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Fitting the Message to the Listener: Children Selectively Mention General and Specific Facts

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In three experiments, two hundred and ninety-seven 4- to 6-year-olds were asked to describe objects to a listener, and their answers were coded for the presence of general and specific facts. In Experiments 1 and 2, the listener's knowledge of the kinds of objects was manipulated. This affected references to specific facts at all ages, but only affected references to general facts in children aged 5 and older. In Experiment 3, children's goal in communicating was either pedagogical or not. Pedagogy influenced references to general information from age 4, but not references to specific information. These findings are informative about how children vary general and specific information in conversation, and suggest that listeners' knowledge and children's pedagogical goals influenced children's responses via different mechanisms.

Suppose you get a didgeridoo, and tell your friends Igor and Kirk about it. Igor does not know anything about didgeridoos, and does not even know what a didgeridoo is, so you tell him *general* facts about didgeridoos—facts that are generally true of members of this kind (Prasada, 2000). For instance, you explain that the didgeridoo is a musical instrument and that you blow into it to make sound. Kirk, on the other hand, is a professional didgeridoo player, so he will be more interested to hear facts that are *specific* to your didgeridoo and that make it special or differentiate it from other didgeridoos. You tell him that it was handcrafted by Djalu Gurruwiwi, a renowned didgeridoo maker, and that it has multicolored etchings on it. Effective communication often requires an understanding of whether to tell listeners general or specific facts.

In this article, we explore the development of children's communication of general and specific facts. Developing awareness of when to provide general and specific information is crucial for children to appropriately communicate in a variety of contexts, from casual conversation to formal teaching. Young children might appropriately provide each type of information because they have some understanding of which facts are generally true of a kind and which facts are specific to just some members of the kind. Recent research suggests that children use a variety of cues to infer whether new information is general or specific in scope. For instance, they are likely to assume that information is general if it is conveyed using kind-referring noun phrases (e.g., "didgeridoos are expensive" rather than "these didgeridoos are expensive" or "some didgeridoos are expensive"; Cimpian & Markman, 2008; Gelman, Star, & Flukes, 2002; Koenig et al., 2015), if it is conveyed in a pedagogical context (Butler & Markman, 2012, 2014; also see Butler & Tomasello, 2016), and if it concerns properties that are unlikely to be accidental or temporary (e.g., Cimpian & Markman, 2008; Gelman, 1988; Graham, Cameron, & Welder, 2005).

However, appropriately providing each type of information may also be challenging for children. First, there are developmental differences between 4- and 6-year-olds and adults in which properties they consider general. For instance, although adults consider inborn properties of biological kinds to be general, children are less restrictive and also treat acquired properties as general (Gelman & Bloom, 2007). Such differences could lead children to inappropriately convey specific information when they should instead convey general information. Second, it requires that children know when it is most appropriate to convey general versus specific facts.

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To investigate children's ability to meet these challenges, we examine two factors that they might consider in deciding whether to mention general or specific information: listeners' knowledge state and pedagogical goals.

Listener's Knowledge State

When listeners are knowledgeable about a kind, it is often inappropriate to tell them general facts about it because they may already know these facts. However, information specific to particular members of the kind may be novel and appropriate to convey (e.g., Clark & Haviland, 1977). In the didgeridoo example, you avoided telling Kurt general facts about didgeridoos because he already knew them. Instead, you told him specific information about your didgeridoo because it was likely new for him, and therefore informative. Conversely, when listeners are largely or completely ignorant about a kind, general information may be more relevant and useful than information about specific members (Csibra & Gergely, 2006). In fact, without this general information, an ignorant listener might be unable to appreciate the interest of specific information—if your friend Igor is unaware that didgeridoos make music, he may not understand why it is exciting that your eucalyptus wood didgeridoo has an earthy tone.

Young children might tailor general and specific information based on listeners' knowledge, as they show sensitivity to knowledge states in a variety of other communicative tasks (see Miller, 2000 for a review). For instance, infants and toddlers show sensitivity to others' knowledge when pointing to objects and gesturing for them (e.g., Liszkowski, Carpenter, & Tomasello, 2008; O'Neill, 1996). Three- to 5-year-olds likewise fill partners in on information from events they have missed (Menig-Peterson, 1975; Perner & Leekam, 1986; Saylor, Baird, & Gallerani, 2006) and consider listener's knowledge when providing justifications (Köymen, Mammen, & Tomasello, 2016). Preschoolers also tailor their references to objects and people depending on what their conversational partner can see and on what their partner has already mentioned (Matthews, Lieven, Theakston, & Tomasello, 2006; Nadig & Sedivy, 2002; Nilsen & Graham, 2009; Nilsen & Mangal, 2012). By age 5, children are also sensitive to whether their partners' utterances are overinformative given children's own knowledge (Morisseau, Davies, & Matthews, 2013). Such findings suggest that preschoolers might consider listeners' knowledge state when deciding whether to convey general or specific information. At the same time, we might expect developmental changes in whether children do this, because their sensitivity to listener's knowledge improves with age (e.g., Epley, Morewedge, & Keysar, 2004; Saylor et al., 2006) and with the development of children's executive functioning (Nilsen & Graham, 2009).

Children might also find it challenging to consider listeners' knowledge state when deciding whether to convey general or specific information. In most studies showing children's sensitivity to listeners' knowledge, children provided more information when their listener was ignorant compared with when the listener was knowledgeable. However, a tendency to tell more information to ignorant listeners could lead children to indiscriminately provide them with more information of *both* kinds rather than *selectively* telling ignorant listeners more general information. Also, most studies of children's sensitivity to listener knowledge manipulated whether the listener was knowledgeable or ignorant about a particular fact or object. However, decisions about whether to provide general or specific information often depend on whether the listener is generally knowledgeable or ignorant about an entire kind (e.g., whether the listener knows what didgeridoos are). Reasoning about knowledge of an entire kind may be more difficult for children than reasoning about knowledge of its particular members.

