The Relationship between Children’s, Adolescents’, and Adults’ Epistemological Development and Their Evaluation of Different Teaching Methods

By

Sarah Watson

A thesis submitted in conformity with the requirements for the degree of Master’s

Graduate Department of Psychology
University of Toronto

© Copyright by Sarah Watson (2009)
Abstract

The Relationship between Children’s, Adolescents’, and Adults’ Epistemological Development and Their Evaluation of Different Teaching Methods

Sarah Watson

Master’s

Psychology, University of Toronto

2009

This study assessed the relationship between children’s, adolescents’, and adults’ epistemological development and their evaluations of different teaching methods. Participants were presented with different teaching scenarios in which the domain (scientific or moral), nature (controversial or noncontroversial), and method (lecture or discussion) were varied to determine if this affected participants’ rating of the scenarios. Epistemological development was assessed in three domains: aesthetic, value (moral), and physical truth (science). Ninety-six participants (7–8-, 10–11-, 13–14-year-olds, and college students) were included in the study. In general, it was discovered that older participants (13-14-year-olds and college students) preferred discussion methods, while younger participants (7-8 and 10-11-year-olds) did not discriminate between lectures or discussions. However, all participants took the domain, nature, and method into consideration. Epistemological development was predictive of participants’ preference for teaching methods, but only in the value domain.
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Methods</td>
<td>18</td>
</tr>
<tr>
<td>Results</td>
<td>21</td>
</tr>
<tr>
<td>Discussion</td>
<td>29</td>
</tr>
</tbody>
</table>
List of Tables

Table 1 40
Table 2 41
Table 3 42
List of Appendices

Appendix A 43

Appendix B 51
The Relationship between Children’s, Adolescents’, and Adults’ Epistemological Development and Their Evaluation of Different Teaching Methods

Although researchers have studied lay persons’ conceptions of pedagogy (teaching) and epistemological development (or individuals’ folk theories about knowledge) for several decades now, a gap exists in understanding developmental changes in thinking about these issues across the age span. Most research in these areas has examined college-aged students (e.g., Perry, 1970) and preschoolers (e.g., research on “theory of mind”, see Chandler, Hallett and Sokol, 2002), whereas the development of conceptions of knowledge and teaching in middle childhood has been largely neglected (Hoffer & Pintrich, 2002). This study is the first, to our knowledge, that examines the relationship between children’s epistemological development and their evaluations of different teaching methods.

Epistemological Development

There is much controversy surrounding children’s epistemological development. The source of the controversy is when exactly children develop an interpretative theory of mind; i.e., when they realize that two people can hold different but legitimate beliefs about the world. Most researchers argue that children move from an objectivist belief about the world where there is one reality and a one to one correspondence between the external world and internal beliefs, to a more subjectivist belief that there are multiple truths determined, at least in part, by individual’s interpretations or construals of reality (Sokol, Chandler, Jones, 2004). Researchers disagree, however, about the age at which children develop this interpretative theory of mind. Some authors believe that when young children (3-4-years-old) are able to pass false belief tests, they then have an interpretative theory of mind since they understand that people can hold different beliefs
False belief tasks assess children’s understanding that two people can hold different beliefs, and that one of these beliefs may be false. A commonly used task involves two characters, Susie and Carol. Susie hides a ball in a basket while Carol watches; Susie leaves the room and Carol moves the ball from under the basket into a bag; Susie returns. Children are asked where Susie will look for the ball. Children who do not understand false beliefs will say that Susie will look in the bag, since this is the truth, while children who do understand false beliefs will say that Susie will look in the basket, since this is where she believes the ball to be.

Other authors disagree with this conclusion. Carpendale and Chandler (1996) argue that false belief tests are not a reflection of interpretative abilities; they argue that while children believe that two people can have different beliefs about the same situation, they also believe that one person is right and the other person is wrong. In order for children to truly have an interpretative theory of mind they must believe that two people can have different interpretations of a situation when they are exposed to the same information; i.e., they recognize that there can be two different but legitimate interpretations of the same situation.

Carpendale and Chandler (1996) studied 5-8-year-old children on a number of different interpretative tasks in which two puppets interpret an event differently. Included in the study were ambiguous figure tasks such as the duck-rabbit and rat-man drawings, lexical ambiguity tasks such as pear/pair, and ambiguous referential communication tasks such as “ring”. In order to pass the interpretation tasks, children first needed to recognize that it was legitimate that the two characters would interpret these events differently, and
then they needed to provide appropriate justifications for these different interpretations. They discovered that while all the 5-6-year-olds passed the false belief tasks, none of them passed the interpretation tasks. One of the key components of their task was the ability to give correct justifications as to why the two protagonists can legitimately interpret the situation differently. To rule out the argument that 5-6-year-olds lack the linguistic ability (not the cognitive ability) to do these interpretative tasks, the authors modified their tasks and conducted a second study. Once again, the 5-6-year-olds were unable to pass the interpretation tasks. The authors conclude that younger children lack interpretative maturity not linguistic maturity. There are many authors who agree with this argument and evidence, and believe that an interpretative theory of mind is therefore reached at 7-8-years of age (Carpendale & Chandler, 1996, Chandler & Lalonde, 1996, Fabricius & Schwanenflugel, 1994, Kuhn, 2001, Mansfield & Clinchy, 2007).

In an attempt to find the emergence of an interpretative theory of mind at an earlier age, Ross, Recchia, and Carpendale (2005) used social conflict in their interpretative tasks because they thought this would be more relevant to children. They found that the younger children were able to understand that two protagonists can disagree, but they were unable to give the proper justifications for this disagreement, which is needed for true interpretative ability. The authors explain that young children are stuck in a “right or wrong” mindset and that the development of an interpretative theory of mind does not follow a “two-step” model, but rather, takes a more gradual, constructivist approach. These studies provide strong evidence that children develop an interpretative theory of mind in later childhood.
In an informative study looking at the relevance of domain in epistemological development, Kuhn, Cheney, and Weinstock (2000) explored the emergence and development of an interpretative theory of mind in children. They outline four stages of development: realist, absolutist, multiplist, and evaluativist. Children move from an objective understanding of reality (realist and absolutist levels) where there is one truth, to a subjective view of reality (multiplist level) where different interpretations of reality are valid; finally, some people may reach the evaluativist level in which objectivity is reintegrated into subjectivity and there are criteria for evaluating different claims. The authors explored the domain specificity of these different epistemological levels. They found that people switch into the multiplist level earliest in matters of aesthetic judgment and personal taste and last in truth judgments. All of their participants recognized the legitimacy of two people disagreeing in matters of taste. This robust finding is further substantiated by other research. Even 3-year-olds can acknowledge differences in taste; they recognize that someone can dislike a cookie that they happen to like (Flavell, Flavell, Green, & Moses, 1990). These young children are unable to pass standard false belief tasks, but show some, albeit limited, interpretative ability. Similar to Carpendale and Chandler’s (1996) results, it seems that the ability to recognize that differences in taste are legitimate is separate from true interpretative ability.

In contrast, Kuhn et al., (2000) found that people switch into the evaluativist level fastest in truth judgments. Most adolescents and adults fell into the multiplist level and transitions between levels happened rapidly; very few people were in a transitional period. They found that with age there was a trend of declining absolutism (generally occurring between childhood and adolescence). Kuhn concludes that epistemological
development is domain specific, but in all domains the stage model (movement from absolutist to multiplist to evaluativist conceptions) holds.

Rowley and Robinson (2007) explored young children’s understanding of personal taste further. They designed a study that involved a preference-based and fact-based disagreement between two protagonists. Children and adults were then asked about the legitimacy of the two beliefs, whether it is okay for the two protagonists to disagree, whether one argument is more persuasive than another, and if the truth could be found about their particular disagreement. While children could recognize that it was legitimate for the protagonists to disagree on both the preference and fact-based disputes, the 6-year-olds were not as confident as adults and older children that personal preference was a legitimate factor on which to base an argument. Further, both the 6- and 8-year-old children claimed that the truth could be found in both the fact and preference-based stories. This clearly shows that young children have a limited understanding of the subjectivity of personal taste; they believe that the truth can be found in disputes about taste, and they are unsure if personal taste is an appropriate factor on which to base a belief. Rowley and Robinson conclude that distinctions must be made about shallow and deep understanding of subjectivity. Young children seem to have a shallow understanding and cannot be said to understand the constructive nature of knowing (multiplist level according to Kuhn, Cheney and Weinstock, 2000).

