



## Artifacts and Original Intent: A Cross-Cultural Perspective on the Design Stance

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### Abstract

How do people decide what category an artifact belongs to? Previous studies have suggested that adults and, to some degree, children, categorize artifacts in accordance with the design stance, a categorization system which privileges the designer's original intent in making categorization judgments. However, these studies have all been conducted in Western, technologically advanced societies, where artifacts are mass produced. In this study, we examined intuitions about artifact categorization among the Shuar, a hunter-horticulturalist society in the Amazon region of Ecuador. We used a forced-choice method similar to previous studies, but unlike these studies, our scenarios involved artifacts that would be familiar to the Shuar. We also incorporated a community condition to examine the possible effect of community consensus on how artifacts are categorized. The same scenarios were presented to university student participants in the UK. Across populations and conditions, participants tended to categorize artifacts in terms of a creator's intent as opposed to a differing current use. This lends support to the view that the design stance may be a universal feature of human cognition. However, we conclude with some thoughts on the limitations of the present method for studying artifact concepts.

### Keywords

Anthropology, psychology, philosophy, concepts, cross-cultural analysis, artifact cognition, categorization, design stance

How do people decide whether something is a chair or a clock or a boat? And are such judgments dependent on different principles than decisions about whether something is a frog or a tiger or a diamond? Many psychologists now think that while artifact concepts need to be distinguished from natural kind

concepts, the two have an important affinity. Both are said to exemplify aspects of essentialist thinking.

At the most general level, psychological essentialism maintains that ordinary categorization involves a fair amount of causal-explanatory reasoning and is not simply a matter of registering an item's perceptual properties (Gelman, 2003). Psychological essentialism emphasizes that just because something looks like a skunk does not mean that it is judged to be a skunk. What matters is whether the item is thought to have the essence that is appropriate to skunks. Suppose, for example, that a creature started out as a cat and that scientists altered its appearance via plastic surgery, changing the shape of its legs, adding a white stripe down its back, installing a gland that secretes a noxious odor, etc. In the end, the creature would resemble a skunk far more than it would resemble a cat, but many people would maintain that it is still a cat (Keil, 1989). The thinking that underlies this judgment is that the creature's skunk-like appearance lacks the right causal basis; it lacks the essence presumed to be shared by genuine skunks.

On standard treatments of psychological essentialism, ordinary people's understanding of essences can be very sketchy. People may not be in a position to say much more about the skunk essence than that it is a hidden, internal property of these animals and that the essence determines, or strongly constrains, the characteristic perceptual properties of skunks. To the extent that people have general ideas about what types of properties constitute an essence, the ones that are often cited are micro-structural properties – genes in the case of living kinds, chemical composition in the case of many non-living kinds.

At first glance, artifact concepts do not seem to follow the same general pattern as natural kind concepts. Chairs are not thought to have some hidden internal property that makes them chairs, and no one supposes there is a chair gene or chemical essence of chairhood. Also, though we can easily imagine how science might investigate skunks and force us to substantially revise our views about them, it is hard to see how the same thing could be true of chairs. However, proponents of psychological essentialism do not claim that natural kind concepts and artifact concepts implicate the same types of essences. Artifacts are supposed to have their own distinctive type. As Paul Bloom has put it (Bloom, 2000, p. 163):

It is true that we don't think of artifacts as having internal essences in the sense of natural kinds. But this doesn't refute the view that artifacts are seen as having essences in the sense of having deeper causal properties that explain their superficial features and determine the categories they belong to. Instead of being biological and chemical, the essences of artifacts are social and psychological.

If there is a standard view about what this is, it is that the essence of an artifact has to do with the intention of the person who made it, the artifact's creator or designer.

There would be little interest in extending psychological essentialism to artifact concepts if a designer's intent were just one property among others, where people decide that something is a chair, say, by simply summing up these properties. The point of referring to a designer's intent as the essence of an artifact is that the decision about whether something is a chair is an explanatory process similar to what goes on with natural kinds. The presumption is that people judge that something is a chair by inferring that the best explanation of its salient observable properties is that it has the right origin, that it was made with the distinctive intent associated with the category chair. Following current practice, we will refer to this approach to artifact concepts as *the design stance*.

Proponents of the design stance often argue for it by drawing attention to its intuitive appeal. For example, Paul Bloom (1996) notes that typical ordinary artifacts cannot be categorized solely in terms of their appearance because their perceptual properties allow for too much variation. Not all clocks have a circular face with numerals imprinted along the edge. There are also digital clocks, clocks shaped like footballs, and clocks for the blind that indicate the time non-visually. So, when we judge that something is a clock, we cannot rely on the distinctive appearance of a clock; there is no distinctive appearance. Bloom also notes that we cannot settle the matter by appeal to what an artifact does, for instance, the fact that clocks tell the time. After all, a broken clock is still a clock even though it does not tell the time; also, something may function to tell the time (e.g., a shadow on a tree) and yet that does not make it a clock. The design stance does not face these complications because it does not take either appearance or function to directly establish whether something is a member of a given artifact category. Appearance and function merely enter into an explanatory inference as evidence about the category.

