NAEP RESEARCH PROJECT

Impact of Modes of Instruction and Classroom Activities

On the 2019 NAEP Eighth-Grade Science Assessment

Susan Sobehrad

Problem

Students have a difficult time finding good answers to ill-structured questions using online resources.

Students need opportunities to practice critical thinking and scientific questioning.

The purpose of this study is to examine teacher and student views regarding the development of online research skills

Purpose

What’s Missing

How do teachers help students navigate vast amounts of knowledge to find solutions to specific questions?

- How much time should be spent?
- What types of activities are effective?
- With what frequency should they be offered?

Key Ideas from Research

Pitfalls

Online searches can:

- Foster misconceptions
- Miss important information
- Be skewed by the filter bubble
- Be at too high a comprehension level

Scaffolds

Structured guidance is necessary:

- Writing queries
- Building domain knowledge
- Sifting out irrelevant information

Moderation

Inquiry-based teaching has a very weak relationship with attainment in science unless accompanied by a high level of guidance

Short Term

Strategies such as questioning, locating, critically evaluating, synthesizing, and communicating can be scaffold, but improvements are not lasting.

Overload

Cognitive load theory:

- Working memory can only process limited information
- Student is overwhelmed by vast amount of available resources

Research Questions

1

How often do teachers in an eighth grade science class ask students to use a computer or other technological resources to conduct a search for science information?

2

How often did students participate in inquiry activities in an eighth grade science classroom?

3

How often are eighth grade science students asked to combine information about science from multiple sources for an assignment?

Results

Research Question #1

Increased use of computers had no effect on student achievement.

Research Question #2

The frequency of inquiry activities had diminishing returns--moderate use of the practice had a higher significance over consistent use.

Research Question #3

The frequency of combining information from multiple sources also had diminishing returns--moderate use of the practice had a higher significance over consistent use.

Discussion/Conclusions

Increased inquiry in science classrooms

- Student driven
- Open-ended
- Use technology to devise solutions

Access to information doesn't ensure that new learning occurs

Lack of domain knowledge, non-linear structure, finding isn't learning

There are limits to a student's working memory

Cognitive overload, more isn't always better, lack of sense-making processes

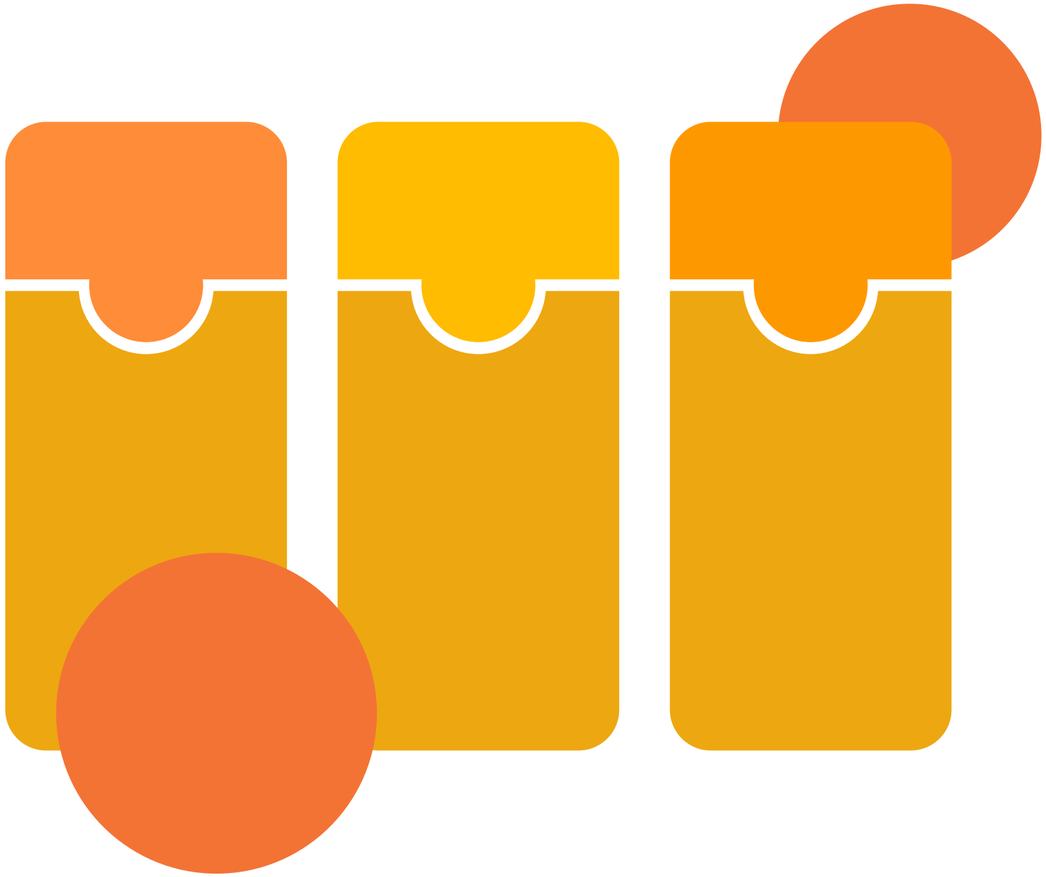
Adding more inquiry isn't enough to ensure more learning

Thorough, repeated scaffolding; metacognitive hints, continuous support

Additional scaffolding is the key to higher achievement

Just because students are digital natives doesn't mean they are digital wizards

Implications



Frequent use of technology doesn’t ensure increased achievement.