Wainryb, Shaw, Langley, Cottam, & Lewis (2004) also studied the domain specificity of epistemological development. Looking at 5-, 7-, and 9-year-olds the authors assessed four realms of disagreements: moral, fact, taste, and ambiguous. It was found that nearly all participants took a non-relativistic stance on moral and factual
disagreements, regardless of age. For example, children thought that moral disagreements such as whether it is right or wrong to hit and kick other children, as well as factual disagreements such as whether gravity causes objects to fall up or down were not subjective. In the personal taste and ambiguous domains there were age-related trends. Indeed, one-third of 5-year-olds and most of the older children took a relativistic stance, believing for example, that the taste of ice cream (personal taste) is subjective, as is reasons why a family dog is not eating his food (ambiguous). Older participants took a more tolerant stance toward disagreements; however, all participants were more tolerant toward factual, ambiguous, and taste disagreements and more critical of moral disagreements. This study further supports a domain-specific theory of epistemological development. In contrast to Kuhn et al. (2000), Wainryb et al. (2004) do not think that beliefs need to follow a stage model. Rather, they argue that depending on the realm of belief (domain), relativism and non-relativism may be equally appropriate, independent of age.

In a rare longitudinal study of children’s epistemological development, Mansfield and Clinchy (2002) studied children at 10-years of age, then 13-years of age, and finally at 16-years of age. The authors were looking at the participants’ perceptions of two disagreeing protagonists. The conflicts ranged from immediately resolvable matters of fact, to more complex matters of interpretation, and finally, to matters of taste or value which are likely to be un-resolvable. They found that as children age, they were better able to integrate external objective reality with internal factors. Further, the role of experience changed as well. Younger children think that one experience is enough to base an opinion on, while older children believe that multiple experiences are needed to form
an accurate opinion. Older children also feel that prior knowledge is important as well as experience. This study is in line with Kuhn et al., (2000) who demonstrated that people in the evaluativist level use more complex reasoning to integrate objectivity and subjectivity by using objective criteria to evaluate a claim.

In other research arguing for the later development of an interpretative theory of mind, Chandler and Lalonde (2002) designed a series of studies testing children’s interpretative abilities using droodles (an obscure image that could be interpreted in multiple ways). Children (5- and 6-years-old) as well as adults were shown a picture and then part of the picture was covered so an obscure image (the droodle) was then seen. Two puppets were introduced who had not seen the full picture, and children were asked to guess what each puppet would say the obscure image portrayed. The authors suggested that people with an understanding of interpretation would understand that it is highly improbable that two different people (or puppets) would generate the same guess for the obscure image. The results showed that the children had a limited understanding of interpretation compared to adults; indeed, 96% of children were able to pass the false-belief task, but only 40% were able to pass the interpretative task. The authors argue for a two-step development of the mind whereby children first have a copy theory of mind where the mind is thought to be passive and information flows into the mind; next, children develop an interpretative theory of mind where the mind is an active agent that acts on this information and contributes to representations of reality.

The same authors also designed a study based on Taylor’s (1988) training technique to see if interpretative ability could be taught. They gave children a series of lessons in interpretation using the droodle stimuli. After the lesson, only two of the sixteen children
failed the interpretative task illustrating that children can improve their interpretative abilities. This is an important finding. Studying children’s interpretative abilities is not an abstract phenomenon interesting only to academics, but rather, it can be used to improve children’s understanding of the mind. An interpretative theory of mind is important for school-aged children in terms of understanding their peers, understanding the world, and for values education. It is difficult to teach students values education when they do not comprehend that two people can interpret the same situation differently.

Clearly, children’s epistemological development is quite complex, but children appear to develop an interpretative theory of mind in middle childhood. From the studies described above, we see a number of interesting findings that deserve further attention. The domain of focus is highly relevant and this will be explored in the current study. The role that authority figures play in the forming of an opinion is another interesting developmental phenomenon; this will be explored further in the third section of the paper when we focus on children’s perceptions of authority and expertise.

**From Epistemology to Moral Development**

The interaction between interpretative abilities and moral development is highlighted clearly in Wainryb, Shaw, Laupa, and Smith’s (2001) study that explored third graders’, seventh graders’, and college students’ opinions about disagreements involving conventional, moral, metaphysical, and psychological beliefs. The authors looked at three main issues: the acceptability of believing particular beliefs, the acceptability of acting on these beliefs, and the importance of diversity of belief. They found that third graders made more negative judgments about believing divergent beliefs than did seventh graders, and they both made more negative judgments about acting on
divergent beliefs than did college students. Third graders more often than older students thought that it was unacceptable to hold a belief when it could lead to harm. This is interesting because the authors thought third graders would say it was only wrong to *act* on a belief that could lead to harm, not simply to *hold* the belief. All participants said that it was fine to act in ways consistent with their moral beliefs, but wrong to act inconsistently with their moral beliefs. Third graders believed that conventions were culturally relative, while psychological beliefs were universal. The conventional beliefs used in the study reflect culturally specific norms, such as how to attract a waiter’s attention, while the psychological beliefs focus on personal and relational difficulties, such as how much personal information one should disclose to good friends. It was further found that the older participants were more accepting of nonmoral disagreements than the younger students and the authors believe this is due to their more advanced understanding of subjectivity and interpretation.

The development from childhood to adulthood with regard to opinions about divergent beliefs is more complex than anticipated. While young children were less tolerant in general about beliefs that differ from their own compared with older participants, even adolescents described someone who disagrees with them as immature and uninformed. Clearly, even adolescents are not completely accepting of divergent beliefs. The domain, type of belief, and cultural context are all taken into consideration when people of all ages formulate evaluations of divergent beliefs. All participants distinguished between tolerating a belief and valuing diversity of that belief. They thought that in the psychological and metaphysical realm diversity was both tolerable and desirable; in the conventional realm diversity was tolerable but undesirable; whereas
diversity in the moral realm was seen as both undesirable and intolerable. It is clear that interpretative abilities and moral development interact in a very real way, and thus it is important to foster development in both realms.

**Teaching Values and Methods**

Nicholls, Nelson, and Gleaves (1995) studied children’s perceptions of the fairness of two different teaching methods: discussion and memorization, along with their views of the purpose or aim of education. They discovered that older children preferred discussion-based learning, whereas younger children did not make this distinction. Further, older children saw inquiry and discussion as promoting excitement about learning, which they ranked as the most important purpose of learning. In sharp contrast, younger children ranked excitement about learning as the least important purpose of learning, and memorization as the second most important purpose. It is clear that there are marked developmental trends with regard to opinions about learning and teaching methods that may relate to epistemological development.

In one of the few studies to examine elementary school-age children’s concepts of teaching and knowledge, Nicholls and Nelson (1992) contrasted children’s conceptions of controversial (e.g., whether there is intelligent life in space), noncontroversial (e.g., whether it is possible for a space shuttle to leave Earth without an engine or thrust to lift it), and conventional knowledge (e.g., use of the word *shuttle*). They interviewed children in grades 1-6 about the different types of knowledge. Children understood the nature and significance of the different types of knowledge; indeed, they believed that conventional matters along with controversial ethical matters would change over time and place, but they did not think that noncontroversial knowledge would change. Further, children also
felt that controversial and noncontroversial information should be treated differently by teachers. Interestingly, the authors discovered that children are not deferential to authority. With regard to controversial matters, many older, but not younger children, thought that teachers should not vouch for one opinion over another, even if that opinion was the same as the students’ opinion. This reveals that, with age, children increasingly make the distinction between controversial and noncontroversial matters and feel that teachers should vary their teaching methods accordingly.

Laupa and Turiel (1986) also studied authority in a school context and found that children have a complex understanding of authority. They take age, position in the institution, and command given into account when evaluating an order from an authority. Younger children tended to place greater importance in the adult status than older children, but still, they took a number of other factors into consideration, such as the authorities’ expertise regarding the matter in question. Moreover, research on children’s conceptions of expertise in different domains (Danovitch and Keil, 2007) has shown that, with age, children increasingly recognize the role of different characteristics of authorities as better suited to solving problems in different domains. For example, older children identify “experts” who possess moral traits (behaving in a caring and just way) as more reliable in solving moral problems, but those with other traits (e.g., being knowledgeable and possessing critical thinking skills) are seen as more suited to solving science problems. Similarly, Mansfield and Clinchy (2002) demonstrated that younger children rely more on authority than older children, who incorporate the opinion of an authority with other factors such as personal opinion and experience. The role that authority played in the decision-making process changed with increasing age; younger
children used authority figures as the source of truth in a situation, while older children saw authority as a useful resource for gaining more information about a situation. Taken together, these studies reveal that children are able to actively evaluate commands given from an authority and recognize the legitimacy of different characteristics of authority figures in their education.