Apart from intuitive arguments, there is also some empirical evidence on behalf of the design stance, though much of this focuses on issues of cognitive development. For instance, Matan and Carey (2001) argue that the design stance begins to coalesce around the age of six. When an artifact's original intended function is pitted against a differing current use, six-year-olds side with original intent, while younger children are indifferent between the two. In contrast, Gelman and Bloom (2000) have found that even three-year-olds are sensitive to intent in naming artifacts. If told about a newspaper that becomes folded into the shape of a hat, they are more likely to name it using an artifact term ("hat") than a material term ("paper") when the transformation is described as being intentional rather than accidental.

Developmental studies along these lines promise to offer important insight into the origins of the categorization strategies that underlie artifact concepts. At the same time, the focus on development is somewhat premature in that it overestimates the extent to which we understand the adult competence against which children are to be measured. We see at least four limitations of this research.

First, there are a number of related theories of artifact categorization that are conflated under the rubric of the design stance. Before turning to children, we need to tease these apart and determine which, if any, of these properly describes the pattern of adult categorization. We assume, at a minimum, that all proponents of the design stance take the categorization of artifacts to involve at least implicit causal-explanatory reasoning. Yet the exact role of the intent of a designer is controversial. Matan and Carey (2001) assume that what matters is ultimately the original intended function of an artifact, that is, the function that its creator had in mind. On this version, the essence of a chair might be taken to be that its creator intended it to be sat upon by a single individual. Bloom (1996) argues against this view, however, noting that such an intention would not distinguish chairs from similar yet distinct artifacts (e.g., stools) and also that it is perfectly coherent that someone could make a chair without intending it to ever be sat on (e.g., as a work of art for display in a museum). For Bloom, the proper characterization of the design stance is still in terms of a designer's intent, but the intention that matters is that the item was made to be a chair, not that it was made to serve a particular function.

If the difference between these two approaches were not enough, it is worth mentioning that many discussions of the design stance associate the view with the philosopher Daniel Dennett (1971). But while Dennett can be credited with coining the phrase "the design stance", and while Dennett also views the categorization of artifacts as, in some sense, an explanatory process, Dennett himself argues that the intention of a designer does *not* have a special status in determining what category an artifact belongs to. For Dennett, the designer has no more say in the matter than an artist has in dictating the proper interpretation of his artwork (Dennett 1990). As he puts it, "the inventor is not the final arbiter of what an artifact is, or is for; the users decide that. The inventor is just another user... if others can find better uses for it, his intentions, clearheaded or muddled, are of mere historical interest" (1990, 186). Clearly, until we carefully distinguish these various approaches to artifact categorization and establish how adults actually think about artifacts, we are not going to be in a position to ask when and how children develop the design stance.

Consider, for example, the question of whether an object of one kind – say a teapot – can come to be an object of a different kind simply in virtue of the intentions of its later users. In a study seeking to test the design stance, Adele Matan and Susan Carey sought to show that the original designer’s intent trumps other possible uses of the object. Matan and Carey presented brief stories about artifacts that are created by one person for a given purpose and then used by another for a different purpose. In one of their stories, a woman makes something to water flowers with but another woman ends up using it to make tea. The question subjects are then asked is whether it is a watering can or a teapot. Matan and Carey found that adults side with original intent over current use about 80% of the time and have taken this to be solid evidence that people conceptualize artifacts just as the design stance says.

Intuitive evidence suggests, however, that sometimes current use trumps original intent. Bloom (2004) notes that Warhol and Duchamp created works of art from ordinary objects in apparently just this way, and that the same seems to at least sometimes be true of objects outside of art – for example, a house can become a church or a shop, and cease to be a house, simply in virtue of the intentions of its users (pp. 85-86). Such cases highlight the fact that standard presentations of the design stance tend to incorporate an ambiguity that needs to be resolved. Exactly whose intentions count and under what circumstances? Is it the original designer’s intention that matters, or can a later user “re-design” an object merely by imposing their own intentions upon it? What exactly *is* it to be the designer of an artifact? Notice that if having intentions about the use or kind of an object is enough, as Bloom’s house/church example suggests, then the design stance would make *exactly the opposite* prediction than Matan and Carey suppose. For present purposes we will put aside these complications and assume with Matan and Carey that the design stance is committed to the original designer’s intent as the factor that determines kind membership. We note, however, that there are important and unresolved issues about what exactly the design stance says about the matter.

Second, the empirical studies in support of the design stance typically pit design considerations against mere appearance or an alternative possible function. Such studies may establish that designer’s intent has some role to play in categorization, but they are not enough to show that the essence of artifact concepts is given by the design stance, or even that artifact concepts have essences. To really put the design stance to the test requires an extensive set of contrasts showing how the explanatory interest of a designer’s intent relates to other considerations. Would designer’s intent still be so important if a large amount of time passed between the original intent and the current use? Or if the item were poorly suited to fulfilling the original intended function but

much better suited to the new function? Or if it were it were never used for the original function but often or habitually used for the new function? Or if it were used for the new function not just by one person, but by an entire community? Or if an entire community came to regard the item as an object as having a different primary function than its original function? Although some of these factors have been explored in related experimental paradigms, for example, in important studies by Kelemen (1999) and German and Johnson (2002), there is a great deal of work left to be done. As things stand, it would be hasty to conclude that designer's intent has the privileged role that advocates of the design stance suppose; it may be just one factor among others that guide the categorization of artifacts (Malt and Johnson 1998, Sloman and Malt 2003).