Pedagogical Goals

A second factor that might influence whether children mention general or specific information is pedagogical goals. When interpreting information, children show sensitivity to the speaker's pedagogical intent; they are more likely to interpret information as generalizing to members of a kind when it is presented with pedagogical cues compared with when it is presented without these cues (Butler & Markman, 2012; Csibra & Gergely, 2009). Children might mirror this tendency in their own teaching, and might be more likely to provide general facts when teaching than in other communicative contexts.

It is also plausible that children might mention more general facts when teaching because they show the ability to teach others (e.g., Ronfard, Was, & Harris, 2016; Strauss, Ziv, & Stein, 2002; Ziv, Solomon, Strauss, & Frye, 2016), and convey different information when teaching than when pursuing other communicative goals (Rhodes, Bonawitz, Shafto, Chen, & Caglar, 2015). With development, children become increasingly effective teachers and adopt teaching strategies that are more attuned with the learner (e.g., Strauss et al., 2002; Ziv et al., 2016); hence, this provides another reason to expect that children's appropriate references to general and specific information might change with age.

One recent study on children's teaching is particularly relevant for our investigation: Gelman, Ware, Manczak, and Graham (2013) found that 4- to 7-year-olds increased their use of kind-referring utterances (e.g., "tigers," rather than "this tiger") when they were asked to teach than when they were told to talk to a peer. These findings are consistent with the possibility that the goal of teaching prompts children to reference more general information, because kind-referring utterances typically convey general knowledge (Cimpian & Markman, 2008; Gelman, Leslie, Was, & Koch, 2015; Graham, Nayer, & Gelman, 2011; see Gelman, 2004 for an overview). However, Gelman et al.'s study did not actually examine whether children reference more general *facts* when teaching. Although their participants produced more kind-referring utterances when teaching, this might not have corresponded with an increase in providing general information. It is possible to use a nongeneric noun phrase to convey information that *is* general. For example, if you indicate your didgeridoo and say "*it* is a musical instrument," you convey general information about digeridoos using an *individual*-referring sentence. As such, it is unknown whether children are more likely to convey general information when they teach.

The Current Approach

We examined children's developing ability to use listener's knowledge and pedagogical intent to appropriately mention general and specific facts. In our experiments, children were shown photos of objects and asked to describe them to a listener. For instance, children were shown a photo of a green frog-faced umbrella and were asked to tell the listener about it. We examined whether children mentioned the unique features of the object that would not extend to other members of the kind (e.g., the umbrella having a frog face) and also if children mentioned the generalizable features (e.g., umbrellas keeping you dry). In Experiments 1 and 2, we examined whether listener's knowledge of the object affected children's references to general and specific facts. In Experiment 3, we examined whether being instructed to teach similarly affected children's references to each type of information. To ensure that it was plausible that the listener might not know about familiar objects like umbrellas (Experiments 1 and 2), and that children could feel they would know enough to teach the listener (Experiment 3), we had children address a teddy bear (similarly, Gelman et al., 2013; Ronfard et al., 2016 used puppets as learners).

Across the three experiments, we tested children aged 4–6 because previous research suggests that children in this age range distinguish between general and specific information (e.g., Cimpian & Cadena, 2010; Cimpian & Markman, 2009; Koenig et al., 2015), and likewise are sensitive to listeners' knowledge states when communicating. At the same time, previous findings suggest that we might see developmental changes in children's ability to appropriately mention general and specific information.

Experiment 1

Method

Participants

We tested 65 children aged 4 and 5 between January and March 2015. There were thirty 4-year-olds (M = 4;6, SD = 3.38 months, range = 4;0–4;11; 9 girls) and thirty-five 5-year-olds (M = 5;6, SD = 3.73, range = 5;0–5;11; 19 girls); Table 1 provides more detailed information about the participants in each condition for all experiments. An additional five 4-year-olds and two 5-year-olds were recruited but were removed from the analysis for failing comprehension questions or providing uninformative responses on both trials. We also tested 3-year-olds but stopped after only 2 of the 12 children tested completed both trials. In this experiment, and those subsequent, children were recruited from their schools and day cares in the Waterloo Region, Ontario, and tested individually in a quiet area of their school. Demographic information was not formally collected, but the region is predominantly middle class, and approximately 79% of residents in this region are Caucasian, with Chinese and South Asians as the most visible minority. All children in these experiments were fluent in English.

Procedure

Children were randomly assigned to either of two conditions, knowledge or ignorance, in a between-subjects design. Children were first introduced to Mr. Bear, a stuffed bear who served as the communicative partner in the experiment. In each of the two trials, children were told Mr. Bear's knowledge state about a kind of object (umbrellas in one trial and leaves in the other, with trial order counterbalanced across children). In the knowledge condition, children were told that Mr. Bear knew about the relevant kind, and in the ignorant condition, they were told that he did not know about it. For instance, in the umbrella trial, children were either told "Where Mr. Bear comes from, they *have* umbrellas. Mr. Bear *knows lots of things* about umbrellas" or "Where Mr. Bear comes from, they *don't have* umbrellas. Mr. Bear *doesn't know anything* about umbrellas." Children were then asked a comprehension question about whether Mr. Bear knew about the kind.

Table 1
Participant Information by Age and Condition

	N	*M*	Range
Experiment 1			
Four-year-olds			
Knowledge	16	4;6	4;0–4;11
Ignorance	14	4;6	4;0–4;11
Five-year-olds			
Knowledge	17	5;6	5;0–5;11
Ignorance	18	5;6	5;0–5;11
Experiment 2			
Four-year-olds			
Knowledge	17	4;6	4;0–4;11
Ignorance	16	4;7	4;1–4;11
Baseline	15	4;6	4;1–4;11
Five-year-olds			
Knowledge	20	5;6	5;0–5;11
Ignorance	18	5;6	5;0–5;11
Baseline	16	5;6	5;1–5;11
Six-year-olds			
Knowledge	21	6;6	6;0–6;11
Ignorance	19	6;5	6;0–6;11
Baseline	20	6;5	6;0–6;10
Experiment 3			
Four-year-olds			
Teach	18	4;6	4;1–4;10
Tell	14	4;6	4;0–4;11
Five-year-olds			
Teach	16	5;7	5;0–5;11
Tell	21	5;6	5;0–5;11

After being told the bear's knowledge state about the kind, children were shown a photograph of a unique member of the kind displayed on a laptop computer. In the umbrella trial, the photograph was of a frog-faced umbrella; in the leaf trial, it was of a red leaf (see Figure 1). The experimenter then said, "Look! Here's an umbrella! Can you tell Mr. Bear about it?" We anticipated that children would respond by providing general information about the kind (e.g., "it protects you from the rain"), by providing information specific to the particular object shown (e.g., "this umbrella has a face"), or by providing both types of information. Of key interest was whether the type of information provided would depend on the bear's knowledge state.

