

## CATALySES Action Research Proposal 2017

**Title:** A study of the impact of Reading Skills and Strategies on Achievement in a High School Biology course.

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**Abstract:** There are many dedicated, energetic, creative teachers, who work tirelessly to create innovative, hands on activities for their students. Many have streamlined their courses to increase accessibility to their students, using shortened presentations, videos and hands-on activities to present new information; leaving the textbook to be used as a reference tool. These wonderful lessons are created in hopes that they have motivated their students enough that they will learn and excel in their high school science course. However, no matter their efforts there is a gap in achievement, especially on state-standard comprehension tests.

This action research study will attempt to see if the gap in achievement in the high school science course lies in the student's inability to utilize reading skills and reading strategies in their high school Biology course. Reading strategies, designed to increase comprehension, will be used before, during, and after reading the course textbook and relevant articles. The research will be measured using state standard-based comprehension pre and post-tests. The students will also complete self-reporting surveys and interviews which will assess their comfort/familiarity with various reading strategies.

### **Rationale:**

"The climate in today's exemplary science classrooms is grounded in the high standards and vision described in the National Science Education Standards. All students, regardless of age, sex, cultural or ethnic background, disabilities, aspirations, or interest and motivation in science, should have the opportunity to attain high levels of scientific literacy" (Barton & Jordan, 2001)

I have been a high school science teacher for the past 9 years, and most recently a high school biology teacher for the past 5 years. When I shifted to Biology, a high stakes end of course state exam course, I stopped using reading strategies, or quality reading in general. I left reading behind, for the simple reason that teaching reading skills and strategies takes too much time. Instead I have tried to shorten my lessons by streamlining the information into short presentations with guided notes, so we could hurry onto practice. For years now we have been hearing that you need to get them actively engaged through group work, hands-on learning, and no real mention of reading.

In the last couple of years our school's pass rate has declined, which correlates to Biology now being offered to our advanced ninth grade students their 8<sup>th</sup> grade year. We have lost our buffer, and slowly our scores have declined 74% 2014, 69% 2015, 69% 2016 and 65% 2017. My personal scores in my standard Biology course have declined 64% 2014, 58% 2015, 47% 2016 and 40% 2017, however my honors scores have stayed above 90%. These scores have diminished greatly, even with my most innovative lessons. So I asked myself, and began to research; what is missing?

In 2015, a new administrator over the Science department at my high school, reviewed our data and insisted we must bring reading back to our courses, and recommended two-column notes be done. It was a very difficult and frustrating experience. Many teachers found the students just copied the vocabulary, or a first or last sentence from the textbook. Students lacked the reading skills to read, and summarize. We as teachers, lacked the training to help build their reading skill set. By the end of the first semester only one Biology teacher continued to use the strategy. At the end of the year, the Biology EOC scores remained the same at 69%.

Past research has identified that how well an individual comprehends and learns from reading expository texts depends on relationships between individual differences such as prior knowledge, reading skill and the text itself (high or low cohesion). The study indicated that the difficulty in learning new concepts could be much more attainable by the students if the new text is more cohesive (a little longer with repetition), however this is only if they had sufficient reading skill (Ozuru, Dempsey & McNamara 2008). Surprisingly, there was no significant difference between the achievement between lower knowledge students, and higher knowledge students as long as they excelled in reading skills. Reading skills actually compensated those students who lacked in background knowledge (O'Reilly & McNamara 2016).

However, not all students have the prior knowledge and many do not have the reading skills. Many studies agree that background knowledge is essential to how well a student is able to not only comprehend but apply the new information. "Failure to employ effective strategies causes the student to process the information "mindlessly" and settle for superficial understanding" (O'Reilly & McNamara 2016). "In recent studies, low knowledge students reading skill improved students achievement, and a high level of reading strategy knowledge did improve achievement" as well (O'Reilly and McNamara 2016). In conclusion, not only do we need to improve text quality, and reading skills but we need to take the time to provide training on reading strategies (Ozuru, Dempsey & McNamara 2008).

Using the cited evidence from my research I have decided that I will try to incorporate reading comprehension skills and strategies to help improve my students' achievement in high school Biology, most specifically in the comprehension of emerging pathogens. Immediately I researched strategies that I would be able to use in my course that would not disrupt the lesson but enhance my lessons. Using the NSTA website and the CPET emerging pathogens program, I was able to generate a list of strategies that have been created to deepen student comprehension by providing prior knowledge exercises, and skills to deepen knowledge during and after reading. In the end, I hope to create students who possess the skills to make them good readers and good scientist: "engaging prior knowledge, forming hypothesis, establishing plans, evaluating understanding, determining the relative importance of information, describing patterns, comparing and contrasting, making inferences, drawing conclusions, generalizing, evaluating sources and so on" (Barton & Jordan 2001).

**Description of teaching unit or module(s), including expected outcomes:**

The goal is to implement the following reading strategies throughout the school year, including during the action proposal time. By implementing them from the beginning of the school year, it will allow time for myself to better execute them, and for the students to have gained in reading skills and strategies. If the reading strategies were implemented only during the action proposal, the students would not be gaining from the reading because they would still be learning how to do the strategies.