A related concern with experiments that are cited on behalf of the design stance is their reliance on stories that may seem somewhat artificial or short on details. In Matan and Carey's study, there was a strong preference for saying that an object was of the category associated with the original intended function. However, their subjects may have had difficulty supposing that the various objects underwent the change of use that the stories mentioned (e.g., that a watering can would plausibly be used as a tea pot). Or if the new uses were accepted, subjects might have been influenced by whether they thought an item was more likely to be a better at one or the other function. The fact that Matan and Carey provided so little information about the objects – nothing apart from their original intended function and the differing current use – left the subjects to make their own assumptions about these things.

A third potential limitation of these sorts of studies is that the question that is often asked involves a forced choice (Malt and Sloman, 2007a). *Is it a watering can or is it a teapot?* When adults side with the category corresponding to the original intent of the designer, the response is supposed to be indicative of the design stance. However, it ought to be acknowledged that the question is not an especially natural one. The worry then is that the answer that subjects give may not tap into a fundamental psychological operation – one that underlies artifact categorization – but may tell us more about how people interpret the motivation behind the question (for more on this possibility, see Malt and Sloman (2007b,c) and Bloom (2007)). And if the forced choice is awkward for adults, it may be even more awkward for children, making it all the more difficult to draw conclusions about how children conceptualize artifacts.

Fourth, part of the motivation for looking at the emergence of the design stance in development is the supposition that it may be an innate, species-specific feature of the human mind. Though it is hard to find theorists who are perfectly explicit about this matter, we have little doubt that many who are

attracted to the design stance are motivated by the speculation that humans are proficient with artifacts partly because of our unique way of conceptualizing them – i.e., in terms of a designer’s intent. Further, the connection between the abundance of artifacts in human life and the design stance is strengthened by the observation that non-human animals do poorly on theory of mind tasks and so are likely to have an impoverished understanding of intention. Perhaps it is their inability to conceptualize artifacts as we do that explains why their use of artifacts is so limited. It would be hasty, however, to suppose that current studies do establish that humans as a species conceptualize artifacts in terms of a designer’s intent. These studies focus on a fairly narrow adult population, viz., American college students and other high SES adults who live in technologically advanced Western societies. Even if the data establish that such people think of artifacts in terms of a designer’s intent, this would hardly show that the design stance is a human trait. Clearly, we need to look at other populations and the patterns of inference that are found in diverse cultural contexts. The study of natural kind concepts offers a model for this kind of research. Recently, there has been considerable interest in the cross-cultural examination of concepts for living kinds, and the results have indicated a strong universal component to these concepts (e.g., Berlin, 1992; Medin and Atran, 2004). Similar work needs to be done on artifact concepts so that we can begin to identify which if any aspects of these concepts are universal.

Although no single study could possibly address all the concerns we have raised, the present study is meant to address some of these concerns and to encourage further investigation of how adults conceptualize artifacts. Here we adapt the basic methodology employed by proponents of the design stance but with two significant modifications.

One is that we perform a direct comparison between Western adults and adults in a technologically sparse culture, i.e., the Shuar of Ecuador. A previous study with the Shuar revealed their tendency for functional fixedness, which in turn indicates that Shuar adults may associate a given artifact with a single prominent function (German and Barrett, 2005).<sup>1</sup> However, that study did not directly solicit intuitions about naming or categorizing. By asking Shuar adults to consider scenarios that pit a designer’s intent against a differing use, we hope to determine whether the Shuar exhibit the same pattern of categorization as is claimed for Western adults.

The other modification is that our stories incorporate socially relevant information that might encourage categorization at odds with a designer’s

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<sup>1</sup> Functional fixedness occurs when the priming of a conventional use for an artifact makes it difficult to envision task-relevant atypical uses of the artifact.

intent. In particular, we were interested in whether the categorization of artifacts may be sensitive to community norms regarding the use of an artifact. Community norms will typically line up with designer's intent and, like intended function, may differ from other possible uses of an item. But community norms can also be pitted against designer's intent. For example, if everyone in the community thinks that a given string-mesh item is used for resting upon (i.e., as a hammock), then even if the original designer intended it to be used for fishing with, people might think that it is a hammock, not a fishing net. On the other hand, if the design stance correctly describes how people conceptualize artifacts, then adding information about community norms should not shift people's judgments away from a designer's intent; so long as it is perfectly clear that the designer made it for fishing, the item should count as a fishing net, regardless of how it is currently understood. Another advantage of mentioning community norms is that it would not be surprising if these were given different weight in different cultures. For example, one might suppose that community norms matter less in a technologically sparse community where there may be more pressure to extract the maximum utility from the few available artifacts.

## Methods

### *Stimulus Materials*

We probed participants' intuitions about artifact categorization using a forced-choice scenario method similar to that used in previous experiments (e.g., Matan and Carey, 2001). In this paradigm, participants are given verbal or written vignettes that describe the history of an artifact from its creation to its current use. In the present study, each vignette consisted of two critical parts. The first part described who created the artifact and for what purpose it was created. The second part described the causal scenario via which the artifact came to change hands and the circumstances under which its new owner used it. We employed two types of scenario, which we call *the standard condition* and *the community condition*. In the standard condition, which parallels that used by previous studies, the new owner finds the object and uses it for a purpose different than that intended by its creator. The community conditions were identical with respect to both how the object reached its new owner and how it was used, but differed in that they described the new use as a matter of cultural consensus in the community of the new owner. All vignettes were followed by an "A or B" target question: "If you had to choose, would you say that the object is an A or a B?" (e.g., a fishing net or a hammock).