Nicholls and Thorkildsen (1989) showed that elementary school-age children differentiate between conventional (e.g., mathematical notation systems) and substantive information (e.g., mathematical concepts) and believe that teachers should also recognize this difference in their approach to teaching. Students in grades 1-6 unanimously agreed that substantive matters should be taught with exploratory teaching methods and conventional matters are more appropriately taught with didactic teaching methods (e.g., lectures). These children also felt that matters of substance (mathematical concepts) are more important than matters of convention (notational systems). It is clear from this initial research that by middle to late childhood, children have the ability to discriminate between different types of knowledge and prefer to be taught in accordance with these differences.

Recently, Helwig, Ryerson, and Prencipe (2008) extended investigations of children’s conceptions of teaching into the moral domain. They studied children’s evaluations of different methods for teaching values such as racial equality or patriotism. These authors found that in general, older children prefer teaching methods for values that favour children’s own constructive activities and rational autonomy (“autonomous” or democratic methods), such as class discussions where children come up with their own reasons and reflections and exchange their views with peers, in contrast to
“heteronomous” methods (Piaget, 1932) in which the teacher lectures to students and transmits conclusions and reasons for students to memorize. In contrast to older children, younger children (i.e., 7-8-year-olds) did not discriminate between heteronomous and autonomous teaching methods, viewing both as highly acceptable when teaching values.

The Present Study: Goals and Purposes

In the present study, we will investigate the developmental pattern found in the Helwig et al., (2008) study further in order to determine if the tendency for older participants to prefer more autonomous or democratic approaches to learning is domain-dependent, as well as dependent on the nature of the topic (e.g., controversial or noncontroversial), and how these distinctions may be related to epistemological development. Thus, in this study we will explore judgments and reasoning (using a structured clinical interview) about teaching and knowledge in two different domains: the moral domain (comprising values relating to issues of welfare or justice, Turiel, 2006), versus the domain of science, when topics in each of these domains may be either controversial or noncontroversial in nature.

A major purpose of the present study is to examine relations between preferences for autonomous methods of teaching (e.g., discussions) versus heteronomous teaching methods and children’s epistemological development in the domains of morality and science. It is hypothesized that as children age, and are more epistemologically advanced in a particular domain (i.e., have more sophisticated interpretative abilities), they will tend to be more critical of lecture-based pedagogy, especially in cases in which the teacher teaches a particular position on a controversial issue. We also expected that movement beyond an absolutist position would be related to increasing preferences for
discussions, especially when the topic is controversial, as this method provides a pedagogical forum for children to express varying positions on a topic and to explore their own thinking. In contrast, it is predicted that younger children, especially those who are not as epistemologically advanced, will not tend to discriminate between lecture- or discussion-based teaching methods or take into account the controversial or non-controversial nature of the topic. Indeed, younger children may even prefer lecture-based learning because they value direct learning as an efficient means to transmit “truth” (Helwig et al., 2008). Because we will be exploring this question by investigating teaching in two domains (morality and science) and epistemological development in several domains (including those related to morality and scientific understanding), we will be able to establish whether any relations uncovered between preferences for autonomous methods and epistemological development is domain-related. We will also be able to explore whether and how children’s epistemological level is related to their tendency to accept or reject teachers who are presented as experts who teach the teachers’ own position regarding controversial issues. Overall, the study is expected to provide detailed information about whether and how epistemological understanding may account for some of the age-related patterns found in prior research in this area.

A second issue to be explored in this study is why older children prefer discussions. Prior research (Helwig et al., 2008) has established that older children are more likely to prefer discussions and to justify their preferences by appeals to an “active learner” along with the need to foster children’s agency and choice in methods of values education. However there are at least two possible reasons why children may desire discussion-based learning: first, they may simply want agency or a say in the material, or
secondly they may also recognize that there is another side to the argument. That is, on
the one hand there is the moral argument that children want to be heard (autonomy), and
on the other hand, there is the more interpretative argument that there are multiple sides
that need to be presented (which is presumably more centrally related to epistemological
understanding). This question will be explored in the interview by examining the
participants’ justifications in cases where autonomous teaching methods (discussions) are
supported in order to better distinguish between these different types of justifications.
Thus, examining the justifications that children provide for autonomous methods more
closely than in prior research may help to provide further evidence bearing on the
question of whether epistemological conceptions are related to children’s conceptions of
teaching methods in different domains. The justification analysis is currently underway
and will be pursued in a follow-up to the master’s thesis; as such, the justification data
will not be reported in this thesis.

Methods

Participants

The sample consisted of 96 participants evenly divided into four age groups: 7-8-
year-olds (M= 7.57), 10-11-year-olds (M= 10.40), 13-14-year-olds (M= 13.25), and
PSY100 students (M= 19.71). There were equal numbers of males and females in each
group. Child and adolescent participants were obtained from the Child Study Centre’s
University of Toronto database, which contains over 10 000 names of children whose
parents agreed to participate in research. Families are recruited through a number of
different ways, including hospitals, day-care centres, mass-mailings, and parent/baby
conferences. The sample consists of families from different backgrounds and the students
attend a wide variety of schools throughout the Toronto metropolitan area. The database is maintained at the University of Toronto. The PSY100 students were obtained from the PSY100 pool (undergraduate psychology students enrolled in PSY100 introductory course). The ethnic background of the sample was 74% European, 13.5% Asian, and 12.5% other backgrounds. Ninety-three percent of participants (children’s parents or university undergraduates) provided demographic information on occupation and education. Sixty-three percent were employed in professional, managerial, sales, or other technical occupations; 13.8% were employed in service occupations, trades, or manufacturing; 9% were stay-at-home parents (all mothers); 3% were unemployed; and 5% were retired. Sixty-eight percent completed university or a post-graduate degree, 15% had completed college, and 13% had completed high school only.

**Design and Procedures**

Participants were given, in a structure clinical interview (see Appendix A) lasting approximately 30-40 minutes, four different scenarios to assess their preferred teaching method for different topics (each of these scenarios was counterbalanced). They were given a moral controversial topic (whether more money should be spent on health care or feeding the poor), a moral noncontroversial topic (whether the government should build hospitals to take care of the sick), a scientific controversial topic (competing theories about whether dinosaurs are cold-blooded or warm-blooded), and a scientific noncontroversial topic (classifying dinosaurs). For each of these topics, a teacher either lectured to the children, or allowed the students to engage in a discussion about the material (the order of the two teaching methods was also counterbalanced).
After each controversial scenario was introduced, participants were asked to give their opinion on the topic. For the controversial topics, the teacher was described as taking a particular stance on the issue; this stance was either consistent or inconsistent with the participant’s own opinion; e.g., “The teacher tells the students that he thinks dinosaurs are cold-blooded and gives them reasons why.” After asking children to evaluate this teaching method, we presented the opposite opinion: “Suppose the teacher did the same thing, except that instead of cold-blooded, he thought that the dinosaurs were warm-blooded.” Whether the teacher’s initial stance was consistent or inconsistent with the participant’s response was also counterbalanced between participants.

After hearing each of the four teaching methods (lecture or discussion) the participants were asked: “Do you think this is a good or bad way to teach the students about X. Why?” Participants answered using a 7-point rating scale (1 = really bad, 2 = medium bad, 3 = a little bad, 4 = neither good nor bad, 5 = a little good, 6 = medium good, 7 = really good).

