# Assisting Struggling Biology Students to Succeed with the Use of SQ3R

Dr. Suzanne Horn, Queens University of Charlotte
1900 Selwyn Drive, Charlotte NC 28274

Dr. Cynthia Compton, Wingate University
220 N. Camden St. Wingate, North Carolina 28174

Samantha Gleiser, Myers Park High School
2400 Colony Road Charlotte, NC 28209

And

Kimberly Etheridge, Myers Park High School
2400 Colony Road Charlotte, NC 28209

## Abstract

This case study examines the process two high school biology teachers went through to find and implement an appropriate teaching strategy to help struggling students taking a beginning biology course. Both teachers discovered at the beginning of the semester through formative evaluation and past achievement scores that students were behind academically and they feared student ability to be successful in the course due to lower literacy skills.

The teachers reached out to the researchers to assist in locating methods that would help students comprehend their biology text. This study follows how the teachers selected and implemented the method in their classrooms, the students' perception of the activity, and the teachers' perception of using a focused reading system as a whole class methodology.

Teachers were happy with the increase in student knowledge and motivation using the SQ3R system they selected. However, working at this deeper level slowed the progress of the course. This caused a tension for teachers. While the curriculum was taught using the SQ3R method, the teachers had to decide between slowing the lessons so students could use the method which resulted in deeper learning or keeping up with the county mandated pacing set for the course so that all material is taught. This tension was never resolved.

Key Words: Reading Instruction, SQ3R, Professional Development, High School Reading

## Purpose of the Study

The purpose of this study was to examine if the SQ3R (Survey, Question, Read, Recite, Review) reading procedure (Robinson, 1970 as seen in (4)) could help students who were at the least one to two grade levels behind in reading to be successful in a biology preparation course. Students were enrolled in the pre-biology course who were deemed to be "struggling" according to state test scores. The pre-biology course previewed major concepts that the students would encounter in a standard biology course taken later that year.

## Theoretical Framework

The inability of students to read is a vital issue for their success in live. This is why it is imperative that teachers assist struggling students to help them gain mastery in reading their content area. Illiteracy causes students to miss out on information and valuable post- graduation opportunities or, in the worst case scenario, they fail to graduate. Illiteracy disadvantages students politically, socially, and economically so it is important teachers commit to improve literacy in students no matter the content they teach. Content area teachers can accomplish this by implementing reading strategies in their instruction in addition to teaching content (2). "One of the never-ending challenges in teaching is to find ways to meet students where they are in their learning and to then help them develop their skills and practices further" (7, p. 1).

Though student teachers learn reading strategies, as evidenced through their varied class and student teaching assignments, there are indications that strategy instruction does not get transferred to their classrooms upon graduation. There is little follow-up research when pre-service teachers become classroom teachers with regard to their reading instructional practices. The few studies that do exist

are focused primarily on elementary teachers and not secondary teachers where this strategy instruction is just as imperative (1).Thus, it is important that we connect with secondary teachers to see what strategies they are using in reading instruction in the content areas. Where there are none in practice, we need to institute appropriate staff development.

Robinson (1970) developed the SQ3R study strategy to improve learning by using higher-level study skills. SQ3R entails five steps: Survey, Question, Read, Recite, and Review. In the first step the student surveys chapter headings and subheadings to identify chapter content. This step helps students to understand the organization of the chapter and activate prior knowledge to aide in comprehension. In the second step the reader develops questions from the information they gained in the survey step. When students create their own questions, it assists by increasing motivation by activating curiosity and assists comprehension by providing students with a reading guide. In the third step students actively read the text to answer their created questions. In the fourth step students answer each question without the use of the text. If they cannot answer the question, they review the text again and then attempt to answer the question. In the fifth step, the reader reviews the chapter headings to determine if they can recall the key points from the chapter that were discovered in their questions and answers. If they cannot, they are asked to once again review their questions and answers and the text (4).

This active reading strategy, like any other, is not inherent. It must be taught. Students need to learn how to use SQ3R. One way to teach this system is through think-alouds. In a study about interactive think-alouds, the teacher used the tool to help students to gain independence at monitoring their own comprehension. Teachers share key information through guided modeling. Students become independent in the skill through a gradual release of responsibility. This method enabled students to assume control of their learning over time. The ultimate goal being that students become independent monitors of their own comprehension while encountering challenging text. Guided modeling provided the scaffolding that allowed them to see and practice the monitoring skills. This interactive thinking out loud, aimed instruction within the student's zone of proximal development, based on Vygotsky's 1934/1978 work (8). It provided students with the opportunity to observe, recognize, emulate, adopt, practice, and self-regulate these metacognitive strategies with teacher support modeling and support(5).