For example, here is the full text of a standard condition vignette as given to UK subjects:

An indigenous South American man made an object out of string for catching fish in the river. One day, when he was fishing with the object, it got washed away in the river and another man found it. The other man took it out of the river and hung it between two trees. He used the thing to rest in. From that day on, he always used it for resting.

The corresponding community condition was as follows:

Imagine two indigenous South American groups, the Ache and the Hiwi. The Ache make things with string. They use these things to fish in the river. However, the Hiwi don't do this. Like the Ache, the Hiwi use string to weave objects, but they don't use them to fish. Instead, the Hiwi hang the objects between two trees, and use them to rest in.

A man from an Ache village made an object out of string to catch fish in the river, as the Ache do. One day, the man took the thing to the river to fish. When he was fishing with it, the river carried it away and another man, a man from a Hiwi village, found it. The Hiwi man took it out of the river and hung it between two trees. He used the thing to rest in, as the Hiwi do. From that day on, the object remained in the Hiwi village, and they used it like that.

Both types of vignette were followed by a forced choice, “A or B”, target question, in this case, “If you had to choose, would you say that the object is a fishing net or a hammock?”

All subjects received four different scenarios, under the following experimental constraints. There were four different story types, which are summarized in Table 1: net/hammock, basket/cage, pounder/marker and drum/bucket. Each subject received exactly one version of each of these stories.

*Table 1*  
*Descriptions of artifact scenarios*

Scenario name	Description A	Description B	Target question
Net/hammock	Object made of string, for catching fish in the river	Object made of string, for hanging between two trees and resting	If you had to choose, would you say that the object is a fishing net or a hammock?

Table 1 (cont.)

Scenario name	Description A	Description B	Target question
Basket/cage	Object made of vines with hole in the end, where chickens can sleep at night	Object made of vines with hole in the end, for gathering vegetables	If you had to choose, would you say that the object is a basket or a chicken cage?
Pounder/marker	Object made of wood, used to crush a starchy root to make the local drink called <i>chicha</i>	Object made of wood, for indicating border of property	If you had to choose, would you say that the object is a chicha pounder or a property marker?
Drum/bucket	Object made of wood with hole on one end, to hit with a stick to make rhythmic noises	Object made of wood with hole on one end, to keep rice in	If you had to choose, would you say that the object is a drum or a rice bucket?

The versions varied in two ways. One was the experimental manipulation, standard vs. community. Each subject received exactly two standard versions and two community versions. Which stories were matched with which experimental manipulation varied across subjects in a counterbalanced fashion, so that all story/manipulation combinations were presented. Second, order in which the artifacts were presented varied. For example, in the net/hammock story, some subjects were told that the original object was a net ( $A \rightarrow B$ ) and others that it was a hammock ( $B \rightarrow A$ ). The target question for this story, however, always asked about the net first.  $A \rightarrow B/B \rightarrow A$  orders were counterbalanced, to control for order effects. Although previous studies have counterbalanced the order of the items chronologically (such that the original category is sometimes presented first and sometimes second), we did not do this in the present study.<sup>2</sup>

<sup>2</sup> We should note that previous studies have not found a statistically significant effect for the order in which the events of a vignette are told, i.e., whether the creator's intent is mentioned first or whether the current use is mentioned first (Matan and Carey, 2001). A pilot study by Laurence, Margolis, and Siegal also found no such order effect with UK subjects.

Finally, the order in which the stories were presented to each subject was randomized, to control for this kind of order effect.

The stories were presented to Shuar and UK participants, as described below. The stories were constructed so as to be plausible to the Shuar. All of the artifacts are ones that could be, and sometimes are, made by the Shuar. We used the exact same artifacts in the scenarios given to UK subjects, though the stories were contextualized by explaining that they concerned indigenous South American people. Thus, for all artifacts used, it was highly plausible that they could be made by hand, by a single individual.

The community manipulation was also designed for maximum plausibility by describing an ethnic context with which the Shuar would be familiar. The Shuar are aware of other ethnic groups that have different artifact traditions. For example, the culturally related neighboring group, the Achuar, manufacture blowguns by hand, whereas the Shuar do not. Although the Ache and Hiwi are actual indigenous South American groups, the Shuar are not familiar with them. The names were used to add further plausibility to the scenarios.

### *Participants*

*Shuar participants.* The Shuar are an indigenous hunter-horticulturalist society in the Amazon region of Ecuador. The Shuar live in small villages of up to 300 people, with varying degrees of integration into mainstream Ecuadorian society. In all Shuar communities, many artifacts are still made by hand, including houses, furniture, jewelry, baskets, and other kinds of tools and household items.

Participants included 24 Shuar adults from three Shuar villages: 16 men (mean age 33.8 years, range 17 to 63) and 8 women (mean age 30.4 years, range 22–46).

*UK participants.* UK subjects included a total of 108 adult students at the University of Sheffield (Sheffield, UK). Two subjects declined to identify their sex. Of the remaining 106, there were 55 men (mean age 19.3 years, range 18–23) and 51 women (mean age 19.0 years, range 18–20).

### *Procedure*

*Shuar participants.* Shuar participants were interviewed in their homes by the first author or a research assistant. Interviews were conducted in Spanish. All participants were Spanish/Shuar bilingual. Texts were read aloud from a sheet of paper, and subject responses were recorded in a field notebook.