As an additional variable, the level of expertise of the teacher was varied. After each lecture scenario, we asked participants to evaluate the teaching method when the teacher is an expert (knows a lot about the topic). This question was designed to determine if the teacher’s level of knowledge/expertise is relevant to the adoption of the teaching method, and whether the role of expertise may vary by domain and age, as suggested by prior research (Danovitch & Keil, 2007). At the end of each scenario, we asked the participants which of the methods (lecture or discussion) is better, and why. Finally, at the end of all four scenarios, we asked the child and adolescent participants about their own experience with discussions in the classroom. Specifically, we asked them how
likely they are to have discussions in their school classrooms, and they used a 5-point rating scale to answer (1 = not at all likely, 2 = only a little bit likely, 3 = kind of likely, 4 = very likely, 5 = extremely likely). They were also asked about what types of topics they have discussions about (if they do). This enabled us to explore possible relations between the frequency of children’s perceptions of experience with discussion and their judgments of the different methods and epistemological level.

In the second part of the interview, we assessed epistemological development in order to examine correlations with participants’ preferred teaching methods. We used three of the five domains introduced by Kuhn et al., (2000) (see Appendix B). In this measure, children are presented with conflicting opinions in three domains: aesthetic, value, and physical truth (science). They were asked about the perceived rightness of each disagreement to determine their epistemological level (e.g., absolutist, multiplist, or evaluativist). In addition, we added two questions relating directly to the interview (e.g., one on dinosaurs and one on morality) to see if the specific epistemological level was related to their evaluation of the teaching methods.

Results

Evaluations were analyzed using analyses of variance (ANOVAs) on major questions of interest. For all significant interactions follow-up analyses of simple effects were conducted and where appropriate, pair-wise comparisons using the Bonferroni correction for multiple comparisons, with the overall alpha set at .05. Linear Regressions were used to evaluate the relationship between epistemological level and preference for different teaching methods. The means and standard deviations for all scenarios across age groups are presented in Table 1.
Evaluations of Teaching Methods

Do evaluations vary by method, domain, and nature of the topic?

To explore this question, a 4 (age) x 2 (gender) x 2 (teaching method: discussion versus lecture) x 2 (domain: scientific versus moral) x 2 (nature: controversial versus noncontroversial) ANOVA was conducted with method, domain, and nature as repeated measures. A significant Age x Method x Domain interaction ($F(3, 86) = 6.441, p = .001$) was found. Post hoc analyses revealed that lectures in the moral domain were rated more positively by the 7-and 8-year-olds and 10-and 11-year-olds than both the 13-and 14-year-olds and university undergraduates (all $p < .004$). Similarly, lectures in the scientific domain were rated more positively by the 7-and 8-year-olds than the 13- and 14-year-olds and university undergraduates. The 10-and 11-year-olds rated lectures in the scientific domain more positively than the 13- and 14-year-olds, but they did not differ from the university undergraduates (all $p < .007$). This reflects the fact that the university undergraduates rated the lecture in the scientific domain significantly more positively than the lecture in the moral domain ($p < .001$). The three younger age groups did not make this distinction, and their ratings were the similar for the lectures in the moral and scientific domains.

Regarding discussions in the moral domain, the 7-and 8-year-olds rated this method significantly less positively than the 10-and 11-year-olds ($p = .029$) and university undergraduates ($p = .002$). For discussions in the scientific domain, no differences were found between the age groups. The university undergraduates however, rated discussions in the moral domain significantly more positively than discussions in the scientific domain ($p = .002$) whereas no other age group differed in their ratings. This suggests that
the 3-way interaction is fuelled by the university undergraduates, since they made
distinctions between each the four method/domain combinations in the analysis reported
above.

A Method x Nature x Age interaction (F (3, 86) = 3.897, p =.012) was also found.
For lectures on noncontroversial topics, the 7-and 8-year-olds rated this method more
positively than both the 13-and 14-year-olds and university undergraduates. The 10-and
11-year-olds also rated lectures on noncontroversial topics more positively than the 13-
and 14-year-olds but not the university undergraduates (all ps <.019). For lectures on
controversial topics, the 7-and 8-year-olds and 10-and 11-year-olds rated this method
more positively than the 13- and 14-year-olds and undergraduate students (all ps <.002).
For discussions on noncontroversial topics, there were no differences between the four
age groups; however, for discussions on controversial topics, differences emerged. The 7-
and 8-year-olds rated discussions on controversial topics less positively than all three
older age groups (all ps <.020).

Looking at differences within age-groups, post hoc comparisons revealed that all age
groups rated lectures on controversial topics less positively than lectures on
noncontroversial topics (all ps < .009). However, only the undergraduate students made
further distinctions. They rated moral lectures less positively than scientific lectures (p =
.001), scientific discussions less positively than moral discussions (p = .001), and
controversial discussions more positively than noncontroversial discussions (p = .038).

Finally, when looking at ratings of discussions versus lectures for the different
scenarios, it was found that the 7- and 8-year-olds did not distinguish between lectures
and discussions for any of the scenarios; i.e., they rated heteronomous and autonomous
teaching methods equally well. The 13- and 14-year-olds rated lectures less positively than discussions for all scenarios (all $p < .001$), while the 10-and 11-year-olds did not differentiate between lecture and discussion in the moral noncontroversial and scientific noncontroversial domain. The undergraduate students did not differ in their ratings for the scientific noncontroversial domain.

**Relations Between Experience with Discussions and Ratings of Teaching**

**Methods**

To examine the effect of reported experience with discussions in the classroom on evaluations of discussions and lectures as teaching methods, a one-way analysis of variance was conducted for each age group. Results revealed that classroom experience with discussions (as reported by participants) had no impact on ratings of discussion versus lecture methods for the 7- and 8-year-olds, 13-and 14-year-olds, and undergraduate students. For the 10-and 11-year-olds however, there was a relationship between experience with discussion and ratings of discussions ($F(3, 23) = 3.382, p = .038$). Children who have more experience with discussions in the classroom rated the discussion methods in this study higher than students without such experience.

**Do evaluations of lectures vary by expertise?**

In a follow-up condition presented in the lecture scenarios, the expertise of the teacher was manipulated. Separate age x gender x expertise (initial presentation versus with expertise) ANOVAs were run for the four scenarios (moral controversial, moral noncontroversial, scientific controversial, and scientific noncontroversial) to examine the effects of expertise. In the moral noncontroversial scenario, there was an Age x Expertise interaction ($F(3, 87) = 6.818, p < .001$). Post hoc analyses revealed that the 13-and 14-
year-olds and university undergraduates rated the expert teacher more positively than the non-expert teacher, whereas the youngest age groups did not make this distinction (all \( ps < .001 \)). Further, the 7- and 8-year-olds rated the expert significantly more positively than the 13- and 14-year-olds (\( p = .012 \)) and the university undergraduates (\( p = .001 \)), a finding that reflects the youngest age group’s highly positive ratings of lectures in general. No significant findings were found for the moral controversial condition.

In the scientific controversial scenario there was an Age x Expertise interaction (\( F (3, 87) = 3.133, p = .030 \)). Post hoc analyses on differences between ratings of experts versus non-experts showed that the 13- and 14-year-olds, and university undergraduates rated experts more positively than non-experts (\( ps < .001 \)). The 7- and 8-year-olds and 10-and 11-year-olds did not distinguish between experts and non-experts. Looking between age groups it was found that the 7- and 8-year-olds rated the expert higher than both the 13-and 14-year-olds and the university undergraduates (\( ps < .001 \)).

In the scientific noncontroversial scenario there was also an Age x Expertise interaction (\( F (3, 88) = 2.77, p = .046 \)). The 13-and 14-year-olds and PSY100 students rated the expert more positively than the non-expert (\( ps < .001 \)), whereas the two younger age groups did not distinguish between expertise level. Post hoc tests examining differences between age groups in evaluations of experts revealed that the 13-and 14-year-olds rated the expert less positively than the 7-and 8-year-olds (\( p < .001 \)). Taken together, this pattern of findings indicates that the 13-and 14-year-olds were influenced by expertise to a greater extent than the 7- and 8-year-olds, but overall their ratings of lectures were significantly lower than that of the 7- and 8-year-olds. Thus, the relatively high ratings of lectures overall by younger participants appears to have resulted in a
ceiling effect in which the manipulation of expertise could not yield measurable effects on evaluations lectures for the youngest age group.