When children were asked the final test question ("Can you tell Mr. Bear about it?"), they were allowed to respond for as long as they wished. Children were deemed to be finished responding if there were 3 s of silence or a verbal indication (e.g., "that's all") at which point all children were asked if they had anything else to tell the bear. The experimenter moved on to the next trial when the child finished responding to the prompt. Some children remained silent when the experimenter first asked the question, in which case the experimenter waited for 5 s for a response before she asked once if the child had any ideas.

As described earlier, each trial included a comprehension check to confirm that children were aware of the bear's knowledge state. When children responded correctly, the experimenter praised them and repeated the knowledge information again. Occasionally, however, children failed a comprehension question. In these cases, the knowledge state information was repeated and the question was asked once more. If children responded correctly, the experimenter praised them and repeated

Figure 1. Items used in Experiments 1, 2, and 3. [Color figure can be viewed at wileyonlinelibrary.com].

the knowledge information. Children who responded incorrectly both times ($N = 2$) completed the trial, but their data were removed from the analysis on a trial-by-trial basis.

Coding

The session was audio recorded, and children's responses were transcribed by a research assistant blind to the hypothesis. Coding was conducted in two phases. In the first phase, each trial was coded by the first author and a research assistant blind to the hypothesis. Coders first identified informative responses produced by the children. To be informative, a child needed to provide information at any point during the trial that described the object in question. For example, the statement "umbrellas keep you dry" was coded as informative, whereas silence or irrelevant statements like "he likes it" were not. Then, responses were coded for whether the child labeled the object, but did not provide any additional information about it; for instance, "that's an umbrella" but not "that's a green umbrella." Agreement was near perfect, with 99% and 97% agreement for informative ($\kappa = .98$) and labeling ($\kappa = .76$), respectively. Disagreements were resolved by discussion. Neither informative responses nor labeling differed by condition, age, or their interaction, all ps > .10. Responses in trials coded as informative, but not consisting of labeling only, were retained for further coding (i.e., 117 of 144 trials).

In the second phase of coding, two independent research assistants blind to the hypothesis coded the response for each trial on two dimensions. First, they coded whether the response included any general information: information that is generally true of the object kind and not specific to only some objects of the kind (e.g., "umbrellas keep you dry"). Then, they coded whether the response included any specific information: information applicable to some objects of the kind but not generally true of the object kind (e.g., "the umbrella looks like a frog"). (We consider alternative ways of framing general and specific information in the General Discussion.) Responses were coded for both types of information because they often included multiple pieces of information and could therefore include both kinds. For instance, one child's description of the umbrella included the general information, "you hold it when it's raining," and the specific information, "It's so green up there red and black, and it looks like it has eyes." For this reason, coders were instructed to *not* see specific and general information as mutually exclusive.

Instead of simply coding for the presence or absence of each type of information, responses were coded using 5-point Likert scales, ranging from 1 (*definitely does not [contain general/specific information]*) to 5 (*definitely does*). Cronbach's alphas were acceptable for both ratings: general $\alpha = .82$, specific $\alpha = .92$. Each of the scores was averaged across coders and across trials for further analysis. Data from the subsequent experiments were coded by the same individuals, using the same coding procedures (see Table 2 for sample responses and the average general and specific scores they received).

We had the coders use Likert scales to allow them to convey differences in the extent to which the information mentioned in responses was general and specific. For example, suppose a child said that the umbrella is used for staying dry in the rain. This information might be assigned a general score of 5 because it is very general (it is true of almost all umbrellas). However, if the child instead said that the umbrella has a hook, they might receive a general score of 3 because this information is moderately general (i.e., although hooks are common on umbrellas, many umbrellas have other kinds of handles). Such variation in the degree to which facts are viewed as general is reflected in studies on adults' judgments of generics, as participants in these studies are often asked to rate statements using Likert scales (e.g., Khemlani, Leslie, & Glucksberg, 2012; Prasada, Khemlani, Leslie, & Glucksberg, 2013; Tasimi, Gelman, Cimpian, & Knobe, in press). However, as can be seen in the Supporting Information, the coders in this experiment and the subsequent experiments assigned intermediate scores infrequently and instead predominantly gave the extreme scores of 1 and 5.

It is also important to note that these coding instructions focused on the factual content of children's responses rather than on whether their syntax indicated that the responses were generic (e.g., coders were *not* instructed to examine whether responses featured bare plural noun phrases). However, in the Supporting Information, we report results yielded in subsequent coding that did examine whether children's responses were structurally generic. We also report on a third dimension that the coders looked at: whether responses mentioned information that was visually available in the picture. The results of this measure were not substantially different from general and specific scores presented next.