*UK participants.* UK participants were given texts in the form of a questionnaire booklet, with one story per page. Questionnaires were filled out at the

beginning of a class period. Subjects were not paid for participation. Texts given to UK subjects were identical to those given to Shuar subjects, except for brief phrases framing the South American cultural context for the UK students.

Texts of story scenarios are included in the Appendix.

## Results

### *Data Coding*

Each subject provided judgments for four stories. Each judgment was coded as “1” if the subject chose the original artifact category, and “0” if the subject chose the new artifact category. From these, each subject’s responses were summed and divided by the total number of responses given by that subject. This provided an index of the proportion of each subject’s responses that favored the original, as opposed to the new, artifact category. We used a proportion measure, rather than summing responses, to correct for missing data.

The only missing data occurred in a single story scenario, the basket/cage scenario, with Shuar participants. In this scenario, the Community condition (order B→A), had to be discarded because of a mistake in the text. In addition, for UK participants in the drum/bucket scenario, Community condition (order B→A), the order was mistakenly given as A→B. Therefore, all UK participants in the drum/bucket scenario, Community condition are treated as order A→B, but the data are not treated as missing.

The 1/0 coding system was used for all of the following analyses.

### *Is there an Overall Preference in each Population for Original Artifact Category?*

For each subject, responses to all four stories were summed and divided by total number of responses given, as described above. These indices were then compared against a chance proportion of 0.5 using a one-sample *t*-test.

Both populations showed a significant preference for the original artifact category, across conditions. Shuar participants preferred the original category 73.6% of the time (SD = 23.3%). This global preference was significantly above chance (one-sample *t*-test, two-tailed,  $t(23) = 4.97$ ,  $P < 0.001$ ). UK participants preferred the original category 62.0% of the time (SD = 34.3%). This global preference was significantly above chance (one-sample *t*-test, two-tailed,  $t(107) = 3.65$ ,  $P < 0.001$ ).

*Was there a Difference between Shuar and UK Participants in Overall Preference for Original Artifact Category?*

Values of the indices described above, proportion of responses preferring original artifact name, were compared between populations using a Mann–Whitney U-test (which does not assume equal variance or sample sizes between populations). Overall population preferences for original artifact category were not significantly different ( $Z = -1.27$ ,  $P = 0.203$ ).

*Did the Standard/Community Manipulation have an Effect?*

For each participant, an index was constructed for the participant’s two “standard” story version responses, and for the participant’s two “community” story version responses. Mean values of these indices by population and condition are shown in Fig. 1.

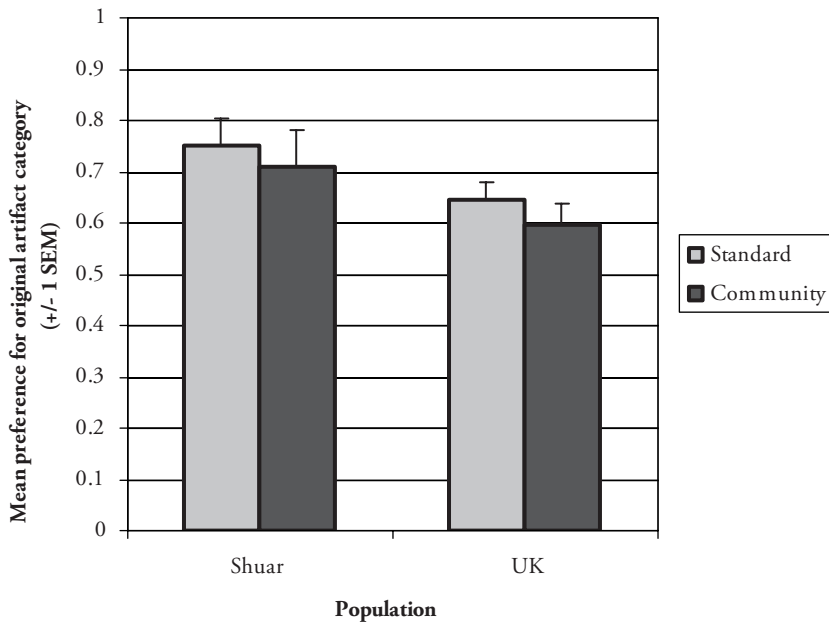


Figure 1. Mean preference for original artifact category by population and condition (standard versus community).

For Shuar participants, overall preference for original artifact category was 75.0% in standard conditions ( $SD = 25.5\%$ ), and 70.8% in community conditions ( $SD = 35.9\%$ ). Both of these were significantly above chance in the

direction of preference for original artifact category (one-sample  $t$ -tests, two-tailed; standard:  $t(23) = 4.80$ ,  $P < 0.001$ , community:  $t(23) = 2.85$ ,  $P < 0.01$ ). However, neither was significantly different from each other (paired sample  $t$ -test, two-tailed:  $t(23) = 0.526$ ,  $P = 0.604$ ).

For UK participants, overall preference for original artifact category was 64.4% in standard conditions ( $SD = 38.1\%$ ) and 59.7% in community conditions ( $SD = 41.3\%$ ). Both of these were significantly above chance in the direction of preference for original artifact category (one-sample  $t$ -tests, two-tailed; standard:  $t(107) = 3.92$ ,  $P < 0.001$ , community:  $t(107) = 2.45$ ,  $p < 0.05$ ). However, neither was significantly different from each other (paired sample  $t$ -test, two-tailed:  $t(107) = 1.20$ ,  $P = 0.234$ ).

