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Elephants are Gray: Linguistic Sensitivity and the Use of Generic Utterances in Pedagogical and Nonpedagogical Contexts

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Abstract

Prior research indicates that humans adapt their language depending on context. This linguistic sensitivity has been suggested to indicate a natural pedagogy shared by all humans. This sensitivity has, however, only been demonstrated with English-speaking samples thus far. In two studies, we followed the experimental procedure of the original study to replicate their findings with German-speaking samples. With Study 2 conducted in the diglossic environment of the German-speaking part of Switzerland, we were additionally able to provide a first test for whether this sensitivity is restricted to the language spoken in formal educational settings or occurs also in everyday language. Across both studies, we found a more frequent use of generic utterances in the pedagogical context than in the nonpedagogical context, both in Germany (Study 1) and in Switzerland (Study 2). These results and the strong effect sizes provide clear support for a natural pedagogy.

Keywords: Natural pedagogy; Generics; Language; Universality; Diglossia

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1. Introduction

Prior research indicates that humans adapt their language depending on context. Csibra and Gergely (2009) postulated a linguistic sensitivity as an indicator of a natural pedagogy shared by all humans. This sensitivity has, however, only been demonstrated with English-speaking samples thus far (Gelman, Ware, Manczak, & Graham, 2013). In two studies, we followed the experimental procedure of Gelman et al. (2013) to replicate their findings with German-speaking samples. With Study 2 conducted in the diglossic environment of the German-speaking part of Switzerland, we were additionally able to provide a first test for whether this sensitivity is restricted to the language spoken in formal educational settings or occurs also in everyday language. Across both studies, we found a more frequent use of generic utterances in the pedagogical context than in the nonpedagogical context, both in Germany (Study 1) and in Switzerland (Study 2). These results and the strong effect sizes provide clear support for a natural pedagogy as put forward by Csibra and Gergely (2009).

Conveying information via language plays a key role in pedagogical contexts. The learner needs to understand the information provided by the utterances of an educated person while the educated person needs to convey information in suitable linguistic forms. Csibra and Gergely (2009) proposed a particular sensitivity of humans to generic statements in pedagogical settings. This sensitivity is assumed to be part of a general pedagogical system referred to as natural pedagogy and to be inter alia indicated by an enhanced use of generic utterances. The advantage of generic utterances is that they provide generalizable knowledge (e.g., Cimpian & Markman, 2009; Gelman & Markman, 1986; Prasada, 2000). Put differently, generic utterances indicate categorical knowledge. For example, generic utterances such as "Elephants are gray" or "Police officers wear uniforms" indicate knowledge that is valid for all elephants or police officers, respectively. That is, if a property (i.e., some information) is ascribed to a category using a generic utterance, this linguistic form indicates that the property can be generalized to all members or instances of this category.

Based on Csibra and Gergely's idea (2009), Gelman et al. (2013) hypothesized that both children and adults would show a context-sensitive use of generics. Specifically, they should produce more generic utterances in a pedagogical than in a nonpedagogical context. Gelman et al. (2013; Study 2) tested English-speaking 6-year-olds and young adults by prompting participants to be a teacher in one condition (pedagogical context) and to communicate with a friend in the other condition (nonpedagogical context). As expected, participants produced significantly more generic utterances in the pedagogical than in the nonpedagogical context. Gelman et al. concluded that both children and adult speakers sensitively adapt their linguistic utterances to contexts in accordance with the natural pedagogy proposed by Csibra and Gergely. However, empirical evidence for this sensitivity has thus far only been reported for English-language speakers. If Csibra and Gergely's proposition of a natural pedagogy holds true, the context-sensitive language use should be universal. Thus, the results of Gelman et al. (2013) must be replicated in languages other than English. We conducted two studies in two different German-speaking countries (Germany and Switzerland) to conceptually replicate Gelman et al.'s (2013) findings, that is, to test whether German speakers, similar to American English speakers, produce more generic utterances in pedagogical than in nonpedagogical

contexts. In addition to the conceptual replication in Study 1 in Germany, we extended the experimental design in Study 2 to investigate a possible confound in the diglossic environment of Switzerland.