Table 2
Sample Utterances by Coding Pattern Based on Mean General and Specific Scores

Pattern	Utterance	General	Specific
High general, high specific	[Cup] Has different color spots. And it's white. And you drink from it.	5.0	5.0
	[Leaf] They're all different colors of the rainbow and that one's red.	5.0	5.0
	[Umbrella] Yea. It's so green up there red and black and it looks like it has eyes. Yea ummm when you hold it when it's raining you have to put it carefully. Yea when it's in your house, when you go outside put it on to make not wet.	5.0	5.0
High general, low specific	[Cup] Cup is like how you drink stuff. Sometimes you can make cups, and you can paint them.	5.0	1.5
	[Leaf] Umm a leaf fall off trees.	5.0	1.0
	[Sheep] You can take wool off the sheep	4.5	1.0
Low general, high specific	[Leaf] It's red.	1.0	5.0
	[Cup] Polkadots. The whole cup is dotty.	1.0	5.0
	[Umbrella] He has eyes. A smiley face. Some dots on here.	1.0	5.0
Low general, low specific	[Sheep] It's different without the top. Ummm the face is different.	1.0	2.0
	[Sheep] Lines.	1.0	1.0
Other	[Cup] Cup has dots. Cup has a handle.	3.5	5.0
	[Leaf] It is read and if you put it under paper and then roll it just like that roll a roll a crayon on it and then you'll see the shape of it. And that's all. And leaves are really cool.	3.0	5.0
	[Sheep] Ummm a shepherd took care of it.	3.5	2.5

Note. This table shows some of the more prevalent response patterns in the data. Note, though, that these response patterns were not the basis of any analyses, which were instead based on participants' average general and specific scores.

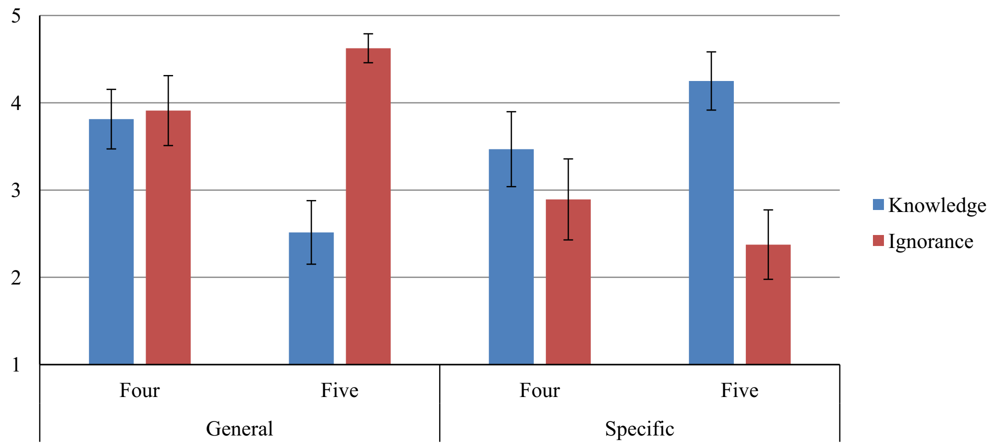

Figure 2. Average scores in Experiment 1. Error bars represent 1 *SE*. [Color figure can be viewed at wileyonlinelibrary.com].

Results and Discussion

We wanted to see if children provided more general information when the bear was ignorant and more specific information when he possessed knowledge. To examine these predictions, we conducted separate Age (4, 5) × Condition (knowledge, ignorance) analyses of variance (ANOVAs) on children's general and specific scores (see Figure 2 for children's mean scores).

For general scores, there was no main effect of age, $p = .368$, but there was a main effect of condition, $F(1, 61) = 11.79$, $p = .001$, $\eta_p^2 = .16$, and an Age × Condition interaction, $F(1, 61) = 9.79$, $p = .003$, $\eta_p^2 = .14$. As can be seen in Figure 2, 5-year-olds were more likely to provide general information to the bear when he was ignorant than when he was knowledgeable, $t(22.41) = 5.28$, $p < .001$, whereas 4-year-olds showed no sensitivity to his knowledge state, $t(28) = 0.19$, $p = .852$. These findings suggest that it is only at age 5 that children are first sensitive to a listener's knowledge state when conveying general information.

For specific scores, there was only a main effect of condition, $F(1, 61) = 9.10$, $p = .004$, $\eta_p^2 = .13$, indicating that children were more likely to provide specific information when the bear was knowledgeable than when he was ignorant. There was no main effect of age and no interaction, both ps > .11. These findings suggest that children of *both* ages are sensitive to listener's knowledge state when conveying specific information.

We also conducted a series of paired *t* tests to examine whether children provided general information over specific information when the bear was ignorant, but specific information over general information when he was knowledgeable. Only the first expectation was met: Children were more likely to provide general information than specific information when the bear was ignorant, $t(31) = 3.67$, $p = .001$, but they provided both types of information equivalently when he was knowledgeable, $t(32) = -1.486$, $p = .147$.

In sum, children were sensitive to the listener's knowledge state when determining what information to provide. They were more likely to provide specific information when addressing a knowledgeable listener and general information when addressing an ignorant listener. However, children at both ages were sensitive to the listener's knowledge state when providing specific information, whereas only the 5-year-olds were sensitive to it when providing general information.

Experiment 2

The first experiment showed that children vary which information they convey depending on whether their listener is knowledgeable or ignorant. However, the findings do not distinguish between whether children are sensitive to *both* of these epistemic states or to just one of them. For instance, children are known to overattribute knowledge to others in a phenomenon known as the "curse of knowledge" (e.g., Birch & Bloom, 2003, 2004; Camerer, Loewenstein, & Weber, 1989; also see Cimpian & Scott, 2012). If children show this effect, they might assume that the bear is knowledgeable and therefore only be sensitive to information that the bear is ignorant.

To investigate whether children are sensitive to knowledge, ignorance, or both epistemic states, the next experiment compared responses in the knowledge and ignorance conditions with those from a new "baseline" condition in which children were not given any information about the bear's knowledge. We again not only tested 4- and 5-year-olds but also tested 6-year-olds to better assess developmental effects. We also had children teach the bear about new items to ensure that the results from the first experiment were not contingent on the particular items used.