Thus, while the difference between standard and community conditions was in the direction expected if community norms shift subjects' judgments away from original intended function, in neither population was it significantly so. Both populations showed a significant preference for original artifact category, irrespective of condition.

#### *Was there an Effect of which Artifact Category was Presented First?*

We did not counterbalance artifact presentation with respect to chronological order of events in the story (i.e., original artifact category first or second). However, we did counterbalance the actual artifact category labels. For example, in half of the net/hammock stories, the net was the original category (A) and the hammock the new category (B), and in the other half, the order was reversed (B first, A second). In contrast, the order that these items were asked in the target question were always the same, namely, "A or B?" ("net or hammock?"). Thus, there was the possibility for order effects if, for example, subjects' preferences were affected by order of presentation in the stories and in the target question.

To assess this, indices were computed for all cases in which item A was presented first, and B second ( $A \rightarrow B$ ), and for all cases in which B was presented first and A second ( $B \rightarrow A$ ).

Among Shuar participants, preference for original artifact category was 81.3% ( $SD = 28.8\%$ ) in  $A \rightarrow B$  conditions, and 66.7% in  $B \rightarrow A$  conditions ( $SD = 35.1\%$ ). This difference was not significant (paired sample  $t$ -test, two-tailed,  $t(23) = 1.57$ ,  $P = 0.129$ ).

Among UK participants, preference for original artifact category was 69.3% ( $SD = 37.3\%$ ) in  $A \rightarrow B$  conditions and 51.0% in  $B \rightarrow A$  conditions ( $SD = 45.3\%$ ). This difference was significant (paired sample  $t$ -test, two-tailed,  $t(107) = 4.35$ ,  $P < 0.001$ ).

Thus, in both populations, judgments in favor of original artifact category were higher in conditions in which the order of artifact categories presented was A→B, as opposed to B→A. However, this difference was only significant for UK participants.

#### *Were there Effects of Order of Story Presentation?*

We randomized the order in which stories were presented to participants. To examine effects of story order, we conducted a one-way repeated measures ANOVA for each participant population, with order in which the story appeared as the single factor, and category judgment (0 or 1) as the dependent variable.

For Shuar participants, there was no effect of story order on preference for original artifact category ( $F(3,16) = 0.423, P = 0.739$ ). For UK participants, on the other hand, there was a significant effect of story order on preference for original artifact category ( $F(3,105) = 37.7, P < 0.001$ ), such that preferences for original artifact category increased from the first story presented to the last story presented.

## **Discussion**

Overall our data lend further support to the design stance approach to artifact categorization. Subjects in both cultures tended to side with the category corresponding to the creator's original intent. Although this tendency was stronger for the Shuar than for UK subjects, the difference was not statistically significant. Also, the standard *versus* community manipulation had no significant effect.

In some ways, both of these results are surprising. The Shuar live in a society that offers little exposure to advanced technology and where most familiar artifacts are made by hand. Also, given the paucity of artifacts in Shuar society, there is an obvious need to employ whatever tools happen to be available so long as it is minimally effective. College students in the UK, in contrast, are surrounded by mass-produced artifacts that permeate every aspect of their lives, and the prevalence of highly-specialized artifacts ensures that there is a tool for every job. These differences are so striking that one might well expect to see a corresponding difference in how artifacts are conceptualized. Intuitively, the Shuar have good reason not to hold any special allegiance to the original intent of an artifact's creator. Doing so makes it harder to approach matters with the flexibility that is appropriate to recruiting the few available

artifacts in novel circumstances. But our results indicate, on the contrary, that there is a pattern of categorization that the Shuar share with Western subjects. When given a choice between original intent and current use, both tend to side with original intent and do so regardless of contravening community norms. To this extent, our results replicate previous findings on behalf of the design stance (Matan and Carey, 2001) and are consistent with the speculation that the design stance may be a universal feature of human cognition.

It is important, however, to recognize the limitations of the present study. One is that while our procedure controlled for various potential order effects, we did not vary the presentation of the chronological order of events in a vignette. This means that subjects always heard about the original intent first and the subsequent use second. The concern is that a primacy effect, where people find earlier material to be more salient, might favor answers in the same direction as the design stance. We think that this is unlikely, however, since earlier pilot studies with UK subjects using different materials showed no statistically significant order effect of this kind (see note 2).

A second limitation to the current study is that there are many factors that are potentially relevant to real-world categorization decisions that are omitted in our vignettes. Earlier we mentioned that previous studies that are taken to support the design stance generally leave out most information about an artifact apart from what its creator intended and how it is currently used. We noted that this is a somewhat artificial arrangement, since real-world categorization decisions may be sensitive to a wide variety of information that is normally available and considered to be relevant. Our own study aims to remedy the situation by reintroducing one potentially relevant piece of information, viz., the community norm relating to a given artifact. We also made an effort to make the transformations of the artifacts plausible (e.g., one could plausibly imagine a hammock being used as a net and vice versa). However, we'd be the first to admit that these improvements are only a beginning. We found that the community condition on its own did not have a statistically significant effect with either population, but perhaps presenting and systematically varying other variables would have a statistically significant effect (either on their own or in combination with one another). As we noted earlier, it is not clear whether designer's intent would trump current use if there were a significant temporal gap between creation of the artifact and its current use, or if an item were relatively poorly suited to fulfilling its original intended function as compared to its current function, and so on. Clearly, much work still needs to be done along these lines in order to fully evaluate the design stance.