Technology applications need to be intentionally chosen, and scaffolds must be in place to ensure successful implementation of the tools.

Effective use of technology is not an intuitive process for students.

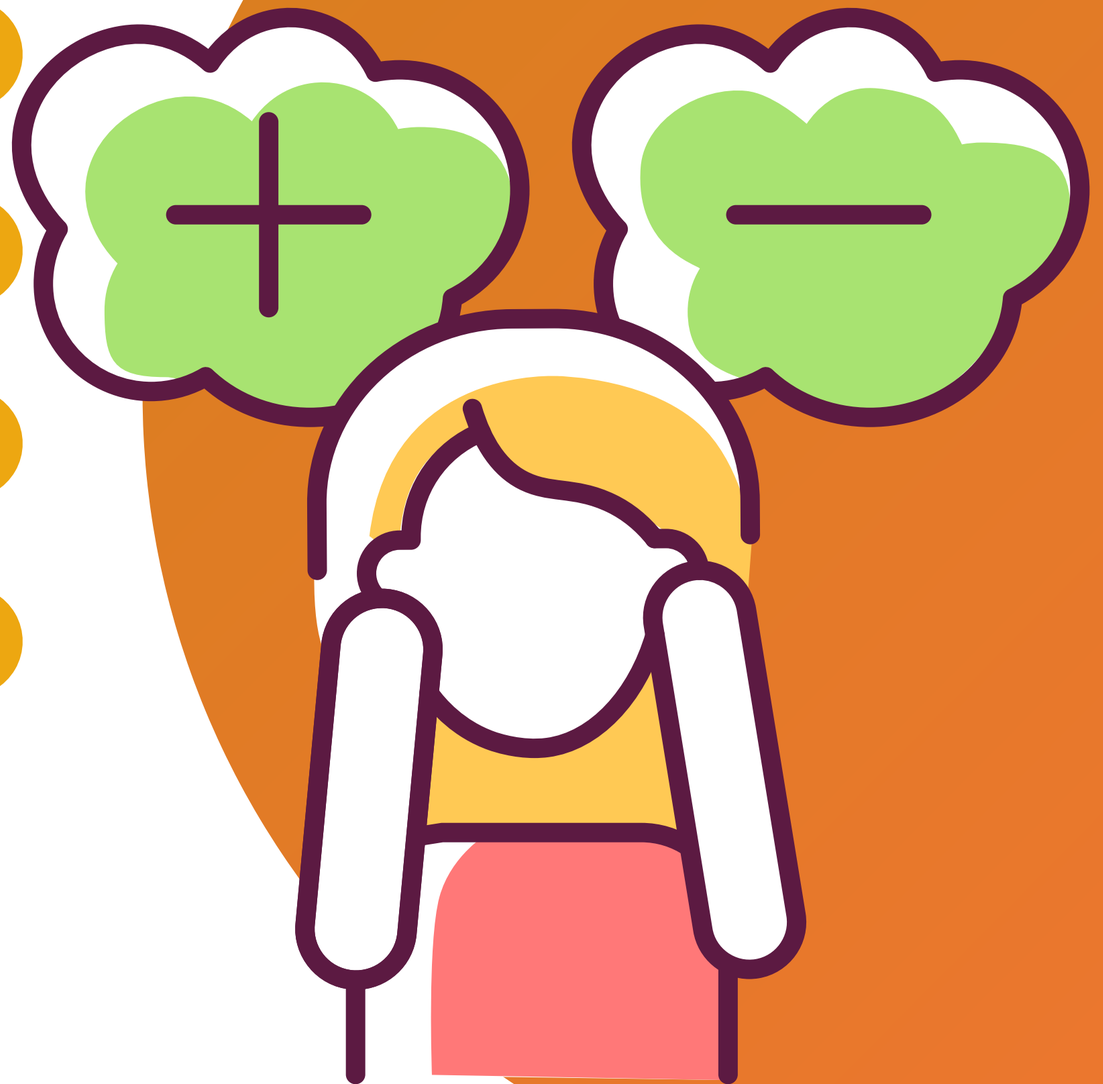
Modeling and scaffolds should be used to help students master skills appropriate to the task.

Inquiry and knowledge synthesis both require that students can handle a high cognitive load.

To offset these demands, pedagogy needs to include strategies designed to help teachers and students organize information in a way that streamlines thought processes and makes connections clear.

Limitations

- Lack of detail about activities
- Scaffolding is assumed
- Frequency is not extent
- Geography



Recommendations

How To

Determine effective methods for teaching students how to write successful queries and how to combine information from multiple sources into new knowledge.

Scientific Inferencing

Effective methods for the use of inferencing to improve inquiry and knowledge synthesis would lead toward students better equipped to tackle solving ill-structured problems using online resources.

Thank You

For Your Attention