## Method

In this study two biology teachers targeted a class of struggling students to use the SQ3R method to help students learn how to encounter non-fiction text in a methodical way that would help them learn the content. Prior to the study no specific reading strategy was used except answering questions found at the end of the chapter. The teachers requested a specific staff development that would help them instruct students to use text productively. The researchers and teachers met several times to discuss the students, their skill level, and possible strategies to help students learn content from their reading. Prior to any change in instruction, a survey was given to students exploring the strategies they used while participating in reading assignments. This was helpful in guiding the teachers and researchers to beneficial choices. After evaluation of possible strategies and students responses to the survey, the researchers/staff developers and the teachers jointly decided the SQ3R method was the most appropriate.

The high school teachers then implemented the SQ3R through modeling. First the biology teachers modeled the process as a whole class activity for a chapter. The students were given a SQ3R worksheet with all of the steps and asked to go through the biology text and list all bold-print sub-headings and list them under the Survey column in the handout. This was then discussed as a whole class and teachers completed a think aloud showing choices they would make. Next, they were instructed to close the biology text book and using those headings, create at least one question about each topic listed. These questions were recorded in the Question column. Again, these questions were discussed as a whole class and teachers completed a think aloud showing what they would ask. Students were then allowed to return to the text and read to find the answers to their questions. Students were permitted to copy verbatim from the text and record the information in the Read column. The students then were asked to re-write their answers using their own descriptions, diagrams or illustrations in the Retell(Recite) column. To add additional support to this portion of the process, the class shared what they had learned from reading as a part of the Recite component. Teachers had students share their key ideas and again modeled what they would have placed there. If there were questions left unanswered by the reading, they were incorporated into the lecture so that students did not feel their questions were unimportant.

After several weeks of this modeling aloud as a whole class, the teachers moved to a partnership

where students worked through the SQ3R strategies with a classmate. The teacher interjected with whole class instruction or pair instruction based on what the teacher deduced students needed for support. If while observing the various groups the teachers felt students did not comprehend the material, they offered more support by going back to the whole class model. This partnership process continued for six additional weeks. During the remaining two weeks of the study, the students worked independently. The teacher again monitored the independent work and paired students to check their work if they felt they needed more support. The most at-risk students never moved beyond partners. The teachers gave instruction to the pairs or the whole class as they found was necessary for students to understand the process or comprehend key elements in the reading.

At the end of the semester a post survey was given to measure if students showed growth in how they approached and conducted reading assignments.

## Materials

A survey was developed by the researchers and that same survey was given pre and post strategy instruction. The teachers were given reading materials about SQ3R obtained from the ReadWriteThink.org website to learn the method. This was supplemented with discussion from the researchers/staff developers, and sample SQ3R charts obtained from Freeology.com to adapt and use in their classrooms. Samples of completed work by students and lesson plans were collected from both teachers.

## Results

In a survey given to students where they self-assessed their perception of success, the students felt they showed growth in their ability to complete reading assignments effectively. Using SPSS software, descriptive statistics were calculated. A represents the pre-survey while B represents the post-survey in the table below.

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Comprehension A | 25 | 1 | 4 | 2.24 | .779 |
| Comprehension B | 25 | 1 | 4 | 3.12 | .666 |
| Fluency A | 25 | 1 | 4 | 2.12 | .781 |
| Fluency B | 25 | 2 | 4 | 2.84 | .746 |
| Differentiation A | 25 | 1 | 3 | 1.76 | .663 |
| Differentiation B | 25 | 1 | 4 | 3.28 | .737 |
| Comprehension Strategies A | 25 | 1 | 4 | 2.04 | .841 |
| Comprehension Strategies B | 25 | 1 | 4 | 3.32 | .690 |
| Comfort in Classroom A | 25 | 2 | 4 | 3.36 | .700 |
| Comfort in Classroom B | 25 | 2 | 4 | 3.56 | .712 |

In the student survey, good growth was shown in all, with the exception of comfort, which made sense to the researchers. Students found that the method helped with their comprehension of reading. Questions in the survey that focused on fluency showed that students felt they were more fluent in their reading using the SQ3R method. In questions that inquired about differentiation of learning, students found that they felt they could adapt the method to their specific needs as a learner. In a second set of questions that asked about comprehension and retention, students felt they

gained in their ability to understand and retain the material that they read. Students however, were not that much more comfortable completing reading assignments. This made sense to the teachers and researchers as these students were at-risk students who were behind and using this method for only a couple of months would not instill complete comfort in their ability to read and comprehend challenging material that was written at grade-level while they were below grade level in their reading abilities.