The confound concerns the origin of linguistic sensitivity. As said, Csibra and Gergely (2009) hypothesized that conveying generic information via communication is natural and universal in human cultures. Accordingly, this natural pedagogy should also exist independently of formal education in everyday life. However, the language spoken in formal educational/pedagogical contexts and in everyday life is usually the same (e.g., English or German). Thus, in most cultures and their languages (e.g., English in the United States, German in Germany), it is not possible to disentangle whether a linguistic sensitivity to expressing generics in pedagogical contexts results from a natural pedagogy (i.e., it exists in everyday language) or from enculturation through the specific language and linguistic constructions used in formal education institutions (sometimes referred to as educational or academic language).

However, there are diglossic environments, such as the German-speaking part of Switzerland, which offer the unique possibility to disentangle this confound. In 1959, the American linguist Charles A. Ferguson coined the sociolinguistic term *diglossia* and illustrated it with Switzerland as an example (Ferguson, 1959). The term describes societies in which two related languages are used in different contexts (Christen, Guntern, Hove, & Petkova, 2010). In other words, diglossia is a special kind of bilingualism in which two linguistic varieties of different statuses coexist and contend with each other (Hove, Christen & Ziegler, 2008). At home or in most other informal situations, Swiss people, including children, speak Swiss German. In classrooms, teachers and children are obliged to speak Standard German. For decades, there have been many discussions regarding the status and use of Standard German and Swiss German. The current status is that the two language varieties are used in different contexts and focus on different social aspects (Hove et al. 2008). Swiss German and Standard German differ to a quite strong extent so that, for instance, Germans visiting Switzerland hardly understand any Swiss German.

If the proposition of a natural pedagogy (Csibra & Gergely, 2009) holds true, the enhanced use of generic utterances in pedagogical contexts should be independent of formal education since pedagogical situations are not limited to formal education but occur continuously in all kinds of contexts. With regard to our study, this independency predicts that we should find an enhanced use of generic utterances in a pedagogical context no matter whether Swiss Germans or Standard German is spoken. If we would find a higher frequency of generic utterances only in Standard German but not in Swiss German, this pattern would indicate that producing generic utterances is a result of continuous immersion into formal educational settings. A diglossic environment thus offers the unique opportunity to experimentally test the breadth of the natural pedagogy assumption and its independence from formal education.

2. Present studies

We conducted two studies. Study 1 was conducted in a monoglossic environment in Germany. The term monoglossic denotes that German is spoken in everyday life and in

formal pedagogical/educational settings. The German language is, in this regard, similar to the American English linguistic environment in which Gelman et al. (2013) conducted their study. With Study 1, we aimed to conceptually replicate Gelman et al.'s findings in a different language. We experimentally manipulated whether adults described a set of pictures in a pedagogical or nonpedagogical context in a within-subject design. Following Gelman et al., we expected participants to produce more generic utterances in the pedagogical than in the nonpedagogical context in Study 1.

Study 2 was conducted in the German-speaking part of Switzerland, that is, in a diglossic environment. The methodology was the same as in Study 1, but we added *Language* as another factor (Swiss German, Standard German) to the within-subject design because the diglossic environment allowed us to disentangle *natural* pedagogical contexts and more *formal* pedagogical contexts as laid out above. Based on the proposition of a natural pedagogy, we expected that participants would produce more generic utterances in pedagogical contexts independent of whether they speak Swiss or Standard German. In conjunction, Studies 1 and 2 provide a necessary next step to test the breadth of the natural pedagogy assumption.

3. Study 1

The aim of this study was to investigate whether native speakers of German in Germany would produce more generic utterances in a pedagogical than in a nonpedagogical context. To conceptually replicate Gelman et al. (2013), we followed their methodology as closely as possible.

