Investigating Children's Beliefs About Artificially Intelligent Artifacts

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Introduction

Increasingly, our society is embracing technology in a variety of domains. So-called 'smart' technologies are now being employed for functions as diverse as inter-planetary exploration, house cleaning, and children's toys. Numerous authors and visionaries have suggested that this infusion of technology will result in long-lasting changes to the way we think, perceive, and understand both ourselves and the technology around us (Papert, 1980; Turkle, 1984; 1999).

One potential arena for change is the way we conceptualize what it means to be 'alive'. Prior research suggests a strong relationship between children's judgments of animacy status and associated biological and psychological characteristics (Gelman & Opfer, 2002). The current research explores whether the relationship between animacy and biological/psychological characteristics, as mapped out for living kinds and simple artifacts, also holds for artificially intelligent artifacts.

Another potential arena for change is the way we think about intelligence. Prior to the advent and popularization of intelligent technologies, it could reasonably be assumed that intelligence and intelligent behavior was limited to biological kinds. But given our society's legitimization of the notion of 'intelligent' technologies, is it still reasonable to assume that children's ideas about intelligence are tied to their notions of biological life? Nigam & Klahr (2000) investigated this relationship, but asked about a limited range of characteristics. Another goal of the current study is to investigate the extent to which children are willing to attribute intelligence characteristics in the absence of biological or psychological ones.

Research Questions

1. Do children apply the concept 'alive' consistently across biological kinds, simple artifacts, and intelligent artifacts?

2. Is there a relationship between attributing intelligence and the presence of biological characteristics?

Method

Participants

Participants were recruited from the population of weekend visitors at the Children's Museum of Pittsburgh.

The sample included:

- 30 younger children (M=62.6 months, SD=6.2 months)
- 30 older children (M=82.6 months, SD=6.9 months)
- 29 girls; 31 boys

Poster presented at the Society for Research in Child Development (2005) Atlanta, GA.

Method, cont.

Procedure

A forced-choice task was utilized to determine whether children would attribute biological, psychological and/or intelligence characteristics to the following entities: a person, a cat, a plant, a doll, a humanoid robot, a rover, a computer, and a calculator.

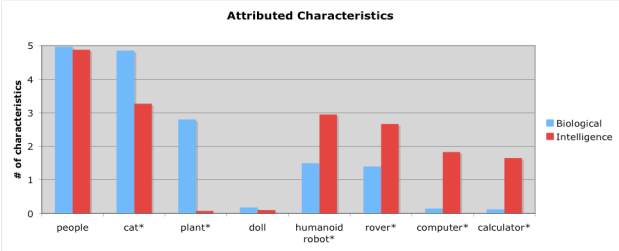
Children were provided with pictures of each of the 8 entities (see below) and asked to indicate which of the following characteristics applied:

- Biological (alive, metabolism, self-generated movement, reproduction, growth)
- Psychological (emotion, volition)
- Intelligence (think, remember, learn, plan, calculate)
- Artifactual processes (made in a factory, put together)

Results

Intelligence and Biology

Are children willing to attribute intelligence in the absence of biological characteristics? With the exception of the person and the doll, the number of biological and intelligence characteristics children attributed to each entity were significantly different from one another (see graph below). This finding suggests that children are willing to attribute intelligence characteristics to entities even when they understand that those entities are non-biological.



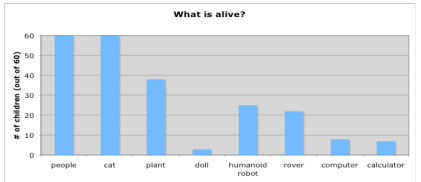
*Significant difference between total # of biological and intelligence characteristics, p<.006

(Note: In this study, self-generated movement is considered a biological characteristic; therefore, a significant portion of the 'biological' score attributed to robots was due to children's belief that they could move by themselves)

Results, cont.

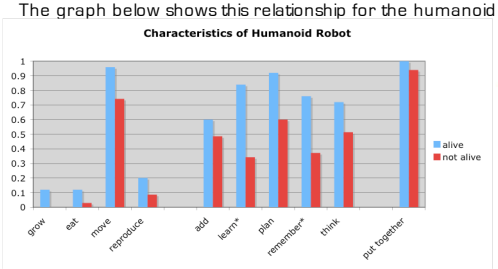
Animacy

The graph below shows the number of children judging each entity to be alive.



Older children were more likely than younger children to say the plant was alive; younger children were more likely than older children to say the calculator was alive. There were no other significant age differences.

Animacy judgments were then examined to determine the relationship between animacy and the attribution of biological and intelligence features. The graph below shows this relationship for the humanoid robot.



Animacy had a significant effect on children's judgments of whether the robot could learn and remember. There were no other significant effects for animacy.

There seems to be little relationship between children's animacy judgments and the presence of biological features for this robot. Rather, judgments of animacy status were consistent with the attribution of 3 features: self-generated movement, learning, and remembering (r=.527).

Conclusions

- When children categorize artificially intelligent artifacts as 'alive', they are not assuming those artifacts share the biological features of living things. Nor do children limit intelligence to biological kinds.

- In addition to the current research, we are also examining the origins of children's ideas about artificial intelligence. That line of research suggests that beliefs about intelligence change as a result of experience with intelligent technology (e.g., robots).

- Taken together, these two lines of research suggest that children (particularly those with experience) can develop a sophisticated understanding of the nature of both biological and artificial intelligence.

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