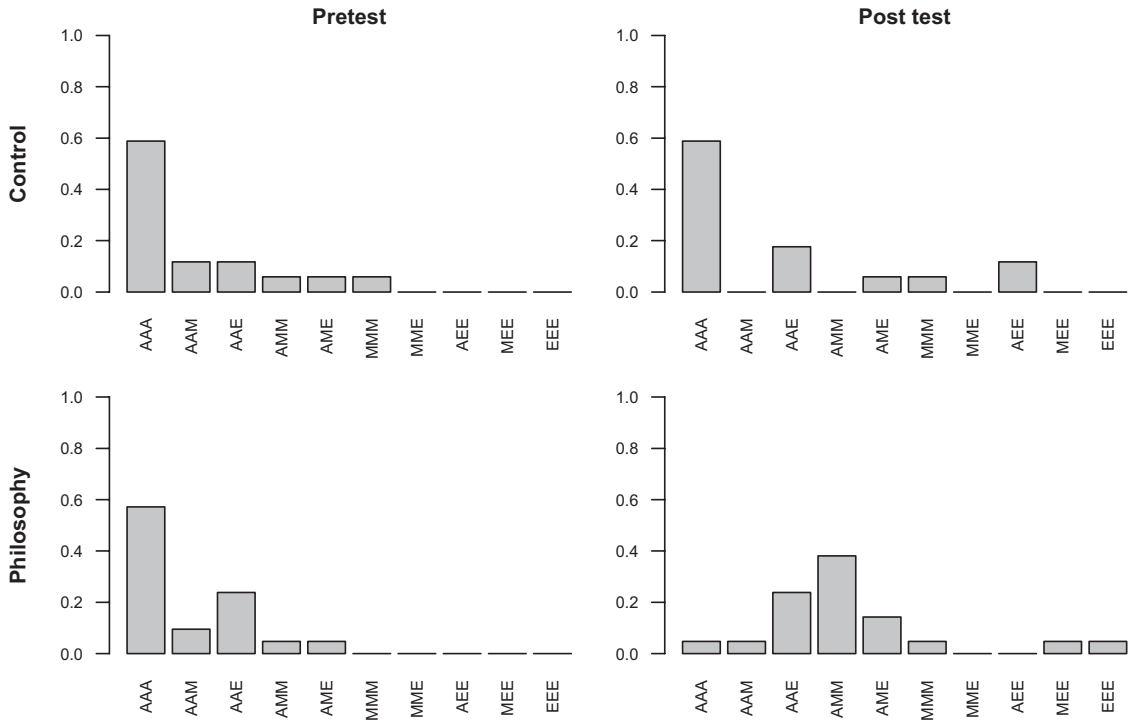

Figure A1. Proportion of each strategy mix in the value domain for philosophy and control groups at pre- and posttest on epistemological understanding task. A = absolutist, M = multiplist, and E = evaluativist [E] responses; AAA, AAM, AAE, AMM, AME, MMM, MME, AEE, MEE, and EEE = 10 possible combinations of strategies that children could employ for the three items each domain.

Received July 2, 2011
Revision received July 2, 2012
Accepted July 10, 2012 ■