3.1. Participants

Gelman et al. (2013) reported a medium to large effect size ($\eta^2 = 0.12$). We used this information to conduct an a priori power analysis that indicated testing at least 36 participants to be able to reliably detect a medium effect ($\alpha = 0.05; f^2 = 0.15; (1 - \beta) = 0.95$). Consequently, we recruited 44 German-speaking university students (39 females) from different fields of study in a medium-sized town in Germany (mean age: 22.7 years, *SD: 2.62*). They were either paid for participation or received course credit. The participants had to have the German language as their mother tongue and to be physically and mentally healthy. All participants fulfilled the inclusion criteria; thus, we had to exclude none. Written informed consent was requested from all participants.

3.2. Materials

Gelman et al. (2013) used 24 drawings as stimuli, each depicting a single object, subject, or entity. We used the same objects, subjects, and entities. The only exception was that we substituted the drawing of a baseball player with a drawing of a footballer because baseball is not a common sport in Germany or Switzerland. The drawings of the stimuli were either taken from Rudel and Butschkow (2011) and Snodgrass and Vanderwart (1980) or were drawn by the first author of the study (Anonymous, 2013). These stimuli were organized into two books

of 12 stimuli (see Table 1, Books A and B) each to be used in either of the two experimental conditions of Study 1 (pedagogical vs. nonpedagogical context). For further details, see Sections 1.1–1.4 in the Supplementary Materials.

3.3. Procedure

All participants were prompted to verbally describe the stimuli. We induced the pedagogical or the nonpedagogical contexts following the procedure of Gelman et al. (2013). That is, in the pedagogical context, we instructed the participants to describe the stimuli of one stimulus book to an alien who does not know anything about the world. The alien was named Zorga for female participants and Zorg for male participants. In the nonpedagogical context, we instructed the participants to imagine talking to a friend about the stimulus in the other stimulus book. The friend was named Tina for female participants and Tom for male participants. For further details, see Section 2 in the Supplementary Materials. The verbal descriptions were recorded.

3.4. Transcribing and coding

The audio recordings were transcribed. The quality of transcription was assured with a second round of transcription. Subsequently, we coded the transcripts to identify generic utterances.

Even though languages differ with respect to how generic utterances are formed, there are some common rules that are valid for all languages. According to Behrens (2005), there are five grammatical categories that can be used for a cross-linguistic analysis of generics: DEF/SG: definite singular; DEF/PL: definite plural; 0/SG: bare singular; 0/PL: bare plural; IND/SG: indefinite singular (see Table 2 for examples). For the coding scheme, see Section 3 in the Supplementary Materials.

To evaluate whether participants produced more generic utterances in the pedagogical than in the nonpedagogical context, we processed the transcripts with three coding steps. The first step in the coding process was to define whether an utterance (i.e., a series of words) can be considered a complete sentence. In spoken language, sentences are often not entirely complete, or the word order is mixed up; therefore, the following three rules were derived based on Gelman, Goetz, Sarnecka, & Flukes, 2008:

1. To be considered a complete sentence, an utterance needs to have a *subject* and a *predicate*. If an utterance did not meet this criterion, it was not analyzed any further.
2. The subject of the utterance had to correspond to the presented stimuli. For example, when a ballerina was presented, the participants had to talk about the ballerina and not about ballet (even if the participant formulated a complete sentence about ballet, it was not analyzed any further).
3. The stimulus had to be the subject of the complete sentence.

The second coding step followed only if an utterance fulfilled all three rules of coding Step 1. If so, we classified the utterance based on the five linguistic categories described by Behrens (2005) and two additional categories (i.e., seven categories in total). The additional

categories served to classify utterances in which a pronoun was used as a subject (PRO) and for fragmented sentences (FRAG; see Table 2).

This PRO category was necessary because many of the utterances referenced a particular previous utterance with the use of a pronoun. For example, a participant began her description of a stimulus with "Elephants are gray" and continued by saying "They have a trunk," "They live in Africa," and so forth. Different types of pronouns, such as demonstrative pronouns, relative pronouns, personal pronouns, and reflexive pronouns, were compiled in the category PRO.

The FRAG category captures a sentence structure that is often used in conversations in German. The sentence structure is fragmented, as only the predicate of the sentence indicates the subject of the sentence. The subject itself is not explicitly mentioned (therefore, violating rule a of coding Step 1 as described above). For example, one participant talked about a dog and used the word dog in his first sentence as a subject. In the next sentence, he said "Sind sehr treu" (English: "Are very faithful"). Given the frequency of this sentence structure in spoken German, we continued to code them.