Method

Participants

We tested 162 children aged 4, 5, and 6 between March and May 2015. There were forty-eight 4-year-olds (M = 4;7, SD = 3.28, range = 4;0–4;11; 24 girls), fifty-four 5-year-olds (M = 5;6, SD = 3.43, range = 5;0–5;11; 31 girls), and sixty 6-year-olds (M = 6;5, SD = 3.60, range = 6;0–6;11; 30 girls). An additional 35 children (eighteen 4-year-olds, thirteen 5-year-olds, and four 6-year-olds) were recruited for the study but were not included in the final analysis due to failing comprehension questions or providing uninformative responses on both trials.

Procedure

The knowledge and ignorance conditions were identical to Experiment 1 but used two different items: a polka-dotted cup and a black sheep (see Figure 1). Four children from these conditions had responses from a trial removed because they failed its comprehension question twice. The procedure in the baseline condition was identical to the procedure in the other conditions, except children were not told about the bear's knowledge state. Hence, the baseline condition did not include a comprehension question, and each trial began with the presentation of a picture on the laptop screen.

Coding

In the first phase of coding, there was near-perfect agreement between the raters in whether responses were informative (98% agreement, $\kappa = .93$) and included labeling (97% agreement, $\kappa = .78$). Informative responding increased with age (4-year-olds: 70% of responses informative, 5-year-olds: 70%, 6-year-olds: 90%), $F(2, 188) = 6.29$, $p = .002$, but informative responding and labeling were not influenced by condition in any main effects or interactions (all ps > .10). Responses that were informative and that did not feature labeling only (n = 292 of 396 trials) were then examined in the second coding phase. Reliability in the second phase was acceptable for both general scores (Cronbach's α = .83) and specific scores (α = .83).

Results and Discussion

We expected to replicate the results of Experiment 1, in which children provided more general information when the listener was ignorant and more specific information when the listener was knowledgeable. We were also interested to see whether responses in the baseline condition would differ from those in the other conditions (see Figure 3 for children's mean general and specific scores by age and condition).

We first examined children's general scores using an Age (4, 5, 6) × Condition (knowledge, baseline, ignorance) ANOVA. There was no main effect of age, $p = .159$, but there was a main effect of condition, $F(2, 152) = 6.32$, $p = .002$, $\eta^2_p = .08$, and a marginal interaction, $F(4, 152) = 2.37$, $p = .055$, $\eta^2_p = .06$. To follow-up on this marginal interaction, one-way ANOVAs examined the effect of condition at each age. At age 4, there was no difference between conditions, $p = .703$, but there were differences at ages 5, $F(2, 51) = 4.50$, $p = .016$, $\eta^2_p = .15$, and 6, $F(2, 57) = 8.00$, $p = .001$, $\eta^2_p = .22$. Five-year-olds were more likely to provide general information in the ignorance condition than in the knowledge condition, $t(34) = 3.05$, $p = .004$, and were marginally more likely to provide general information in the ignorance condition than in the baseline condition, $t(32) = 1.78$, $p = .085$; inclusion of general information was equivalent in the knowledge and baseline conditions, $p = .239$. Six-year-olds were also more likely to provide general information in the ignorance condition than in the knowledge condition, $t(39) = 4.10$, $p < .001$. However, their inclusion of general information did not differ between the ignorance and baseline conditions, $p = .169$, and instead they were more likely to convey general information in the baseline condition than the knowledge condition, $t(38) = 2.33$, $p = .025$. Overall, these findings suggest older children are sensitive to information about both speakers' ignorance and their knowledge, though no single age group showed sensitivity to both types of information (i.e., 5-year-olds were sensitive to information about ignorance, whereas 6-year-olds were sensitive to information about knowledge).

We then examined children's specific scores using an Age × Condition ANOVA. There was a main effect of condition, $F(2, 153) = 9.15$, $p < .001$, $\eta^2_p = .11$, but no main effect of age and no interaction, both *p*s > .33. Children in the knowledge condition were more likely to provide specific information than children in both the ignorance condition, $t(107) = 4.78$, $p > .001$, and the baseline condition, $t(96.48) = 2.40$, $p = .019$. Children in the baseline condition were marginally more likely to include specific information than children in the ignorance condition, $t(102) = 1.90$, $p = .060$. These findings again suggest that children are sensitive to knowledge states when conveying specific information. Furthermore, because inclusion of specific information in the baseline condition fell between that in the knowledge and ignorance conditions, the findings show that children are sensitive to *both* knowledge and ignorance.

Finally, we examined whether children conveyed more general or specific information in each condition. In the knowledge condition, children provided specific information more often than general

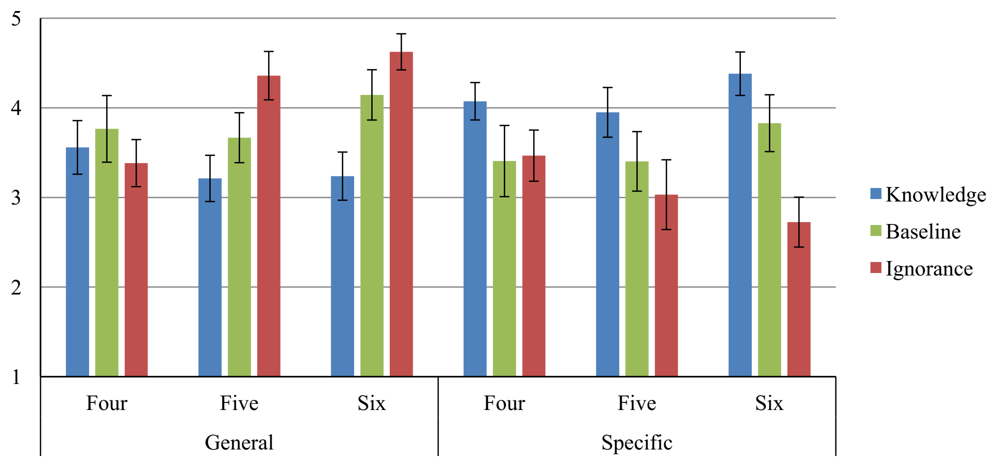

Figure 3. Average scores in Experiment 2. Error bars represent 1 *SE*. [Color figure can be viewed at wileyonlinelibrary.com].

information, $t(57) = 3.24$, $p = .002$. Conversely, in the ignorance condition, children provided general information more often than specific information, $t(50) = 3.94$, $p < .001$. Children in the baseline condition provided both types of information equivalently, $p = .345$. These findings show that children appropriately prioritized the type of information they provided depending on the listener's knowledge state. Also, the fact that patterns differed across all three conditions further suggests that children were sensitive to information about the listener's knowledge *and* ignorance.