**Do evaluations vary according to whether the teacher agrees or disagrees with the participant?**

Because the participants’ own position on controversial topics was assessed prior to receiving the story conditions in which teachers lectured on controversial topics, it was possible to examine whether participants’ evaluations varied according to whether or not the participant’s positions and that of the teacher were in a relation of agreement or disagreement. A 4 (age) x 2 (gender) x 2 (agreement: agree/disagree) x 2 (domain) ANOVA was conducted on evaluations of lectures in controversial topics. It was found that participants’ evaluations of lectures at all ages did not depend on whether the teacher agreed or disagreed with them. This finding is surprising since it was predicted that young children (who are presumably more likely to be at an absolutist level of thinking) would be more likely to evaluate lectures based on their correspondence to their own beliefs about what is true.

**Epistemological Level**

In order to analyze the results for the data on epistemological level, scores for the aesthetic, physical truth, and value domains had to be created. We followed the scoring procedures reported by Kuhn et al., (2000). In order to assign an epistemological level for each participant in each domain, the mode of the scores on the 3 questions assessing epistemological level for each domain was taken (in the case of three different scores, the median was taken). This was done in accordance with Kuhn et al’s., (2000) scoring rationale, as this procedure preserved the three levels of the stage model instead of
summing individual scores to create a larger scale, which would blur boundaries between the stages. For the additional questions on morality and dinosaurs, which related directly to the interview questions, there was only one epistemological question for each; as such, no additional scoring was necessary.

**Age Patterns in Epistemological Level**

Table 2 shows the distribution of epistemological levels for each domain by age group; Table 3 presents the frequencies and percentages of each epistemological level by domain, collapsed across age group. As Table 2 indicates, there was a general transition away from absolute thinking with age, although the patterns varied by domain. The slowest transition from absolutism to multiplism and multiplism to evaluativism occurred in the value domain. Overall, there was a trend of declining absolutism and increasing evaluativism (see Table 2) which is typical of the stage model. Interestingly, Kuhn et al., (2000) found that many adults stabilized at a multiplist level for aesthetic judgments, thinking them to be entirely subjective. Indeed, 81% of their sample rated aesthetic judgments as subjective, as well as 2/5 “experts” (PhD students). The current study found that 75% of people fell into a multiplist epistemological level for aesthetic judgments, which parallels their findings. Considered developmentally, there appears to be a trend of decreasing evaluativism and increasing multiplism with age, which suggests that multiplism in the aesthetic domain is a very common and perhaps appropriate developmental endpoint (see Table 2). Finally, in the physical truth domain, there appears to be very little of developmental interest occurring. Kuhn et al., (2000) found absolutism to remain in some of the older age groups for this domain, but a trend of declining absolutism and increasing evaluativism was evident in their study. Although there is a
slight trend of increasing evaluativism in our study evident for physical truth judgments, no other discernable patterns emerged and this trend was comparatively weak.

To determine developmental changes in epistemological level, a composite epistemological score (EP) was created, summing the scores for the aesthetic, physical truth, and value domains. A 4 (age) x 3 (EP level: absolutist, multiplist, evaluativist) ANOVA was conducted and it was found that EP level did in fact vary with age ($F (3, 92) = 4.872, p = .017$). Post hoc analyses revealed that the 7- and 8-year-olds had significantly lower EP levels than the undergraduate students. However, when correlations between each domain and age were examined, a significant relationship only emerged between the value domain and age ($r = .46, p<.001$)

**Relations Between Epistemological Level and Evaluations of Teaching Methods**

To analyze the effects of epistemological level on ratings of teaching methods, a series of planned linear regressions were conducted comparing absolutists to non-absolutists (multiplists and evaluativists) for the scientific and value domains, with age controlled for as a covariate in the analysis. The aesthetic domain was not included in the analysis due to the extremely small number of absolutists in this domain that rendered statistical analyses invalid due to small cell sizes. However, as the percentages in Table 2 indicate, transcending absolutism in the aesthetic domain (achieved by the vast majority of the youngest age group) is clearly not predictive of variations in evaluations of teaching methods. Absolutists and non-absolutists were compared in the analysis since this represents the important developmental transition between objectivism and subjectivism, hypothesized to potentially impact evaluations of teaching methods. Specifically, it was expected that the achievement of subjectivism would be associated
with a more critical orientation toward lectures, especially regarding controversial issues, and possibly a more positive orientation toward class discussions in which children could give their own viewpoints and no one position on an issue was explicitly taught.

Regarding the value domain, a number of general and specific relations were found between epistemological level and evaluations of teaching methods, all in the expected directions. Participants who were absolutist in the value domain rated lectures more favourably ($\beta = .264, p = .008$) than the non-absolutist thinkers. Epistemological level accounted for 24.8% of the variance in participants’ ratings of lectures. Specifically, value absolutists rated lectures more positively in the controversial topic than the value non-absolutists ($\beta = .225, p = .018$). Examination of each of the scenarios in turn revealed that the value absolutists rated lectures more positively for the moral controversial ($\beta = .211, p = .027$), moral noncontroversial ($\beta = .306, p = .003$), and scientific controversial ($\beta = .203, p = .046$) topics when compared with value non-absolutists. In contrast, value absolutists rated discussions in controversial scientific topics ($\beta = -.287, p = .013$) less positively than the value non-absolutists. Regarding epistemological levels in the physical truth domain, physical truth absolutists rated discussions less positively than physical truth non-absolutists ($\beta = -2.38, p = .019$). Epistemological level for the questions on dinosaurs and morality (that related directly to the interview) had no significant findings.

Discussion

This study assessed children’s, adolescents’, and young adults’ evaluations of two teaching methods (lecture and discussion) and explored relations between level of epistemological development and these evaluations. Younger children tended to rate
lectures more positively than adolescents and adults, but they did not differ in their ratings of lectures and discussions, with both of these methods rated highly positively. This finding paralleled that of prior work examining children’s and adolescents’ reasoning about teaching in the values domain (Helwig et al., 2008). Further, it was found that participants at all age levels took the method (lecture versus discussion), domain (moral versus scientific), and nature of the topic (controversial versus noncontroversial) into account when rating different teaching methods. Epistemological level increased with age and, especially in the value domain, predicted participants’ ratings of teaching methods.

The finding that younger children value lectures, a more heteronomous teaching method (Helwig et al., 2008; Piaget, 1932) was quite pervasive; indeed, their tendency to rate lectures highly positively remained true for scientific and moral lectures and lectures on controversial and noncontroversial topics. Although the youngest age group did not discriminate between lectures and discussions, the older participants valued discussions more for moral issues and controversial topics, and thought that lectures on scientific and noncontroversial topics were more appropriate than lectures on moral and controversial topics. This suggests that for sensitive moral issues and controversial topics, the older children and young adults recognized the importance of autonomous methods of teaching that entail provisions of opportunities for children to express and hear different viewpoints, whereas the younger children did not.

Interestingly, when looking at differences within age groups, the three youngest age groups (7- and 8-year-olds, 10-and 11-year-olds, and 13-and 14-year-olds) did not differ in their ratings of lectures in the moral and scientific domains. The same pattern of lack of distinctions held true for moral versus scientific discussions as well for discussions of
controversial versus noncontroversial issues. However, all participants rated lectures on controversial topics less positively than lectures on noncontroversial topics. Thus, even though the 7- and 8-year-olds appear to value heteronomous and autonomous teaching methods about equally, they are capable of making distinctions in when and where lectures are viewed as more appropriate, at least in regard to controversial and noncontroversial topics. This is an important finding; if children were completely heteronomous and deferential to authority in their views of education, they would rate all methods equally and may even prefer lectures over discussions. Our findings are broadly in line with prior studies showing that young children are capable of making distinctions between teaching methods in their reasoning about the curriculum. Nichols and Thorkildsen (1989) found that young children rate teaching methods differently depending on the content of the topic (e.g., substantive or conventional). Other research has found that children, with increasing age, believe that teachers should teach controversial matters differently than noncontroversial matters (Nichols and Nelson, 1992; Thorkildsen, White-McNulty, & Sodonis, 2004). Prior work (e.g. Nichols & Nelson, 1992) explored whether elementary school age children believe that it is acceptable for teachers to teach a conclusion on a controversial topic that differs from that of the student, and reported that a critical orientation on such teaching for controversial issues emerged over the elementary school years. However, we did not find any age differences due to the participants’ own position on their evaluations of the acceptability of teacher lectures, and younger as well as older participants distinguished between lectures on controversial and noncontroversial topics in their evaluations. The differences between our findings and those of Nichols and Nelson (1992) may be due to
the explicit presentation of a particular method in our study (teaching) for participants to evaluate, which may have helped younger children reveal their competence, as opposed to the more general questions (e.g., Can the teacher teach position x?) presented in Nichols and Nelson (1992). Nevertheless, our findings are in line with the body of prior work suggesting that, by 7-8 years of age, children are capable of appreciating how these distinctions between types of knowledge relate to the acceptability of specific teaching methods such as lectures.