In the third coding step, we coded whether the utterance indeed provides generic information. Here, we followed the Gelman et al. (2013) procedure: If a sentence contained general information, it was coded as "generic." If it contained personal or other, clearly nongeneric information, we categorized it as nongeneric. For example, one participant uttered the following sentence about the stimulus "cat": "*Our cats were just there*." This sentence meets the first three criteria: It refers to the presented stimulus, the stimulus is the subject of the sentence, and it can be categorized as definite plural. Nevertheless, the information is specific, not generic, and therefore, this sentence was not considered generic.

Two raters independently applied the coding system. Their interrater reliability was Cohen's $Kappa = 0.64$, which indicates substantial agreement.

3.5. Results

In the nonpedagogical condition, the participants produced 2954 full sentences, 271 (9.2%) of which were coded as generic utterances. In the pedagogical condition, the participants produced 4719 full sentences, of which 2027 were coded as generic utterances (43%). Table 3 displays the frequencies and percentages per type of generic utterance and condition.

3.6. Mean differences

We used the ratio of the number of generics to the total number of utterances per participant per condition as the dependent variable in all statistical analyses. This ratio accounts for differences in the absolute number of utterances per context and participant (pedagogical: *mean ratio* $= 0.43$, $SD = 0.11$; nonpedagogical: *mean ratio* $= 0.09$, $SD = 0.09$).

We conducted a paired *t test* (given the within-subject design), $t(43) = -17.154$, $p < .001$, Cohen's $d = 2.328$, which indicates a strong main effect. The ratio of generic utterances was 34% higher in the pedagogical condition than in the nonpedagogical condition. The higher likelihood of producing more generic utterances in the pedagogical context is also descriptively visible across all different linguistic categories of how generics can be expressed in

German. Moreover, 43 of the 44 participants produced more generics in the pedagogical condition than in the nonpedagogical condition. Only one participant showed the reverse pattern.

3.7. Discussion of Study 1

The analysis showed a strong effect of the condition; that is, participants produced many more generic utterances in the pedagogical than in the nonpedagogical context as expected. This effect was also descriptively visible for all types of generic utterances and on the individual level (with only one exception). Thus, we could replicate Gelman and colleagues' findings that adult speakers sensitively adjust their language, producing a high rate of generic utterances in a pedagogical context. This finding provides support for the universality of a natural pedagogy as suggested by Csibra and Gergely, given that the sensitivity to use more generic utterances in pedagogical contexts has now also been demonstrated in German. However, as argued in the introduction, monoglossic environments such as the United States or Germany entail a confound. To verify whether the proposition of a natural pedagogy also holds true in a diglossic environment, we conducted Study 2.

4. Study 2

The particular use of language in the German-speaking part of Switzerland offers the unique opportunity to investigate the natural pedagogy proposition and its assumed specific effect on the enhanced production of generic utterances in pedagogical contexts. In the formal Swiss educational system (starting from kindergarten), teachers and students have to speak Standard German, while in (almost) all other situations (e.g., in the schoolyard, at home with their families), teachers and students speak Swiss German.

Therefore, the aim of Study 2 was to investigate whether native speakers of Swiss German would produce more generic utterances in a pedagogical than in a nonpedagogical context independent of whether they speak Standard German or Swiss German when describing the stimuli. That is, Study 2 implemented a 2×2 within-subject design: Participants described the stimuli in pedagogical and nonpedagogical contexts both in Swiss German and in Standard German.

4.1. Participants

Forty-six Swiss German-speaking university students (37 females) participated (mean age = 22.9 years, *SD*: 2.69). They were either paid for participation or received a certificate of participation for course credit. The participants had to be native speakers of Swiss German and to be physically and mentally healthy. If one of the criteria was not fulfilled, they were excluded. Two participants did not show up for the second appointment (two of the four conditions were conducted on one day, and the other two conditions were conducted on another day). Three participants were excluded because they were not native Swiss German speakers. The final sample for the statistical analyses thus comprised 41 participants. Written informed consent was requested from all participants.