In sum, the results from the knowledge and ignorance conditions replicated findings from Experiment 1, with children providing more general information to ignorant listeners than to knowledgeable ones and more specific information to knowledgeable listeners than to ignorant ones. Comparisons between the baseline condition and the other conditions suggested that children were sensitive to information about both knowledge and ignorance; however, this conclusion should be taken with caution because some of the comparisons only yielded marginal effects, and because there were developmental inconsistencies in children's sensitivity to each type of information in their references to general information. We also found similar developmental patterns to those observed in Experiment 1. Although children at all ages tested showed sensitivity to the listener's epistemic state in mentioning specific information, they only showed this sensitivity from age 5 when mentioning general information.

Experiment 3

The first two experiments explored how children vary the specificity of the information they convey depending on whether their listener is explicitly described as knowledgeable or ignorant. In our final experiment, we examined whether pedagogical goals also affects children's references to each type of information. To manipulate children's pedagogical intent, children were either instructed to *teach* the listener about objects or to tell the listener about them. To focus on this manipulation, children were not told about whether the listener was knowledgeable. We also limited this experiment to children aged 4 and 5 because the previous experiments found notable developmental differences between children at these ages, whereas 5- and 6-year-olds largely responded similarly to one another.

Method

Participants

We tested 70 children aged 4 and 5 between April and June 2015. There were thirty-three 4-year-olds (M = 4;6, SD = 3.03, range = 4;0–4;11; 17 girls) and thirty-seven 5-year-olds (M = 5;6, SD = 3.41, range = 5;0–5;11; 21 girls). An additional 18 children (eleven 4-year-olds and seven 5-year-olds) were recruited but not included in the final sample due to providing uninformative responses on both trials. We attempted to test 3-year-olds in this experiment but again found that a small percentage (13 of 33) were able to complete both trials.

Procedure

Children were randomly assigned to either of two conditions, which differed based on whether children were told they would "teach" or "tell" the stuffed bear about some items. In each condition, children completed two trials in which they taught or told (depending on the condition) the bear about an item. These items were the polka-dotted cup and black sheep used in Experiment 2.

To encourage children to respond, we modified the prompting procedure slightly for this experiment. If a child did not respond within 5 s, they were asked again to teach or tell (depending on condition) the bear about the object. All other aspects of the prompting procedure were the same.

Coding

In the first phase of coding, agreement was perfect for coding of informative responses (100%, $\kappa = 1.00$) and near perfect for coding them as featuring labeling (99%, $\kappa = .98$). The percentage of informative responses was slightly higher in the tell condition (86%) than in the teach condition (72%), $t(80.28) = 1.76$, $p = .083$. We suspect this may be due to children's lower confidence in their abilities to teach, as the experimenter noted that several children expressed concern that they did not know how to teach. Labeling frequencies did not differ by condition, $t(78.74) = 1.45$, $p = .152$, and 127 of 176 trials were retained for further coding. In the second phase of coding, agreement was acceptable for both general scores (Cronbach's $\alpha = .88$) and specific scores ($\alpha = .85$).

Results and Discussion

We first examined whether the general information and specific information conveyed by children varied by age or condition (see Figure 4 for children's mean scores). An Age (4, 5) × Condition (teach, tell) ANOVA on general scores revealed a main effect of age, $F(1, 66) = 6.07$, $p = .016$, $\eta_p^2 = .08$, in which 5-year-olds mentioned more general information than 4-year-olds. There was also a main effect of condition, $F(1, 66) = 8.36$, $p = .005$, $\eta_p^2 = .11$, in which children provided more general information when asked to teach than to tell. There was no interaction between age and condition, $p = .422$. A similar ANOVA on specific scores revealed no main effects and no interaction, all $ps \geq .114$.

As in the previous experiments, we also examined whether children were more likely to provide general information or specific information in each condition. Children asked to teach provided general information more often than specific information, $t(33) = 4.93$, $p < .001$. Similarly, children asked to tell showed a trend to provide general information more often than specific information, $t(35) = 1.88$, $p = .069$. These findings suggest that children appropriately prioritized general information when teaching, though interestingly we see that children also tended to prioritize general information when telling.

These findings differ from those in the previous experiments. First, in the previous experiments, 4-year-olds provided general information equivalently across the conditions, but here they were sensitive to condition. Second, in the previous experiments, children were sensitive to condition in conveying specific information, but here they were not sensitive to condition in conveying this information. Both differences suggest dissimilarities between how pedagogical goals and information about a listener's knowledge state affect which information children choose to convey.

General Discussion

In three experiments, we examined 4- to 6-year-old children's developing ability to appropriately mention general and specific facts. In each experiment, children were shown pictures of objects and were asked to inform a listener about them. We then examined whether they mentioned general and specific facts. Children's responses demonstrate that they can use their ability to distinguish between general and specific information in conversation, and with development increasingly use this ability to appropriately inform others.

Our results are also informative about how children base decisions about whether to mention general and specific facts on their listener's knowledge state and on their own pedagogical goals. We next review and discuss how each factor influenced children's responses, and then discuss what our findings reveal about the mechanisms that underlie children's sensitivity to these two factors. We also consider some limitations of our findings, and discuss possible future directions.