In contrast to the younger age groups, the young adults (undergraduate students) made distinctions between domains and in their evaluation of the role of discussions. Specifically, they rated lectures more positively for scientific than moral topics, and discussions of controversial issues were rated more positively than discussions of non-controversial issues. Taken together, our findings appear to indicate that there seem to be two important steps in the development of critical evaluations of teaching methods. First, between 7 and 14 years, children and adolescents become more critical of lectures, but their ratings of discussions remain relatively high. Only later in development, in early adulthood, do more subtle distinctions emerge based on the domain, method, and nature of the topic.

Regarding the role of expertise, in general, the 13-and 14-year-olds and undergraduate students rated experts more positively than non-experts for moral controversial, scientific controversial, and scientific noncontroversial topics. The evaluations for the moral noncontroversial topic did not differ between the expert and non-expert teacher, which suggest that something unique is occurring for this topic. Recall that the moral noncontroversial scenario involved the teacher telling the students
that the government should build hospitals to help sick people. Given that this is a topic most people support (and would agree wholeheartedly with) perhaps participants in our study felt that an expert opinion is not needed for such a conspicuously noncontroversial topic. This type of reasoning could be associated with absolutism, and a closer look at epistemological reasoning may shed light on this issue.

Examining the value domain, our results indicated that 23% of participants were evaluativists. One would predict that evaluativists would value expertise since they recognize that different opinions/beliefs can be more or less correct depending on relevant evidence. Since the majority of participants were not evaluativists for this domain, it may be that they believe moral issues to be subjective (or even black and white in the case of absolutism), in which case experts are not needed. In contrast, 43% of participants were evaluativists in the physical truth domain, which may explain participants’ higher ratings of authority expertise for both controversial and noncontroversial science topics.

Whereas the two older age groups recognized the value of expertise in certain scenarios, the 7- and 8-year-olds and 10- and 11-year-olds made no such distinctions. It is possible that young children do not think that experts offer any more information than the non-expert teacher has to offer. Many studies have shown however, that children can be critical of authority, recognize the limits of teachers, and recognize different ranks of authority figures (Laupa and Turiel, 1986; Nichols and Nelson, 1992; Nichols and Thorkildsen, 1989; Thorkildsen, White-McNulty, and Sodonis, 2004). Perhaps a better explanation is that we are observing a ceiling effect for the youngest age group. The 7- and 8-year-olds rated the lecture with and without the expert approximately equally.
positively ($M$ without expert= 5.23, $M$ with expert = 6.07). Thus, many children in our study may not have been able to rate the expert teacher any more positively than their previously given rating of the non-expert teacher. Future studies might attempt to rule out this ceiling effect (if it is in fact occurring), by asking children--after being presented with an expert and non-expert teacher--which they preferred. If children still did not prefer the expert teacher, we could conclude with greater certainty that they believe experts to have little to offer.

It was found that epistemological level in the value domain was predictive of evaluations of teaching methods. Absolutists rated lectures more favourably in the controversial and noncontroversial moral topics, and in the controversial scientific topics. They also rated discussions of controversial scientific topics less favourably than the non-absolutists. These findings indicate that epistemological level in the value domain is a powerful predictor of ratings of teaching methods, above and beyond the effect of age which was controlled for in the analysis. It is interesting that the remaining domains appear to have very little predictive ability. One possible explanation of the differential contributions of epistemological development in different domains pertains to the different ways in which these domains may relate to individuals’ experiences and construal of exposure to conflicting perspectives typically encountered within each domain.

In the aesthetic domain, multiplism dominates at all ages. This was also true for Kuhn et al., (2000) and these authors argued that people are slow to transition into evaluativism in this domain. Kuhn (2009) explains that it is a concern for students to stagnate at multiplism; she says that there is a “slippery slope between everyone has a
right to their view to all views are equally right” (p. 115). In our study 79% of undergraduate students were multiplists in the aesthetic domain. It is possible that, barring unusual experience (e.g., engagement with different aesthetic “theories” or disputes likely to be more familiar to experts in this domain) the more natural developmental endpoint for most individuals is multiplism. Wainryb et al., (2004) argue that relativism and non-relativism may be equally appropriate depending on the domain, and that relativism is valid for issues of personal choice or taste. Kuhn et al., (2000) found that only 2 out of 5 experts were multiplists in the aesthetic domain, which indicates that there is dissention even among experts. Perhaps children quickly reach a level of subjectivism about aesthetic issues that is grounded in their construal of aesthetics as a largely personal preference that is basically beyond debate or reasoned discussion. Moreover, since aesthetic positions are rarely formally taught (unlike science and even morality), any effects of the achievement of aesthetic subjectivism might remain relatively localized in participants’ thinking and may not provoke a re-evaluation of views of pedagogical methods.

More surprising, however, is the relative lack of impact of subjectivism in the area of physical truth, more typically associated with scientific issues, along with the general impact of value subjectivism on evaluations of teaching methods which extended across both moral and scientific topics. One explanation of these relations might concern the different impact that the achievement of value subjectivism might have versus subjectivism in the “cooler” domain of physical truths. Perhaps once value subjectivism is achieved, individuals may become additionally concerned with attempts to impose values (e.g., through lecturing or other didactic or heteronomous methods), leading to a
more general scepticism about the moral effects of explicit teaching as a form of indoctrination. Such justifications (e.g., value coercion or indoctrination) were reported to increase with age in Helwig et al., (2008) and were used to critically evaluate lectures or other heteronomous teaching methods. These possibilities, and others, will be examined in a subsequent exploration of the justifications given by participants at different epistemological levels in their reasoning about teaching and discussions.

Wainryb, Shaw, Laupa, and Smith (2001) found that young children, adolescents, and adults were highly critical of moral disagreements. In fact they thought disagreements about children’s welfare and equality were undesirable and should not be tolerated. This finding indicates that there are certain universal beliefs with which everyone at all ages adheres to. In the case of certain moral issues, it seems that absolutism is the most dominant and appropriate epistemological level. It appears that indeed, relativism and non-relativism are equally appropriate depending on the domain.

In the physical truth domain there are few, if any developmental trends. Kuhn, Iordanou, Pease, and Wirkala (2008) discuss epistemological development in relation to scientific thinking. They explain that a key component of achieving critical thinking in this domain is the recognition that science is constructed by humans. Studies have shown that many adolescents remain at an absolutist level in science believing that truth is directly knowable (Leach, Driver, Millar, & Scott, 1997; Smith, Maclin, & Houghton, 2000). Kuhn et al. (2008) presented two scientific scenarios to participants, one typical of scientific tasks in which direct observation is available and thus human bias is possible, and a dinosaur question in which neither direct observation nor human bias is possible. They found that while 71% of sixth graders were absolutist in the first scientific question,
only 21% were absolutist in the dinosaur problem. This provides evidence that epistemological development can be fostered with certain types of teaching techniques and that without such techniques, people tend to fall into the absolutist trap.

In the current study, 24% of people were absolutist in the scientific domain, which parallels Kuhn et al. (2008). In this study, it was not the case that the majority of people were absolutist for the scientific domain. Thirty-three percent of participants were multiplists and 43% were evaluativists. It seems that many participants (at all ages) recognized that science is constructed by humans and that certain opinions can be more or less right depending on evidence. The question remains however, why were there no age-related trends or a relationship between scientific epistemological level and ratings of teaching methods? It is odd that even the epistemological question directly related to the scientific topic in the interview (e.g., Robin believes dinosaurs are warm-blooded and Chris believes dinosaurs are cold-blooded) did not correlate with preferences for lecture versus discussion for the scientific controversial topic.

It is important to note that research has found epistemological development to be related to performance in school (Buehl, & Alexander, 2005; Mason & Boscolo, 2004) and that there are training techniques to scaffold epistemological development (Khishle & Abd-El-Khalick, 2002; Kuhn, Iordanou, Pease, and Wirkala, 2008; Lalonde and Chandler, 2002; Sandoval & Morrison, 2003). It is therefore imperative that we study children’s, adolescents’, and adults’ epistemological development and its relevance for education. Interestingly, there was no relation between students’ own reported experience with discussions and their evaluations of teaching methods, with the exception of 10-and 11-year-olds. Given that epistemological level greatly contributes to participants’
evaluations of teaching methods, while their own direct experience in the classroom is less relevant, it is imperative that we explore the epistemological relations found in this study for its potential pedagogical relevance.

