Look! Something shiny! How some textbook visuals can hurt learning

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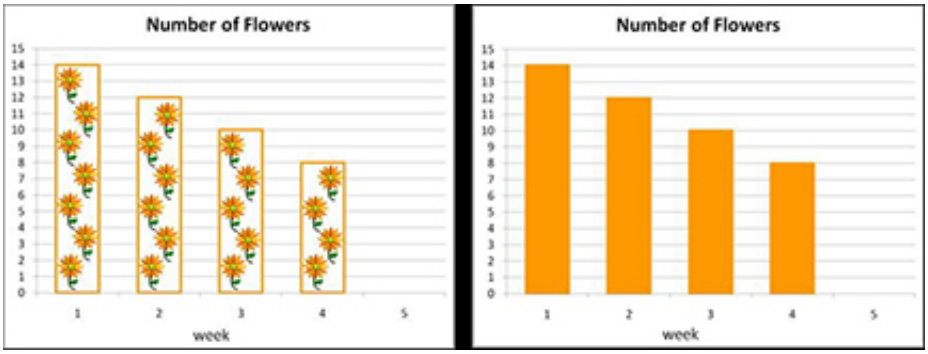

Children who were taught from an image like the one on the left didn't learn how to read graphs as well as did those who were taught from the simpler image on the right. (Courtesy of the authors.)

(Medical Xpress)—Adding captivating visuals to a textbook lesson to attract children's interest may sometimes make it harder for them to learn, a new study suggests.

Researchers found that 6- to 8-year-old children best learned how to read simple bar graphs when the graphs were plain and a single color.

Children who were taught using graphs with images (like shoes or flowers) on the bars didn't learn the lesson as well and sometimes tried counting the images rather than relying on the height of the bars.

"Graphs with pictures may be more visually appealing and engaging to children than those without pictures. However, engagement in the task does not guarantee that children are focusing their attention on the information and procedures they need to learn. Instead, they may be focusing on superficial features," said Jennifer Kaminski, co-author of the study and research scientist in psychology at The Ohio State University.

Kaminski conducted the study with Vladimir Sloutsky, professor of psychology at Ohio State.

The problem of distracting visuals is not just an academic issue. In the study, the authors cite real-life examples of colorful, engaging – and possibly confusing - bar graphs in educational materials aimed at children, as well as in the popular media.

And when the authors asked 16 kindergarten and elementary school teachers whether they would use the visually appealing graphs featured in this study, all of them said they would. Intuitively, most of these teachers felt that the graphs with the pictures would be more effective for instruction than the graphs without, according to the researchers.

The findings apply beyond learning graphs and mathematics, the authors said.

"When designing instructional material, we need to consider children's developing ability to focus their attention and make sure that the material helps them focus on the right things," Kaminski said.

"Any unnecessary visual information may distract children from the very procedures we want them to learn."

The study appears online in the *Journal of Educational Psychology* and

will appear in a future print edition.

The main study involved 122 students in kindergarten, first and second grade. All were tested individually.

The experiment began with a training phase where a researcher showed each child a graph on a computer screen and taught him or her how to read it. The children were then tested on three graphs to see if they could accurately interpret them.

The graphs in the training phase involved how many shoes were in a lost and found for each of five weeks. Half the students were presented with graphs in which the bars were a solid color. The other students were shown graphs in which the bars contained pictures of shoes. The number of shoes in the bars was equal to the corresponding y-value on the graph. In other words, if there were five shoes in the lost and found, there were five shoes pictured in the bar.

After the training phase, the children were tested on new graphs in which the bars were either solid-colored or contained pictures of objects such as flowers. However, the number of objects pictured did not equal the correct y-value for the bar. In other words, the bar value could equal 14 flowers, but only seven flowers were pictured.

"This allowed us to clearly identify which students learned the correct way to read a bar graph from those who simply counted the number of objects in each bar," Sloutsky said.

Sure enough, children who trained with the pictures on the graph were more likely than others to get the answers wrong by simply counting the objects in each bar.

All of the first- and second-graders and 75 percent of the kindergarten

children who learned on the solid-bar graphs appropriately read the new graphs.

However, those who learned with the more visually appealing shoe graphs did not do nearly as well. In this case, 90 percent of kindergarteners and 72 percent of first-graders responded by counting the number of flowers pictured. Second-graders did better, but still about 30 percent responded by counting.

All the children were then tested again with graphs that featured patterned bars, with either stripes or polka dots within each bar.

Again, those who learned from the more visually appealing graphs did worse at interpreting these patterned graphs.

"To our surprise, some children tried to count all the tiny polka dots or stripes in the bars. They clearly didn't learn the correct way to read the graphs," Kaminski said.

The researchers conducted several other related experiments to confirm the results and make sure there weren't other explanations for the findings. In one experiment, some children were trained on graphs with pictures of objects. But in this case, the number of objects pictured was not even close to the correct value of the bar, so the students could not use counting as a strategy.

Still, these children did not do as well on subsequent tests as did those who learned on the graphs with single-colored bars.

"When teaching children new math concepts, keeping material simple is very important," Sloutsky said.

"Any extraneous information we provide, even with the best of

intentions, to make the lesson more interesting may actually hurt learning because it may be misinterpreted," he said.

The researchers said these results don't mean that textbook authors or others can never use interesting visuals or other techniques to capture the interest of students.

"But they need to study how such material will affect students' attention. You can't assume that it is beneficial just because it is colorful; in can affect learning by distracting attention from what is relevant," Sloutsky said.

Provided by The Ohio State University