Listener's Knowledge State

Children at all ages tested were sensitive to their listener's knowledge state when mentioning specific

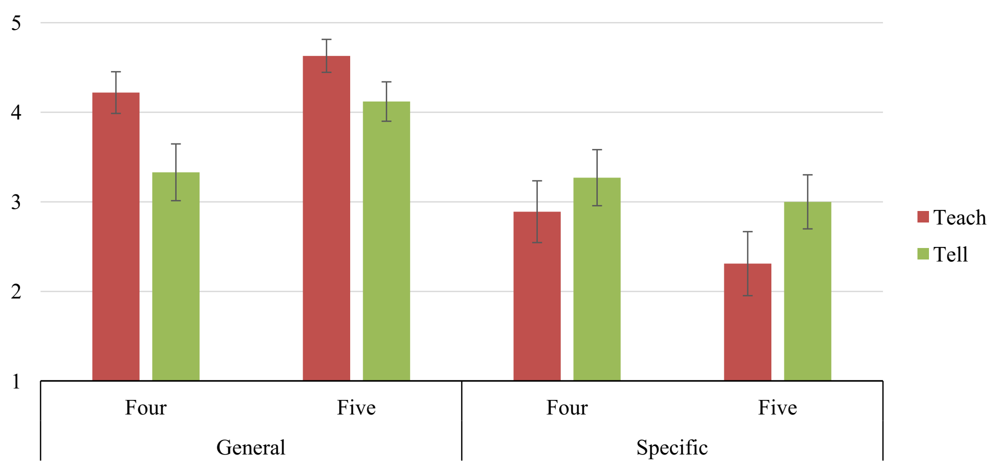

Figure 4. Average scores in Experiment 3. Error bars represent 1 *SE*. [Color figure can be viewed at wileyonlinelibrary.com].

facts; they were less likely to mention specific facts when the listener was ignorant compared with when he was knowledgeable. However, we observed developmental changes in sensitivity to listener's knowledge when children mentioned general facts. Children aged 5 and 6 were more likely to mention general facts when the listener was knowledgeable compared with when he was ignorant, but 4-year-olds mentioned general facts equivalently regardless of the listener's knowledge state. These findings suggest that sensitivity to listener's knowledge affects references to specific facts before it affects references to general facts.

This developmental difference suggests that 4-year-olds had difficulty knowing how to vary references to general knowledge based on the listener's knowledge state. This could have resulted from difficulty imagining that the listener lacked general knowledge about the objects. Complete ignorance might have been especially difficult to imagine because general facts about familiar objects are normally widely known. Such expectations are even reflected in children's processing of new general information. When told facts that are general and pertain to kinds, children are more likely to think that others already know this information (Cimpian & Scott, 2012) and to incorrectly believe that they had known the information all along (Sutherland & Cimpian, 2015). Perhaps 4-year-olds did not mention more general facts when addressing the ignorant listener because they had difficulty overcoming the feeling that the listener already knew this information. Such difficulties might not apply to decreasing references to specific information when addressing an ignorant listener, because this does not require saying something that one feels the listener already knows. On this account, older children were able to vary their references to general facts because they were better able to accept that the listener's knowledge was so different than their own.

We also found that children were sensitive to both the listener's knowledge and their ignorance. Evidence for this came from our "baseline" condition where children were not informed about the listener's knowledge state (Experiment 2). Children in this condition generally provided general and specific information at levels midway between those in the conditions where they were told whether the listener was knowledgeable or ignorant. (These conclusions are somewhat tentative, though, because some of the comparisons only yielded marginal effects.) Our within-subjects analyses further revealed that children in the baseline condition mentioned both types of information equivalently (unlike children in the knowledge and ignorance conditions), further suggesting that children were indeed sensitive to both knowledge and ignorance information. These findings suggest that children did not assume by default that the listener was knowledgeable. If children had assumed knowledge, they should have responded equivalently in the baseline and knowledge conditions, yet we found a difference. (This said, we cannot be certain that children did not assume knowledge in the baseline condition because we did not explicitly ask them about the listener's knowledge state.) Regardless, it is somewhat surprising that children did not appear to assume knowledge because preschoolers are often subject to the "curse of knowledge" and assume that others share their knowledge (e.g., Birch & Bloom, 2003, 2004). Also, it would have been reasonable to assume that the listener was knowledgeable because the objects depicted were all members of very familiar kinds. However, as we consider later, the extent to which children assume others will be knowledgeable likely depends on the nature of the listener, and so participants' responses probably depend, in part, on the fact that the listener in the present experiments was a stuffed animal.

Pedagogical Goals

Children varied the types of facts they mentioned when their goal in addressing the listener was pedagogical: They were more likely to mention general facts when instructed to teach the listener about the objects compared with when they were asked to tell the listener about them. This finding is broadly consistent with findings showing that children use more kind-referring noun phrases when asked to teach (Gelman et al., 2013) and with findings that children are more likely to interpret new information as general when it is presented with pedagogical cues (e.g., Butler & Markman, 2012, 2014).

Although children varied the facts they mentioned depending on their pedagogical intent, this effect was specific to their references to general facts and had no effect on their references to specific facts. This finding reveals that the effects of pedagogical goals on children's utterances are strikingly different from those of knowledge state (recall that knowledge state influenced children's references to both types of facts, with the impact on specific facts emerging first). This difference is surprising to the extent that children's teaching draws on their ability to consider others' knowledge. For instance, 3-year-olds children understand that teaching occurs when one individual has more knowledge than another (Ziv & Frye, 2004), and children's abilities to teach show improvement with developments in their theory of mind (Davis-Unger & Carlson, 2008; Strauss et al., 2002). Despite this link, however, teaching may not always *require* consideration of mental states (see Kline, 2015). We return to this discussion below.