To conclude, children’s, adolescents’, and adults’ evaluations of teaching methods varies across domain, method, and the nature of the topic. Older adolescents value autonomous teaching methods, while younger children do not discriminate between autonomous and heteronomous methods. Epistemological development is domain specific. Older children had higher epistemological levels in the value domain, and this was predictive of more critical evaluations of lectures and a preference for discussions. Neither the aesthetic domain nor the science domain contributed to preference for teaching methods.
References

domain-specific epistemological belief profiles. *American Educational Research
Journal, 42*: 697-726.


understanding and subscribing to an interpretative theory of mind. *Child
Development, 67*, 1686-1706.

developing conceptions of representational life. In I.E. Siegel (Ed.), *Development of
mental representation: Theories and applications* (pp.201-230). Mahway, NJ:
Erlbaum.

knowledge claims. In B.K. Hofer & P.R. Pintrich (Eds), *Personal epistemology: The
psychology of beliefs about knowledge and knowing* (pp.145-168). Mahwah, NJ:
Erlbaum.

Chandler, M.J., & Lalonde, C.E. (1996). Shifting to an interpretative theory of mind: 5-
7- year-olds changing conceptions of mental life. In A. Sameroff & M, Haith (Eds.),
*The five to seven year shift: The age of reason and responsibility*. (pp. 111-139)
Chicago, IL: University of Chicago Press.

Fabricius, W.V., & Schwanenflugel,P.J. (2004). The older child’s theory of mind. In A
Demetrious and A. Efkildes (Eds.), Intelligence, mind, and reasoning: Structure and


Hofer, B.K., & Pintrich, P.R. (2002). *Personal epistemology the psychology of beliefs about knowledge and knowing*. Mahwah, NJ: Erlbaum.


Table 1

Mean Ratings (and Standard Deviations) for Ratings of Teaching Scenarios by Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Moral Non-controversial</th>
<th>Moral Controversial</th>
<th>Scientific Controversial</th>
<th>Scientific Non-controversial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lecture</td>
<td>Discussion</td>
<td>Lecture</td>
<td>Discussion</td>
</tr>
<tr>
<td>7-8 years</td>
<td>5.65 (1.3)</td>
<td>5.92 (1.1)</td>
<td>4.83 (1.6)</td>
<td>5.5 (1.3)</td>
</tr>
<tr>
<td>10-11 years</td>
<td>5.12 (1.83)</td>
<td>6.29 (0.8)</td>
<td>4.21 (1.59)</td>
<td>6.42 (0.78)</td>
</tr>
<tr>
<td>13-14 years</td>
<td>3.96 (1.83)</td>
<td>6.29 (0.8)</td>
<td>2.79 (1.18)</td>
<td>6.29 (0.8)</td>
</tr>
<tr>
<td>Undergraduates</td>
<td>3.46 (1.77)</td>
<td>6.46 (0.78)</td>
<td>2.33 (1.2)</td>
<td>6.62 (0.58)</td>
</tr>
</tbody>
</table>

Note: Ratings are on a 7-point scale, ranging from 1 (really bad) to 7 (really good).
Table 2

Epistemological Levels (EP) Across Domain by Age (percentages)

<table>
<thead>
<tr>
<th>Domain</th>
<th>Age</th>
<th>Absolutist</th>
<th>Multiplist</th>
<th>Evaluativist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic</td>
<td>7-8 years</td>
<td>8</td>
<td>58</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>10-11 years</td>
<td>0</td>
<td>88</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>13-14 years</td>
<td>0</td>
<td>79</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Undergraduates</td>
<td>0</td>
<td>92</td>
<td>8</td>
</tr>
<tr>
<td>Physical</td>
<td>7-8 years</td>
<td>29</td>
<td>29</td>
<td>42</td>
</tr>
<tr>
<td>Truth</td>
<td>10-11 years</td>
<td>8</td>
<td>54</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>13-14 years</td>
<td>33</td>
<td>25</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Undergraduates</td>
<td>25</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>Value</td>
<td>7-8 years</td>
<td>88</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-11 years</td>
<td>54</td>
<td>33</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>13-14 years</td>
<td>33</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Undergraduates</td>
<td>25</td>
<td>30</td>
<td>46</td>
</tr>
<tr>
<td>Moral</td>
<td>7-8 years</td>
<td>45.8</td>
<td>29.2</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>10-11 years</td>
<td>29</td>
<td>46</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>13-14 years</td>
<td>16.7</td>
<td>54.2</td>
<td>29.2</td>
</tr>
<tr>
<td></td>
<td>Undergraduates</td>
<td>12.5</td>
<td>45.8</td>
<td>41.7</td>
</tr>
<tr>
<td>Dinosaurs</td>
<td>7-8 years</td>
<td>50</td>
<td>33.3</td>
<td>16.7</td>
</tr>
<tr>
<td></td>
<td>10-11 years</td>
<td>28</td>
<td>56</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>13-14 years</td>
<td>12.5</td>
<td>45.8</td>
<td>41.7</td>
</tr>
<tr>
<td></td>
<td>Undergraduates</td>
<td>12.5</td>
<td>45.8</td>
<td>41.7</td>
</tr>
</tbody>
</table>
Table 3

*Frequencies (and Percentages) of Epistemological Level by Age and Domain*

<table>
<thead>
<tr>
<th>Domain</th>
<th>Absolutist</th>
<th>Multiplist</th>
<th>Evaluativist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic</td>
<td>2 (2)</td>
<td>76 (79)</td>
<td>18 (19)</td>
</tr>
<tr>
<td>Physical Truth</td>
<td>23 (24)</td>
<td>32 (33)</td>
<td>41 (43)</td>
</tr>
<tr>
<td>Value</td>
<td>48 (50)</td>
<td>26 (27)</td>
<td>22 (23)</td>
</tr>
<tr>
<td>Moral</td>
<td>25 (26)</td>
<td>42 (44)</td>
<td>29 (30)</td>
</tr>
<tr>
<td>Dinosaurs</td>
<td>31 (32)</td>
<td>44 (46)</td>
<td>28 (29)</td>
</tr>
</tbody>
</table>
Appendix A

I am going to tell you about some situations and I’d like to know what you think of them. There are no right or wrong answers to the questions I’m going to be asking you. If there is any question that you do not feel comfortable answering, you can let me know, and we will skip that question. All of the things that you’ll tell me during this interview are confidential, which means that I won’t repeat anything that you say to me to anyone else. The only reason that I’m tape recording the interview is so I don’t have to write down everything you say.

I am going to read to you some situations about different topics teachers might teach in a classroom. I am also going to ask you some questions about the best way to teach each of these different topics.
1) Moral, Noncontroversial Topic: Treatment of the sick in our society

Let’s suppose there is a teacher who wants to teach about the topic of how sick people should be treated in our society. The teacher wanted students to think about whether government should do what it could to build hospitals to take care of sick people in society, instead of letting them take care of themselves.

A. LECTURE

Here’s one way the teacher could teach the kids about this topic. Suppose the teacher tells the students that the sick people in society should be helped and that the government should do what it can to make sure there are hospitals to take care of them, and then he gives them reasons why. The students write down and memorize the reasons the teacher tells them.

Do you think this is a good or bad way to teach the students about the treatment of the sick in our society? (Rating Scale). Why?

Suppose the teacher knew a lot about this topic. The teacher had studied about it a lot in school before becoming a teacher and reads up about it in his spare time. How good or bad do you think it would be to teach it this way then, if the teacher knew a lot about it? (Rating Scale). Why?

B. DISCUSSION

Here’s another way the students could learn about this topic. The teacher asks the students whether the government should do what it could to build hospitals to take care of sick people in society. The class would then read about the healthcare system and talk about this together. The teacher and each student can give their own opinion and they can each say the reasons why they think the way they do. After the class is done talking about it, each student would write down whether they think the government should do what it could to build hospitals to take care of sick people, and the reasons why.

Do you think this is a good or bad way to teach the students about the treatment of the sick in our society? (Rating Scale). Why?