Reading Strategies		
<b>BEFORE</b>		
<b>Front Loading</b>	Increase prior knowledge helps increase comprehension	Prediction / Vocabulary Work
FL: Probable Passage	List words related to topic	Make connections-make predictions
FL: Anticipatory Set	List statements about information with t/f or agree/disagree next to it.	Allows them to activate prior knowledge.
Ex: Memory Mapping	Increase prior knowledge by "mapping" all words they remember and can connect.	Allows them to activate prior knowledge and by sharing learn what others already know.
<b>DURING</b>		
<b>Reflection while reading</b>	Helps them process what they are reading while they are reading it improves comprehension. Teaches them to actively think while reading.	Reflection, responses log
Ex: Response Log	Structured or Not- write statements (stuck out to them) and respond to them. Usually 10 responses per article	Use to find points of confusion, mastery, and interest.
Ex: Say Something	Pre-determined stopping points in which students share in their groups.	Talking about what they are learning is a great tool for comprehension.
Ex: Text Structures	Text structures are captions, headings, illustrations, charts, tables, lists, subtitles, titles etc. Students list the text structures of the text they are reading explain how they are helping convey the main idea of the text	Helps students identify what is important in the text.
<b>AFTER</b>		
<b>Processing</b>	When students are done with a particular reading; readers continue to process and make sense of what they read long after the actual reading event.	Deepen Comprehension
Ex. Literature Circles	Small groups 4-5 ppl placed to discuss what was hard, confusing, interesting, conflicting, questionable, or even difficult/unknown terms.	Can require papers in preparations for circle, or final reflection after circle. Possibility-EC for sharing difficulties
Ex. Re-Creation	Recreate what they read in an alternative form: ex-RAFT technique Role/Audience/Format/Topic , or stories like a molecule of oxygen anything that had them apply what they just learned and explain it.	Show what they understand by explaining it.
Extra Support Especially Low Readers	<ul style="list-style-type: none"> <li>• Audio copies for afterwards</li> <li>• Reading buddy (1<sup>st</sup> person they ask questions to)</li> <li>• Graphic organizers: list of questions, outlines, key terms</li> </ul>	If needed

(Johnson& Martin-Hansen 2005)

Each day of the Pathogen unit will be themed with a guiding question. For example, “What is a pathogen?” and “How do they spread?” etc. On each day, students will engage in reading skills and strategies, and interactive lessons with the expectations that the reading strategies will enhance their comprehension of the unit. Students will become confident in their ability to read, and not have a negative attitude towards reading in science.

Beginning of School Year	<ul style="list-style-type: none"> <li>• Likert Scale Survey (attitude about reading and pathogens)</li> <li>• Interview Questions</li> </ul>
Throughout the School Year	<ul style="list-style-type: none"> <li>• Practice reading strategies and skills</li> </ul>
Day One What is a Pathogen?	<ul style="list-style-type: none"> <li>• Pre-Test</li> <li>• <a href="#">Memory Mapping- Pathogen (Before)</a></li> <li>• <a href="#">Meet the Menacing Microbes Activity</a></li> </ul>
Day Two How do they spread?	<ul style="list-style-type: none"> <li>• <a href="#">Modeling an Outbreak activity.</a></li> <li>• <a href="#">Transmission Article-say something (During)</a></li> <li>• <a href="#">Contagion Models-6 examples</a></li> </ul>
Day Three How do pathogens make us sick?	<ul style="list-style-type: none"> <li>• <a href="#">Bad Bug Lesson One (includes prior knowledge)</a></li> <li>• <a href="#">Pathogenic Prototype (includes re-creation)</a></li> </ul>
Day Four Why are some so successful?	<ul style="list-style-type: none"> <li>• <a href="#">SuperBug Article-Response Log/Share</a></li> <li>• <a href="#">Hunger Games Pathogen Edition</a></li> </ul>
Day Five How are pathogens treated?	<ul style="list-style-type: none"> <li>• <a href="#">Jigsaw-use internet/presentations: Antivirals, Vaccines, Antifungals, Antibiotics, Anti-parasitics, Alternative Medicine</a></li> <li>• <a href="#">Antibiotic Resistance Article say something (During)</a></li> </ul>
Day Six Tie it all in	<ul style="list-style-type: none"> <li>• <a href="#">RAFT- Role/Audience/Format/Topic</a>- each pair of students will be given a patient, the will be given the patient’s history, list of symptoms and 10 possibilities. Students will play the role of the Doctor and will needs to inform his/her patient with thorough information about the illness, history, geographic prevalence, identify the pathogen, info about it, any more symptoms, and how the Doctor will decide to treat the patient.</li> </ul>
Day Seven Closing	<ul style="list-style-type: none"> <li>• <a href="#">Memory Mapping –After</a></li> <li>• Post test</li> <li>• Likert final survey</li> <li>• Final Interview questions</li> </ul>
<p><a href="#">Green= Activity from CATALySES</a>  <a href="#">Blue = Reading Strategies</a></p>	

**Connections to CATALySES summer institute:**

This action proposal will take place late in the school year when we begin to cover Virus’, prokaryotes, and infectious diseases. Here is the list activities I will be using from the CATALySES program.

- Memory Mapping
- Meet the Menacing Microbes Activity
- Modeling an Outbreak
- Contagion Models
- Bad Bug Lesson
- Pathogenic Prototype
- Hunger Games Pathogen Edition

**Data collection and analysis:**

Data will be collected via the use of qualitative and quantitative analysis. A multiple choice assessment will be created using 20 state standard based questions. This assessment will be given as the pre-test and post-test. The results will be analyzed to determine student learning gains.

A self-reporting likert-type (-2=strongly disagree to 2=strongly agree) instrument composed of 20 questions will serve as one approach to collect qualitative data. The likert survey will help analyze their attitude towards reading, their skill level, familiarity with strategies, confidence in their reading skill level, and understanding of emerging pathogens (Wood, Knezek & Christenson, 2010).

I will also adopt open ended questions survey, for unique feedback on their attitude towards reading (why), which strategies they are familiar with, and past experiences in science.

Lastly, I will use memory mapping to gauge and see how much they know in association with the term emerging pathogen. We will then re-map the term at the end of the lesson.

**Literature cited:**

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