Table 1
Stimuli of Study 1 (Books A and B) and Study 2 (Books A–D)

Book	**Animal**	**Food**	**People**	**Book**	**Animal**	**Food**	**People**
A	Butterfly	Banana	Ballerina	**B**	Dog	Carrot	Clown
	Cat	Broccoli	Footballer		Duck	Cheese	Farmer
	Elephant	Cake	Pirate		Ladybug	Ice cream	Firefighter
	Penguin	Pretzel	Police officer		Lion	Orange	Witch
Book	**Animals**	**Food**	**People**	**Book**	**Animals**	**Food**	**People**
C	Fish	Apple	Doctor	**D**	Chicken	Salad	Cook
	Mouse	Bread	Diver		Pig	Hot Dog	Postman
	Giraffe	Tomato	Waiter		Zebra	Popcorn	Pilot
	Turtle	Sandwich	Painter		Tiger	Lime	Astronaut

Note. The stimuli used in Study 1 (Books A and B) are analogous to Gelman et al. (2013) with one exception—a footballer was used instead of a baseball player. Books C and Book D contain newly defined stimuli for Study 2.

Table 2
Seven types of generic utterances used in Studies 1 and 2

Type	Abbreviation	Example
Definite singular	DEF/SG	The dog is a domestic animal
Definite plural	DEF/PL	The dinosaurs are extinct
Bare singular	0/SG	Train is a good way to travel
Bare plural	0/PL	Elephants are gray
Indefinite singular	IND/SG	Water boils at 100 degrees
Pronoun	PRO	They are gray
Fragment sentence	FRAG	Are gray

4.2. Material

The same stimuli as in Study 1 (Books A and B) were used. To implement the 2×2 within-subject design, we added two more books. We selected and used similar kinds of stimuli in the new Books C and D as in Books A and B (see Table 1).

4.3. Procedure

The procedure was analogous to Study 1: There was a pedagogical and nonpedagogical context induced in the same way as in Study 1. Additionally, the participants were asked to describe the stimuli either in Standard German or Swiss German. The order of the conditions

Table 3
Frequencies (and percentages) of generic utterances in the two conditions per type of generic in Study 1

Condition	DEF/SING	DEF/PL	Bare SING	Bare PL	IND/SING	Pronoun	Fragment
Nonpedagogical	6 (0.3%)	2 (0.1%)	13 (0.6%)	18 (0.8%)	21 (1.0%)	135 (6.2%)	35 (1.6%)
Pedagogical	59 (2.7%)	13 (0.6%)	42 (1.9%)	121 (5.6%)	116 (5.3%)	1125 (51.7%)	455 (20.9%)

Table 4
Frequencies (percentages and standard deviations) for Study 2

	Context			
	nonpedagogical		*pedagogical*	
Language	Full sentences	Generics	Full sentences	Generics
Swiss German	3271	432 (8.5%, $SD = 0.07$)	4713	2193 (43.4%, $SD = 0.08$)
Standard German	3147	363 (7.1%, $SD = 0.06$)	4519	2073 (41.0%, $SD = 0.10$)

and which book was used in which condition was completely randomized. Taken together, every participant had to describe stimuli in all four conditions. To avoid exhaustion or the exercise becoming tiring, we divided the four conditions into two sessions on two different days.

4.4. Transcribing and coding

The transcribing and coding followed the same steps as in Study 1. Again, two raters independently applied the coding system. Their interrater reliability was Cohen's *Kappa* = 0.83, indicating high agreement.

In total, participants produced 15,650 full sentences across the four conditions (see Table 4): nonpedagogical Swiss German, nonpedagogical Standard German, pedagogical Swiss German, and pedagogical Standard German.

Table 5 displays the frequencies and percentages of utterances per condition and type of generic utterances.

4.5. Results

As in Study 1, we used the ratio of the number of generics over the total number of utterances per participant and condition as the dependent variable in the statistical analysis to account for individual differences in the absolute number of utterances.