One striking feature of our data for Western subjects is that we found a weaker reliance on original intent than Matan and Carey found. While 80%



of Matan and Carey's adults favored original intent, our UK subjects sided with original intent only 62% of the time. There are a number of possible explanations for this. One is that what we have here is a modest cultural difference (a difference between two Western industrial societies). Another possibility is that our larger subject pool (108 adult subjects as compared to Matan and Carey's 16 adult subjects) is a more accurate reflection of at least the Western tendencies. Another possibility is that these data are only an incomplete gloss on a more complex underlying pattern. A significant subpopulation of subjects in our study consistently chose on the basis of the community norm over the original function (see Fig. 2). Among our Shuar subjects, 7 individuals out of 24, or 29% of subjects, chose original intended function in half the scenarios or fewer. Among our UK subjects, 51 out of 108, or 47%, chose original intended function in half the scenarios or fewer. For comparison, 3 out of 16, or 19%, of adult participants in Experiment 1 in Matan and Carey (2001) chose original intended function in half the scenarios or fewer.

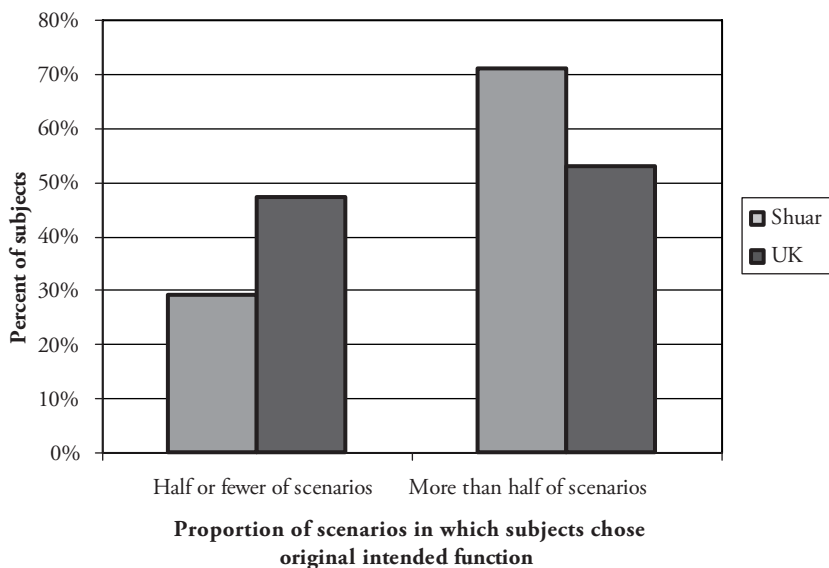


Figure 2. Percent of scenarios in which subjects chose original intended function.

Now there are two ways of interpreting the consistent minority pattern. One is to say that they are essentially noisy data. This explanation would seem very reasonable to us if 80–90% of subjects, across a large sample size, consistently

chose in accordance with the original function. But given that only 56% of our subjects (pooled) chose in accordance with original function more than half the time, it seems only reasonable to consider alternative accounts of the data. One such possibility is that there are multiple stable cognitive styles in evidence here. Some subjects may conceptualize artifacts in accordance with the design stance while others do not. Perhaps certain people regularly default to the community's norms governing an artifact's current use.<sup>3</sup> Even though we found the same overall trend in favor of the design stance in a technologically sparse hunter-horticulturalist society as in a technologically advanced Western society, this may not mean that human beings as a species conceptualize artifacts in accordance with the design stance.

Finally, an even more radical possibility is that our results are strongly colored by the forced choice method that we have adopted (in common with other researchers in this area), where subjects have to decide between two artifact categories. Subjects may have only a relatively small tendency toward the design stance, which is amplified by the forced choice task. In the end, the forced choice method may not be the best way of determining how people conceptualize artifacts. While it is certainly encouraging to see that the methodology can be adapted for use in studying adults in significantly different cultures, and while the method also has the advantage that it can be employed with children, there is still reason to wonder whether it accurately reveals people's categorization dispositions. As we noted earlier, the question *Is it an A or is it a B?* may elicit unintended pragmatic inferences about the questioner's intent. Rather than directly addressing the choice between A and B, subjects may find themselves reasoning about what such an odd question could mean. If this is a concern for Western subjects, it is all the more so when we turn to cultures that have less experience with social science surveys and context-free questionnaires.<sup>4</sup> And if subjects do feel that the question is

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<sup>3</sup> Anecdotal evidence suggests that something similar may hold for natural kind concepts. Putnam (1975) famously introduced a thought experiment about a substance that looks and tastes like ordinary water but has a very different chemical composition, XYZ instead of H<sub>2</sub>O. Putnam's intuition was that it is a forgone conclusion that the substance is not water even though it has water's superficial properties. But our experience teaching the thought experiment in the classroom is that students are often split between those who share Putnam's intuition and those who do not. Perhaps people who have the opposing intuition conceptualize natural kinds differently than Putnam. It certainly seems as if they do.

<sup>4</sup> A related concern is that the forced-choice method may not be sensitive to the conditions in which an evolved system for thinking about artifacts would have its natural application. Such a system, if one exists, is unlikely to have developed under pressure to identify definitive categories. It's more likely that the adaptive function for such a system would have been to organize manmade items for a given purpose, for forming inductive inferences about their functionality, their mechanical organization, or their social significance (or some combination of these).

unnatural, perhaps feeling that there is no answer to the question of what the item “really” is, then this would further undermine the design stance.

