

Singing for science: How the arts can help students who struggle most

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Students in the arts-integrated life science class drew animal and plant cells to understand the structures within. Credit: Mariale Hardiman/Johns Hopkins University

Incorporating the arts—rapping, dancing, drawing—into science lessons can help low-achieving students retain more knowledge and possibly help students of all ability levels be more creative in their learning, finds

a new study by Johns Hopkins University.

The findings were published on Feb. 7 in *Trends in Neuroscience and Education* and support broader arts integration in the classroom.

"Our study provides more evidence that the arts are absolutely needed in schools. I hope the findings can assuage concerns that arts-based lessons won't be as effective in teaching essential skills," says Mariale Hardiman, vice dean of academic affairs for the School of Education at the Johns Hopkins University and the study's first author.

While research already shows that the arts improve students' academic outcomes and memory, it remains unclear whether general exposure to the arts, adding arts to lesson plans, effective instruction, or a combination are responsible for these benefits, says Hardiman.

"When we talk about learning, we have to discuss memory. Children forget much of what they learn and teachers often end up reteaching a lot of content from the previous year. Here we're asking, how exactly can we teach them correctly to begin with so they can remember more?"

In this study, the research team sought to determine whether an arts-integrated curriculum had any direct effects on learning, specifically students' memory for science content.

Throughout the 2013 school year, 350 students in 16 fifth grade classrooms across six Baltimore, Maryland schools took part in the study. Students were randomly assigned into one of two classroom pairs: astronomy and life science, or environmental science and chemistry.



In the arts-integrated chemistry class, students learned about states of matter by working in groups to physically demonstrate solid, liquid and gas particles.
Credit: Mariale Hardiman/Johns Hopkins University

The experiment consisted of two sessions, each lasting three to four weeks, in which students first took either an arts-integrated class or a conventional class. In the second session, students received the opposite type of class; thus, all students experienced both types and all eleven teachers taught both types of classes.

Examples of activities in the arts-integrated classes include rapping or sketching to learn vocabulary words, and designing collages to separate living and non-living things. These activities were matched in the conventional classrooms with standard activities such as reading paragraphs of texts with vocabulary words aloud in a group and completing worksheets.

The research team analyzed students' content retention through pre-, post-, and delayed post-tests 10 weeks after the study ended, and found that students at a basic reading level retained an average 105 percent of the content long term, as demonstrated through the results of delayed post-testing. The researchers discovered that students remembered more in the delayed post-testing because they sang songs they had learned

from their arts activities, which helped them remember content better in the long term, much like how catchy pop lyrics seem to get more and more ingrained in your brain over time.

This addresses a key challenge and could be an additional tool to bridging the achievement gap for students who struggle most to read, says Hardiman, because most conventional curriculum requires students to read to learn; if students cannot read well, they cannot learn well.

The research team also found that students who took a conventional session first remembered more science in the second, arts-integrated session and students who took an arts-integrated session first performed just as well in the second session. While not statistically significant, the researchers suggest the possibility of students applying the creative problem-solving skills they learned to their conventional lessons to enhance their learning.

Looking forward, Hardiman hopes that educators and researchers will put their fully-developed intervention to use to expand on their study and improve understanding of arts integration in schools.

"Our data suggests that traditional instruction seems to perpetuate the achievement gap for students performing at the lower levels of academic achievement. We also found that students at advanced levels of achievement didn't lose any learning from incorporating arts into classrooms, but potentially gained benefits such as engagement in learning and enhanced thinking dispositions. For these reasons, we would encourage educators to adopt integrating the arts into content instruction," says Hardiman.

More information: Mariale M. Hardiman et al, The effects of arts-integrated instruction on memory for science content, *Trends in Neuroscience and Education* (2019). [DOI: 10.1016/j.tine.2019.02.002](https://doi.org/10.1016/j.tine.2019.02.002)

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