Mechanisms Underlying Children's Performance

Together, our findings shed light on the mechanisms underlying children's decisions about whether to mention general or specific facts. First, our findings suggest that children's sensitivity to listeners' knowledge does not reflect a heuristic to tell more information to ignorant listeners. It was plausible that children might follow such an "inform the ignorant" heuristic because children in most previous studies of sensitivity to listeners' knowledge provided more information when their listener was ignorant rather than knowledgeable (Menig-Peterson, 1975; Nadig & Sedivy, 2002; Nilsen & Graham, 2009; Perner & Leekam, 1986; Saylor et al., 2006). However, following such a heuristic should have led children to either indiscriminately provide ignorant listeners with more information of *both* kinds or perhaps to provide ignorant listeners with more general information while not modifying specific information. In contrast with either of these expectations, 4-year-olds (the youngest children we tested) provide *less* specific information when the listener was ignorant. This response is appropriate because a listener who is ignorant about a kind may typically be unable to appreciate the importance of specific information about particular members of the kind. These same findings also argue against the possibility that children's responses simply resulted from adherence to a similar heuristic to avoid telling knowledgeable listeners information that they already know. Again, such a heuristic would not lead children to provide more general than specific information when addressing an ignorant listener. Rather than reflecting adherence to a simple heuristic, children's sensitivity to listener's knowledge more likely reflects perspective taking in which they attempt to consider the information most relevant and useful for the listener.

Second, our findings suggest that listeners' knowledge and children's pedagogical goals acted on children's responses via different mechanisms. This conclusion is supported by our finding that although listener's knowledge affected references to both types of facts, with effects on specific facts emerging first, pedagogical goals only influenced references to general facts. A straightforward explanation for this difference is that children did not consider listener's knowledge when teaching. Although this conclusion does not readily fit with findings that teaching is related to knowledge attribution and theory of mind (Davis-Unger & Carlson, 2008; Strauss et al., 2002), it is consistent with accounts that stress that teaching need not *rely* on knowledge understanding. For instance, cross-disciplinary definitions of teaching do not universally include knowledge understanding as a prerequisite to teaching behavior (see Kline, 2015 for a review). Likewise, the theory of natural pedagogy describes teaching as transmitting general information, which is understood by both teachers and learners without necessarily inferring knowledge states (Csibra & Gergely, 2006, 2009). On this account, children who were instructed to teach may have bypassed reasoning about knowledge by relying on a heuristic that general information should be conveyed when teaching.

Future Directions

In our experiments, we used a stuffed bear as the listener because we wanted it to be plausible that the listener might not know about familiar kinds of objects. However, future research could investigate whether children might respond differently when addressing other types of listeners (and when informing about other kinds of objects). For instance, children might be more likely to provide general information (and less likely to provide specific information) when addressing very young children (or even babies) than when addressing adults, as they assume that younger individuals are ignorant about certain topics (e.g., Jaswal & Neely, 2006; Taylor, Cartwright, & Bowden, 1991, Study 1; but see Pillow & Weed, 1997). At the same time, there are other topics for which they might assume adults are likely to be less knowledgeable (VanderBorght & Jaswal, 2009), and so the pattern of findings could be reversed in these cases. Similarly, children's responses might be influenced by whether they address a listener who appears to be from their own culture or from a foreign one (e.g., based on accent). Children show greater trust in native-accented speakers as informants about the functions of artifacts (e.g., Kinzler, Corriveau, & Harris, 2011), and this could result, at least in part, from assumptions that foreign-accented speakers are less likely to be knowledgeable about them.

An important point about such studies is that they would avoid the need to specify the listener's knowledge state. As such, participants would be in an equivalent position to children in the baseline condition of Experiment 2. This highlights a potential limitation of our baseline condition: Although our findings overall suggested that children's responses in the baseline condition generally scored between their responses in the knowledge and ignorance conditions on both of our measures, these effects might differ if children addressed other types of listeners or informed listeners about other kinds of objects. This may help explain why children did not strongly assume that the listener was knowledgeable—their assumptions of knowledge may vary depending on other characteristics of the listener.

Future research could also examine which of two types of generality children consider in deciding whether to mention general and specific facts. One view links generality with prevalence. On this view, facts are general if they are true of most members of a kind but are instead specific is they are only true of a minority of members. However, a different view of generality holds that a fact is general if it can be generalized to a kind and will be endorsed as a general statement about the kind. On this view, some nonprevalent facts are considered general, and some prevalent facts are rejected as nongeneral. For instance, people affirm that "ducks lay eggs" and "sharks attack swimmers," even though neither proposition expresses a property that is true for most members of the kind (e.g., only a minority of sharks that attack swimmers; Brandone, Cimpian, Leslie, & Gelman, 2012). Likewise, people often deny that "books are paperbacks" and "Canadians are right-handed," even though both propositions express properties true of most members of the relevant kinds (Khemlani et al., 2012; Prasada et al., 2013).

Our coding scheme may have encouraged a prevalence-based interpretation of what counts as general and specific. For instance, coders were told to count responses as general if they mentioned facts that are generally true of the object kind and not specific to only some objects of the kind. However, more direct measures of prevalence-based generality are possible (i.e., coders could be instructed to make prevalence estimates), and these instructions are only an issue to the extent that children mentioned nonprevalent properties that are accepted as generalizations and prevalent properties that are not accepted. Regardless, it would be interesting for future investigations to directly assess which type of generality children considered.

Related to this, future research could investigate the relation between children's references to general facts and their use of kind-referring language. Overall, we might expect these to co-occur, as language that refers to kinds should normally be used to convey information that is generally true of them. However, general facts can be conveyed using nongeneric language, and in the Supporting Information we show that the overall effects on children's references to general facts that we observed (i.e., the effects of listener's knowledge and children's pedagogical goals) arise even when examining responses that only included nongeneric language. Given that children sometimes choose to convey general knowledge using nongeneric language, it might be worthwhile to investigate factors that influence their decisions about how to express these facts.

Conclusion

Children's ability to consider the needs of their listeners continues to develop past early accomplishments like informing listeners of missed events. Our studies add another communicative competency related to the type of information children provide to their listeners—a nuanced distinction that may be accessed through different mechanisms depending on situational constraints like listener's knowledge state and the pedagogical goals of the scenario.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's website:

Appendix S1. Analyses of Visible Scores

Appendix S2. Coders' Use of the Likert Scales

Appendix S3. Generic Language in Children's Responses

Table S1. Percentage of Responses Including Generic Language by Experiment and Condition