## Conclusion

This study offers further experimental support for the design stance, in the form of the first cross-cultural study of this hypothesis. Contrary to our initial expectations, our data from the technologically sparse Shuar society were broadly consistent with previous findings in support of the design stance. Nonetheless, we believe caution is in order before inferring that the design stance is part of a universal human conceptual system for representing artifacts. Here we have outlined what we believe are some of the remaining open questions about the design stance, possible theoretical alternatives to it, and key variables for future work to test. It seems clear that how people think about artifacts is an important part of the story of human evolution, and we suspect that there is much yet to discover about it. We hope that the ideas and data presented here will help to further refine hypotheses about the nature of human artifact cognition.

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## Appendix A: Story Texts, UK Versions

Note: The Shuar received Spanish translations of these texts, which were identical, except for contextualizing information, such as “an indigenous South American man”.

### Net/Hammock

#### *Standard A→B*

An indigenous South American man made an object out of string for catching fish in the river. One day, when he was fishing with the object, it got washed away in the river and another man found it. The other man took it out of the river and hung it between two trees. He used the thing to rest in. From that day on, he always used it for resting.

If you had to choose, would you say that the object is a fishing net or a hammock?

#### *Community A→B*

Imagine two indigenous South American groups, the Ache and the Hiwi. The Ache make things with string. They use these things to fish in the river. However, the Hiwi don't do this. Like the Ache, the Hiwi use string to weave objects, but they don't use them to fish. Instead, the Hiwi hang the objects between two trees, and use them to rest in.

A man from an Ache village made an object out of string to catch fish in the river, as the Ache do. One day, the man took the thing to the river to fish. When he was fishing with it, the river carried it away and another man, a man from a Hiwi village, found it. The Hiwi man took it out of the river and hung it between two trees. He used the thing to rest in, as the Hiwi do. From that day on, the object remained in the Hiwi village, and they used it like that.

If you had to choose, would you say that the object is a fishing net or a hammock?

**Basket/Cage***Standard A→B*

An indigenous South American man used some vines to make an object with a big hole in one end that his family could use to bring vegetables back from their garden. One day, another man found the object and took it to his house. This man used the object as a little house where his chickens could sleep at night. From that day on, he used the object this way.

If you had to choose, would you say that the object is a basket or a chicken cage?

*Community A→B*

Imagine two indigenous South American groups, the Ache and the Hiwi. The Ache use vines to make objects that have a big hole in one end. The Ache use these objects to bring vegetables back from their gardens. However, the Hiwi don't do this. Like the Ache, the Hiwi use vines to make objects that have a big hole in one end, but they don't use these to bring vegetables back from the garden. Instead, the Hiwi use them as little houses where their chickens can sleep at night.

A man from an Ache village used some vines to make an object with a big hole in one end to use to bring vegetables back from the garden, as the Ache do. One day another man, a man from a Hiwi village, found it. The Hiwi man took it and brought it to his village. He used it as a little house where his chickens could sleep at night, as the Hiwi do. From that day on, the object remained in the Hiwi village, and they used it like that.

If you had to choose, would you say that the object is a basket or a chicken cage?

**Chicha Pounder/Property Marker***Standard A→B*

An indigenous South American woman made an object out of wood that she used to crush a starchy root to make the local drink called *chicha*. One day, another woman found the object and took it to her house. She was having an argument with her neighbor over where the boundaries of her property were, so she put the object in the ground to indicate the border of her property. From that day on, she always used it like that.

If you had to choose, would you say that the object is a chicha pounder or a property marker?

*Community A→B*

Imagine two indigenous South American groups, the Ache and the Hiwi. The Ache make objects out of wood that they use to crush a starchy root to make the local drink called *chicha*. However, the Hiwi don't do this. Like the Ache, the Hiwi make objects out of wood, but they don't use them to make *chicha*. Instead, the Hiwi use them to put in the ground to indicate the borders of their properties.

A woman from an Ache village made an object out of wood to prepare *chicha*, as the Ache do. One day another woman, a woman from a Hiwi village, found the object and took it home. She put it in the ground to indicate the border of her property, as the Hiwi do. From that day on, the object remained in the Hiwi village, and they used it like that.

If you had to choose, would you say that the object is a chicha pounder or a property marker?

**Drum/Rice Bucket***Standard A→B*

An indigenous South American man made an object out of wood that had a hole on one end. He hit the object with a stick to make rhythmic noises. One day, another man found the object and took it to his house. He used it to keep his rice in. From that day on, he used it that way.

If you had to choose, would you say that the object is a drum or a rice bucket?

*Community A→B*

Imagine two indigenous South American groups, the Ache and the Hiwi. The Ache make objects out of wood that have holes in one end, and they hit these objects with sticks to make rhythmic noises. However, the Hiwi do not do this. Like the Ache, the Hiwi make objects out of wood that have a hole in one end, but they do not use them to make rhythmic noises. Instead, the Hiwi use the objects to keep their rice in.

A man from an Ache village made an object out of wood that had a hole in one end, and he hit it with a stick to make rhythmic noises, as the Ache do. One day another man, a man from a Hiwi village, found the object and took it home. He used it to keep his rice in, as the Hiwi do. From that day on, the object remained in the Hiwi village, and they used it like that.

If you had to choose, would you say that the object is a drum or a rice bucket?