First, we statistically tested order effects. There were no statistically significant order effects (all ps $> .4$), and the effect sizes were small (all $\eta^2{}_p$s < 0.02). Second, we conducted a 2 (language: Swiss German, Standard German) x 2 (context: pedagogical, nonpedagogical) repeated-measures ANOVA to test our hypotheses. We found a significant and strong main effect of context, $F(1, 40) = 746.43$, $p < .001$, $\eta^2{}_p = 0.949$, but neither a significant main effect of language ($F(1, 40) = 0.57$, $p = .45$, $\eta^2{}_p = 0.014$) nor an interaction of language and context ($F(1, 40) = 0.957$, $p = .334$, $\eta^2{}_p = 0.023$). Thus, participants produced a higher ratio of generic statements in the pedagogical conditions independent of whether they spoke Swiss German or Standard German. The higher likelihood of producing generic utterances in the pedagogical context is also visible across all linguistic categories of how generics can be expressed both when participants spoke in German and when they spoke in Swiss German (see Table 5). Moreover, all 41 participants produced a higher ratio of generic utterances in the pedagogical than in the nonpedagogical condition.

Table 5
Frequencies and percentages per type of generic utterances and condition in Study 2

		DEF_SG	*DEF_PL*	*BARE_SG*	*BARE_PL*	*IND_SG*	*PRO*	*FRAG*	Generics
Swiss German	Nonpedagogical	8 (0.3%)	17 (0.6%)	19 (0.7%)	53 (2%)	13 (0.5%)	268 (10%)	54 (2.1%)	432 (16.5%)
	Pedagogical	86 (3.3%)	28 (1.1%)	49 (1.9%)	122 (4.6%)	101 (3.8%)	1555 (59.2%)	260 (9.9%)	2193 (83.5%)
	Total	*94(3.6%)*	*45 (1.7%)*	*68 (2.6%)*	*175 (6.6%)*	*114 (4.3%)*	*1823(69.2%)*	*314 (12%)*	*2625*
Standard German	Nonpedagogical	13 (0.5%)	19 (0.8%)	7 (0.3%)	45 (1.8%)	5 (0.2%)	245 (10.1%)	28 (1.1%)	363 (14.9%)
	Pedagogical	132 (5.4%)	43 (1.8%)	48 (2%)	129 (5.3%)	99 (4.1%)	1390 (57.1%)	230 (9.4%)	2073 (85.1%)
	Total	*145 (5.9%)*	*62 (2.6%)*	*55 (2.3%)*	*174 (7.1%)*	*104 (4.3%)*	*1635 (67.2%)*	*258 (10.5%)*	*2436*

4.6. Discussion of Study 2

Similar to the results of Study 1, the analysis showed a strong main effect of the context: In the pedagogical context, the ratio of generic utterances was 34.9% in Swiss German and 33.9% in German, compared to the ratio in the nonpedagogical context. No further significant effects were detected. Thus, the pattern of results of Study 2 provides another replication of Gelman et al.'s (2013) findings. By conducting the study in a diglossic environment, the results also provide unconfounded empirical support for the natural pedagogy proposition by Csibra and Gergely (2009) since the participants produced more generic utterances when they spoke Swiss German and when they spoke German to a surprisingly similar extent.

4.7. General discussion

The aim of the present research was to provide a next step in studying the natural pedagogy assumption (Csibra & Gergely, 2009), with a specific focus on the context-sensitive use of generic utterances in pedagogical contexts building on the research by Gelman et al. (2013). To this aim, we conducted two studies: Study 1 in a monoglossic environment (Germany) and Study 2 in a diglossic environment (German-speaking part of Switzerland). Both studies replicate the findings from Gelman et al. (2013) with strong effect sizes. Additionally, with Study 2, we ruled out a potential confound. To date, the context-sensitive use of generics as an indicator of the natural pedagogy assumption has only been demonstrated in an English-speaking environment (Gelman et al., 2013).

