Most preschool math, literacy apps not designed to help children learn, study finds

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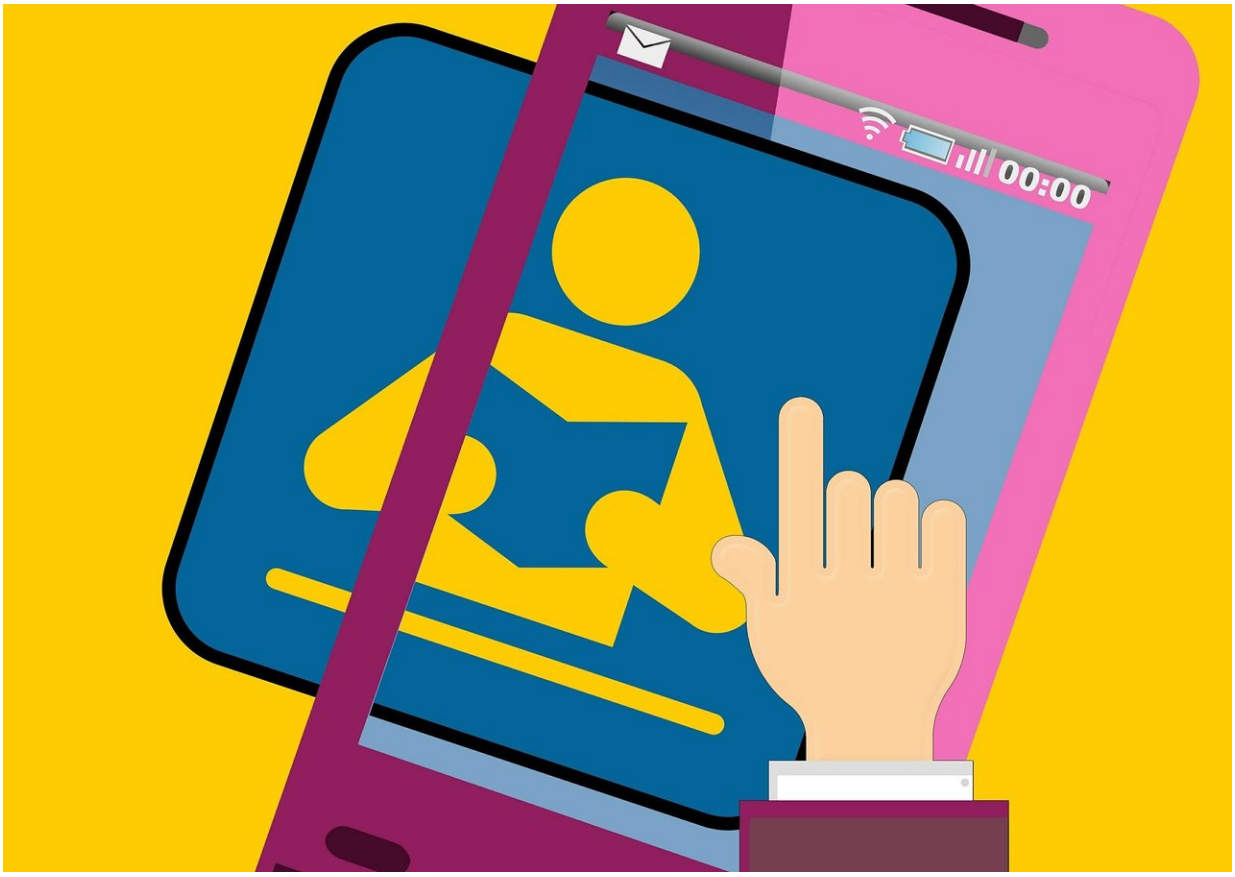

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Most literacy and math educational apps for preschoolers are not designed to help youngsters actually learn, according to a new study from

the University of California, Irvine. Few incorporate features informed by evidence-based best teaching practices or age-appropriate in-play guidance.

Youngsters under 5 process information very differently from older kids. They have shorter attention spans, less working memory capacity and more limitations in visual interpretation and are also still developing the fine motor skills needed for accurate touch-screen interactions.

"More than half of the educational apps on the market are for preschoolers, but little is known about how they are designed to help children learn," said Stephanie Reich, study co-author and associate professor of education. "By examining app design, we found that several different teaching tactics were utilized, but many were not optimal for how research says preschoolers learn. For example, without well-structured feedback or leveling of difficulty, children may end up relying on trial and error or playing simple games that drill the same skills with no progression."

As established by existing research, the key elements for teaching preschoolers with apps are: clarity and simplicity of goals; quality of feedback and rewards; structure of challenge; and motion-based interactions. At the start of play, clear prompts should let the children know what the task is and how to complete it. Since preschoolers are just beginning to develop reading skills, visual demonstrations and verbal descriptions of why certain actions yield certain outcomes help young learners. As for rewards, instead of just earning badges or stickers for completing tasks, unlocking skills or advanced levels of the game can make learning more intrinsically motivating – that is, it makes learning the fun part, rather than the sticker.

App design can be structured to guide children from understanding basic concepts to grasping more complex content by gradually increasing in

difficulty as they progress, as well as decreasing in difficulty when they struggle. Features facilitating physical interaction, including large icon sizes and simplified touch-screen motions, can help preschoolers successfully play the game, boosting learning.

Each month for three months – as part of a doctoral dissertation in UCI's School of Education – Melissa Callaghan and Reich, her faculty adviser, selected the top 10 paid and free children's math and literacy apps from the Apple, Amazon and Google Play stores. For both Apple and Android platforms, they had to have been categorized by the stores as educational games for players under the age of 5.

Each app was evaluated for such design elements as feedback, increasing complexity, guided play, developmental appropriateness and instructive value. Most provided clear goals, moderate instructions and positive feedback, but few supplied in-play guidance on how to complete tasks, rephrased instructions if the initial ones were not understood or offered rewards that advanced learning.

"In this digital age, where the production and consumption of educational preschool apps is high, there is a strong need for research to inform how developers could best design these teaching tools," Reich said. "Our study is a starting point in creating empirical-based frameworks for creating and classifying apps that truly reach and teach a wide range of learners."

The study appears online in the journal *Learning, Media and Technology*. Callaghan, co-author of the study, is now a postdoctoral fellow at Harvard University working on the Reach Every Reader initiative.

More information: Melissa N. Callaghan et al. Are educational preschool apps designed to teach? An analysis of the app market, *Learning, Media and Technology* (2018). DOI:

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