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Study: Young Children Can Learn Math Skills from Intelligent Virtual Characters

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Young Children's Mathematical Learning from Intelligent Characters

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Contact:
Jessica Efstathiou, Senior Media Relations and Communications Associate

E-MAIL

U.S. children lag behind their international peers in science, technology, engineering, and math (STEM) skills, which has led to calls for an integrated math curriculum for 3- to 6-year-olds. A new study examined whether young children's verbal engagement with an onscreen interactive media character could boost their math skills. The study concluded that children's parasocial (that is, one-sided) emotional relationships with the intelligent character and their parasocial interactions (in this case, talking about math with the character) led to quicker, more accurate math responses during virtual game play.

The findings are from research conducted at Georgetown University. They appear in *Child Development*, a journal of the Society for Research in Child Development.

"Our study suggests that children's relationships and interactions with intelligent characters can provide new pathways for 21st century education, with popular media characters bridging traditional boundaries between home and school settings," says Sandra L. Calvert, professor of psychology and director of the Children's Digital Media Center at Georgetown University, who led the study.

Researchers studied 217 children ages 3 to 6 years, most of whom were European American and from college-educated families. They examined the children's math learning from a game featuring a prototype of an intelligent character based on the media character Dora from the animated series, *Dora the Explorer*, who responded to children with spoken language. In three studies, each of which took place over about a year, researchers initially asked if children could learn from the intelligent character. Then they examined the role of children's parasocial relationships by including or not including a character in the virtual game. And then they examined the role of social contingency, with some children's talk about math receiving corrective feedback from the character and other children's talk not receiving the feedback.

Children were taught the add-1 rule—that adding 1 to a number increases the total sum by a single unit—which is one of the most basic and earliest math concepts children learn. Researchers examined

whether the children could learn this rule from an intelligent character in a virtual game, and how that learning was influenced by the children's feelings for the character and their talk with the character. They also examined whether the children's learning in a screen-based context would transfer to learning with physical objects, such as crayons.

Children who had stronger emotional feelings for the character and who talked more to the character about math had quicker, more accurate math responses during their virtual game play, the study found. Children also transferred what they had learned from the virtual game to physical objects more successfully when the game included an embodied virtual character (as opposed to a noncharacter female voiceover of what was said) and when the character used
socially contingent replies to children's talk about math. The findings suggest that children's emotionally tinged parasocial relationships and parasocial talk about math with virtual characters increased their mastery of early math skills.

"Our work sheds light on how children's connection to a character and interactions with them through math talk can improve learning of basic early math skills, a lesson that may be extended to other academic and social areas," explains Evan Barba, associate professor of communication, culture, and technology at Georgetown University, who coauthored the study.

"The implication of our findings is that media characters that are children's friends and playmates can also be children's trusted peers and teachers in math and other subjects," concludes Calvert.

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Summarized from *Child Development, Young Children's Mathematical Learning from Intelligent Characters*, by Calvert, SL (Georgetown University), Putnam, MM (Georgetown University), Aguiar, NR (formerly at Georgetown University, now at University of Wisconsin Whitewater), Ryan, RM (Georgetown University), Wright, CA (formerly at Georgetown University, now at George Washington University), Liu, YHA (formerly at Georgetown University, now at University of Sydney), and Barba, E (Georgetown University). Copyright 2019 The Society for Research in Child Development, Inc. All rights reserved.

Contact Information:
Jessica Efstathiou
Society for Research in Child Development
202-800-3255
jefstathiou@srcd.org