Which way do you think is better, the teacher tells them, or the students have a discussion? Why?
2) Moral, Controversial Topic: Should more money be spent on healthcare or food for the poor?

Let’s suppose there is a teacher who wants to teach about the topic of whether the government should spend more money on healthcare or food for the poor in order to help people. Some people feel that more money should be spent on healthcare, for things like building more hospitals and hiring more doctors. Other people feel that more money should be spent on food for the poor, for things like creating more soup-kitchens and meal-deliveries for people who don’t have much money.

Do you think more money should be spent on healthcare—hiring more doctors and building more hospitals—or should more money be spent on food for the poor, like soup kitchens and meal deliveries?

A. LECTURE

Here’s one way the teacher could teach the kids about this topic. Suppose the teacher reads all about these issues and then decides that one is the best. The teacher tells the students that he thinks more money should be spent on _______ than _______ and gives them reasons why. The students write down and memorize the reasons the teacher tells them.

Do you think this is a good or bad way to teach the students about whether money should be spent on healthcare or food for the poor? (Rating Scale). Why?

Suppose the teacher knew a lot about this topic. The teacher had studied about it a lot in school before becoming a teacher and reads up about it in his spare time. How good or bad do you think it would for the teacher to teach it this way, by telling them what he thought is best and then giving them reasons, if he really knew a lot about it? (Rating Scale). Why?

Suppose the teacher did the same thing, except that instead of spending more money on _______, he thought that more money should be spent on _______. Do you think that would be a good or bad way to teach the students about whether money should be spent on healthcare or food for the poor? (Rating Scale). Why?

Suppose the teacher knew a lot about this topic. The teacher had studied about it a lot in school before becoming a teacher and reads up about it in his spare time. How good or bad do you think it would be for the teacher to teach it this way, by telling them what he thought is best and then giving them reasons, if he really knew a lot about it? (Rating Scale). Why?
B. DISCUSSION

Here’s another way the students could learn about this topic. The teacher asks the students whether the government should spend more money on healthcare or food for the poor. The class would then read about the topic and talk about this together. The teacher and each student can give their own opinion, and they can each say the reasons why they think the way they do. After the class is done talking about it, each student would write down whether they think more money should be spent on healthcare or food for the poor and the reasons why.

Do you think this is a good or bad way to teach the students about whether more money should be spent on healthcare or food for the poor? (Rating Scale). Why?

Which of the two ways we talked about do you think is better, the teacher tells them or the students have a discussion? Why?
3) Scientific, Noncontroversial Topic: Classifying Dinosaurs

Let’s suppose there is a teacher who wants to teach the topic of the best way to classify dinosaurs. Classifying dinosaurs is how scientists put dinosaurs into the right group, based on stuff like the shape of their bones and teeth. Does that make sense?

A. LECTURE

Here’s one way the teacher could teach the kids about this topic. Suppose the teacher tells the students the best way to classify (group) dinosaurs and gives them reasons why. The students write down and memorize the classification (grouping) system the teacher gives them.

Do you think this is a good or bad way to teach the students about classifying (grouping) dinosaurs? (Rating Scale). Why?

Suppose the teacher knew a lot about this topic. Before becoming a teacher, he was a scientist and this was his speciality, and in his spare time he still reads up about it. How good or bad do you think it would be for the teacher to teach it this way then, if he knew a lot about it? (Rating Scale). Why?

B. DISCUSSION

Here’s another way the students could learn about this topic. The teacher asks the students how they think dinosaurs should be classified (grouped). The class would then read about all the different kinds of dinosaurs and talk about this together. The teacher and each student can give their own opinion and they can each say the reasons why they think the way they do. After the class is done talking about it, each student would write down how they think dinosaurs should be classified (grouped) and the reasons why.

Do you think this is a good or bad way to teach the students about classifying dinosaurs? (Rating Scale). Why?

Which way do you think is better, the teacher tells them and they memorize the reasons, or students have a discussion. Why?
4) Scientific, Controversial Topic: Theories on whether dinosaurs are warm or cold-blooded

Let’s suppose there is a teacher who wants to teach students about the topic of whether dinosaurs are warm or cold-blooded. Scientists have different ideas or theories on this topic. Some scientists believe that all the dinosaurs are warm-blooded like mammals, and some scientists think that all the dinosaurs are cold-blooded like the reptiles.

Do you think that dinosaurs are warm or cold-blooded?

A. LECTURE

Here’s one way the teacher could teach the kids about this topic. Suppose the teacher reads about the different theories and decides that one is best. The teacher tells the students that he thinks dinosaurs are _______ blooded and gives them reasons why. The students write down and memorize the theory the teacher tells them.

Do you think this is a good or bad way to teach the students about whether dinosaurs are warm or cold-blooded? (Rating Scale). Why?

Suppose the teacher knew a lot about this topic. Before becoming a teacher, he was a scientist and this was his speciality, and he reads up about it in his spare time. How good or bad do you think it would be for the teacher to teach it this way then, if he knew a lot about it? (Rating Scale). Why?

Suppose the teacher did the same thing, except that instead of _______ blooded, he thought dinosaurs were _______ blooded. Do you think this is a good or bad way to teach the students about whether dinosaurs are warm or cold-blooded? (Rating Scale). Why?

Suppose the teacher knew a lot about this topic. Before becoming a teacher, he was a scientist and this was his speciality, and he reads up about it in his spare time. How good or bad do you think it would be for the teacher to teach it this way then, if he knew a lot about it? (Rating Scale). Why?
B. DISCUSSION

Here’s another way the students could learn about this topic. The teacher asks the students whether they think dinosaurs are warm or cold-blooded. The class would then read about the different theories and talk about this together. The teacher and each student can give their own opinion, and they can each say the reasons why they think the way they do. After the class is done talking about it, each student would write down whether they think dinosaurs are warm or cold-blooded and the reasons why.

Do you think this is a good or bad way to teach the students about whether dinosaurs are warm or cold-blooded? (Rating Scale). Why?

Which way do you think is better, the teacher tells them and they memorize the reasons, or students have a discussion. Why?
Do you ever have discussions in your classes in school?

How likely would you say it is for you to have a class discussion about something in school?

Rating scale:  (1 = not at all likely, 2 = only a little bit likely, 3 = kind of likely, 4 = very likely, 5 = extremely likely)

If answer to first question is yes: When you have class discussions in school, what do you usually discuss?
Appendix B

Epistemological Task (Taken from Kuhn, Cheney, & Weinstock, 2000)

I am going to tell you about Robin and Chris. They are friends but they disagree about a lot of things. I am going to tell you some of the things they disagree about and then ask you questions about whether Robin is right, Chris is right, or they both are right.

Aesthetic judgments

Robin thinks the first piece of music they listen to is better.
Chris thinks the second piece of music they listen to is better.

Robin thinks the first painting they look at is better.
Chris thinks the second painting they look at is better.

Robin thinks the first book they both read is better.
Chris thinks the second book they both read is better.

Value judgments

Robin thinks people should take responsibility for themselves.
Chris thinks people should work together to take care of each other.

Robin thinks lying is wrong.
Chris thinks lying is permissible in certain situations.

Robin thinks the government should limit the number of children families are allowed to have to keep the population from getting too big.
Chris thinks families should have as many children as they choose.

Judgments of truth about the physical world

Robin believes one book's explanation of what atoms are made up of.
Chris believes another book's explanation of what atoms are made up of.

Robin believes one book's explanation of how the brain works.
Chris believes another book's explanation of how the brain works.

Robin believes one mathematician's proof of the math formula is right.
Chris believes another mathematician's proof of the math formula is right.
Additional Questions

Robin thinks the government should spend more money on healthcare. Chris thinks the government should spend more money on food for the poor.

Robin thinks dinosaurs are warm-blooded. Chris thinks dinosaurs are cold-blooded.

After each question: Can only one of their views be right, or could both have some rightness? Response options for this question are as follows:

ONLY ONE RIGHT

BOTH COULD HAVE SOME RIGHTNESS

(circle one)

The immediately following second question, which was contingent on the response to the first, was as follows:

IF BOTH COULD BE RIGHT:

Could one view be better or more right than the other?

ONE COULD BE MORE RIGHT

ONE COULD NOT BE MORE RIGHT THAN THE OTHER

(circle one)

Why do you think this?