Science Education Collection

The Costs and Benefits of Natural Pedagogy

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Overview

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Children have many tools they use over the course of development to learn from adults. Perhaps the earliest tool is imitation, simply copying what they see an adult do or say. However, children actually learn much more effectively than one might expect if they were only imitating. This is because, when it comes to learning and teaching, children and adults have a special relationship. Children treat adults as if they are helpful and knowledgeable teachers, and adults teach children information in a manner that is usually efficient and effective. Through these interactions, children can learn much better than if they were simply using trial-and-error or copying adults exactly. This way of interacting is referred to as natural pedagogy, and it is one of the reasons that young humans are gifted learners.

One of the most impressive aspects of natural pedagogy is that no one teaches adults how to be good teachers, and children treat adults as teachers without having to be trained to do so. However, natural pedagogy also entails costs. Children are curious and intrinsically motivated to explore, so children do some of their best learning when given opportunities to learn and explore on their own. Thus, the result of natural pedagogy is that children learn information taught to them very effectively, but explicit teaching restricts their curious, exploratory behaviors. There is a tradeoff between efficient learning and self-driven exploration.

This video demonstrates the method by which Elizabeth Bonawitz, Patrick Shafto, and colleagues[1] showed the effects of natural pedagogy on young learners.

Procedure

Recruit approximately 40 healthy 4-year-olds with no history of developmental disorders. For the purposes of this demonstration, only two children are tested (one in each condition). Larger sample sizes are recommended when conducting any experiments.

1. Data collection

1. Gather the necessary materials.
    1. Acquire a novel device with four different non-obvious functions. For example, the device used by Bonawitz and colleagues[1] had a hidden button that made a light come on, a tube that squeaked when pulled, a pad that played music when pressed, and a mirror hidden within the object.
2. Preamble
    1. Sit with the child in a quiet space.
    2. Assign the child to one of two conditions.
        1. The pedagogical condition: In this condition, bring out the device and say, “Look at my toy! This is my toy. I’m going to show you how my toy works. Watch this!” Demonstrate one of the hidden affordances of the device to the child by making it squeak. Then say, “Wow, see that? This is how my toy works!’’ and demonstrate the same action again.
        2. The baseline condition: In this condition, bring out the device and say, “Wow, see this toy? Look at this!” Look at the toy briefly to account for the difference in interaction time relative to the pedagogical condition.
3. Test
    1. Say, “Wow, isn’t that cool? I’m going to let you play with the toy. See if you can figure out how this toy works. Let me know when you’re done!” and leave the child to play.
    2. Record the child’s activities on video.
    3. If the child stops playing for 5 s, ask, “Are you done?” If the child says, “yes,” end the experimental session. Otherwise, end the session if the child stops playing for a second 5-s period.

2. Analysis

1. Have two independent coders, who are blind to the condition, code the number of hidden functions discovered by each child. Since one function—the squeaker—was used as a demonstration in the pedagogical condition, it is not considered hidden for the purpose of scoring children’s discoveries. Thus, each child receives a score between 0 (discovered no functions) and 3 (discovered all of the remaining functions).
2. Use a t-test to determine if there are differences in the number of discovered functions between conditions.

Results

Children in the pedagogical condition typically discover fewer of the hidden functions of the device than children in the baseline condition (**Figure 1**). Children taught about the device also usually spend less time playing with it, and they focus their play on the function taught to them by the experimenter, even if they discover other functions. Taken together, these findings suggest that teaching children focuses their attention on the communicated information and meaningfully limits their exploration and curiosity. They engage with the device in a more focused and limited way than children who learn about the device on their own.

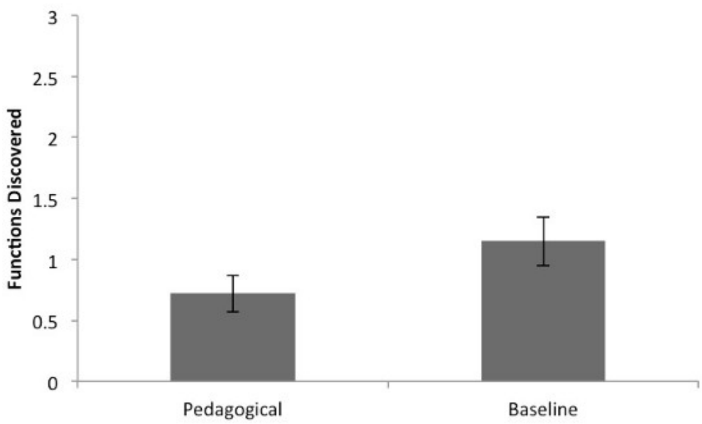

Figure 1. The average number of toy functions discovered by children across conditions.

Applications and Summary

This experiment demonstrates that there is value in letting children explore their world on their own, and that explicitly teaching children can meaningfully limit their curiosity in some situations. In particular, there is a growing body of evidence that children can learn as effectively, if not more effectively, through free play and self-directed exploration than through explicit instruction. That said, teaching is not always a bad thing, and these results must be considered in the broader context of children's learning. Sometimes it is helpful for a person to explore and discover things on their own, but there are also many situations where such exploration is inefficient or even problematic. For example, there are many situations where such exploration only slows learning down, such as learning how to tie shoes or perform long division. These findings demonstrate that teachers must carefully consider when to teach and when to allow children's natural curiosity to guide their learning.

References

1. Bonawitz, E., Shafto, P., Gweon, H., Goodman, N.D., Spelke, E., & Schulz, L. The double-edged sword of pedagogy: Instruction limits spontaneous exploration and discovery. *Cognition.* 120, 322-330 (2011).