The context-sensitive enhanced use of generic utterances was evident at different levels in both studies. First, it was evident at the aggregated level. The ratio of generic utterances in the pedagogical context was much higher than in the nonpedagogical context across participants and linguistic types of generics. Second, it was evident at the individual level. All participants uttered more generics (with only one exception in Study 1) in the pedagogical than in the nonpedagogical context. Third, it was evident for all types of generic utterances in both studies. For each type, more generic utterances were produced when the context was pedagogical (see Tables 4 and 5). This evidence on different levels provides strong support that adult German and Swiss German sensitively adapt their linguistic utterances to contexts in accordance with the natural pedagogy proposed by Csibra and Gergely (2009).

Our studies do not only replicate the previous findings of Gelman et al. (2013) in Germany and Switzerland. With Study 2, conducted in the diglossic environment of the German-speaking part of Switzerland, we could disentangle whether the enhanced use of generic utterances in pedagogical contexts reflects a natural pedagogy (i.e., it also emerges when participants spoke in Swiss German, their everyday language, which is not used in formal educational settings) or is influenced by the specific language and linguistic constructions used in formal education settings. We hypothesized that if the proposition of a natural pedagogy (Csibra & Gergely, 2009) holds true, we should find an enhanced use of generic utterances in a pedagogical context no matter whether Swiss German or Standard German is spoken. The results of Study 2 support this hypothesis clearly. The ratio of the generic utterances was astonishingly balanced across the German and the Swiss German conditions. This pattern of findings provides novel empirical support that "human communication is

specifically adapted to fulfil the function of transmitting generic knowledge between individuals" as assumed in Csibra and Gergely's natural pedagogy (2009, p. 148).

Despite the clear effects shown, our study has limitations. First, the samples consisted of university students. Since they experience high exposure to pedagogical language, they may use generics more often than other population strata. Note, however, that we used a within-subject design in both studies, and the differences between the pedagogical and nonpedagogical contexts with regard to the use of generic utterances were striking given the strong effect sizes. Nevertheless, future studies are needed to further test the breadth of the natural pedagogy assumption by studying context-sensitivity in different population strata and age groups with different experiences in formal education and in language communities with no formal education. Second, we built on the studies by Gelman et al. (2013) and investigated the use of generic utterances as an indicator of a natural pedagogy. Of course, the assumptions of a natural pedagogy as put forward by Csibra and Gergely (2009) comprise several other aspects and features. Thus, our findings provide an important step in evaluating a specific aspect of a natural pedagogy only. Third, to replicate the findings by Gelman et al. (2013), we closely followed their procedure. The procedure implements a highly controlled and partly artificial setting that strictly separates pedagogical and nonpedagogical contexts. Having to speak to an alien and to imagine speaking to a friend are proxies for realistic communication settings, but they remain proxies. Future studies should try to investigate settings that are more realistic to determine whether and to what extent linguistic sensitivity with regard to the use of generic utterances also emerges in natural pedagogical contexts and situations. Investigating more realistic settings may also provide insights into whether pedagogical and nonpedagogical contexts can be strictly separated or whether degrees of pedagogical focus need to be considered to gain a more precise understanding of a natural pedagogy. Despite these limitations, our findings conceptually replicate the findings of Gelman et al. (2013) in a monoglossic environment and extend them to a diglossic environment.

In pedagogical situations, a typical aim is to convey generalizable information as suggested in the natural pedagogy put forward by Csibra and Gergely (2009). Certain linguistic constructions, specifically various types of generic utterances, allow for communicating this generalizability. Our studies replicate, support, and extend previous findings that humans are sensitive to this aim. A rather subtle experimental variation, that is, either providing descriptions of pictures to an alien or a friend, caused German and Swiss German speakers to sensitively adapt their utterances like English speakers in a previous study (Gelman et al., 2013). Specifically, speakers show a remarkably higher likelihood of producing generic utterances that convey generalizable information in a pedagogical context. Taken together, our results provide empirical support that an enhanced use of generic utterances as predicted by the natural pedagogy holds (Supplementary Information) true for German and diglossic Swiss German speakers.

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Conflicts of interest

We certify that we have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements) or nonfinancial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this article. Furthermore, we followed the ethical guidelines of ETH Zürich (Switzerland) and the University of Saarbrücken (Germany), where the two studies were conducted. Written informed consent was requested from all participants.

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.