After using the method for ten weeks, the teachers felt it did help students with their comprehension. They found that students were more active in their reading and learning, but using the method caused them to slow down instruction. Through the class discussions and questioning, the teachers were alerted to the fact that students did not understand basic information that they assumed students knew. This required the teachers to stop and re-teach information that the at-risk students did not have as assumed prior knowledge for high school biology. This did help with the units taught, students did indeed walk away with better knowledge based on the informal and formal assessments given in class. Teachers however, wrestled with the fact that they taught less material. This caused a tension in their instruction.

Students appeared to be more enthusiastic about reading as a result of implementing the SQ3R strategy. "I believe students took ownership of the assignment because they were reading to answer personally developed questions. By the end of the study, students were asking for the handout by name" (teacher one). "One of the most encouraging parts to this study was observing students decipher previously intimidating text and manipulate it into something tangible, even though at times, it was as basic as constructing a timeline" (teacher two).

The teachers re-created the SQ3R template to include options for the Retell column. These options allowed students to depend on personally preferred mechanisms of expressing their understanding of the text. "The Retell(Recite) column proved to be most challenging for students. This segment of the process was met with the most student resistance; it also proved to be most beneficial because it improved the students' comprehension levels" (teacher one). The process of working through the retell through class and partner discussion did cause a slowdown in instruction. "I thought that part would take 20 minutes and it ended up taking most of the period!" (teacher two). This caused the teachers to have to make instructional decisions of moving forward with instruction even if students had not completely comprehended or eliminate some of the material that was to be taught. This caused a tension that could not be resolved in the study.

In one of our wrap up meetings evaluating the project, the teachers thought about the concept of working with a personalized in-service training that did not focus on the newest and hippest of strategies, but the research based strategies that she knew and how to apply them in her current teaching situation. Teacher two reflected on this concept of working with in-service training on previously learned strategies. For years, I have admitted that many of my students struggle with the biology end-of-course test because of poor reading comprehension skills. I had taken courses to try and make myself better equipped to handle these literacy issues, but not until I became involved with this directed in-service do I recognize the importance of incorporating such reading strategies into the content area. Just as many students need extra time to learn content material; many struggling students also require extra assistance in order to improve reading comprehension skills. I believe the SQ3R strategy can be beneficial when used in classrooms populated by students who have traditionally been viewed as low-performers. The connection between college professors and classroom teachers is a vital part of the educational environment. After being in the classroom for many years, it is easy to let go of, or simply forget about, strategies introduced years earlier. College professors bring current research and fresh ideas into the classroom and by working directly with classroom teachers, student achievement improves. This type of directed in-service allows classroom teachers to instantly implement strategies, ask questions, and receive immediate feedback.

**Scholarly Significance**

As much as we are proud of the work we do instructing pre-service teachers in methods of content area reading, many of these highly effective strategies are not always used once our students become full-time teachers (Alger, 2009). It is important that we go out into schools and work with teachers that are currently in practice as well as pre-service teachers. Sometimes in our outreach to schools as college professors we are not teaching practicing teachers something new, but reminding them of excellent strategies that they learned in the past and helping them to think through how to implement them in their current teaching situation. In our case, it was helping teachers to assist their

struggling students to gain in their knowledge. When students who struggle are given specific strategies to use, it can help them to be more intentional and improve their learning (5).

It is clear that allowing children to pass through our schools with below average literacy levels is setting students up for many difficulties. Often children who have low literacy levels face other social issues in their lives. Early language development interventions, as well as substantive and deep in-service education for teachers, seems to be just two of many promising avenues that can help struggling children (3). These two researchers felt it is important that not only elementary teachers focus on literacy, but rather that we work together, at all levels of schooling, in the community of education to help struggling students succeed.

Being present in the schools in a project such as this helps us to enter into discussions with practicing teachers about the realities of today's teaching and strategies that will help their students, as well as tensions that arise in their teaching when using specific instructional methods. This dialog is important for two reasons. First, it helps practicing teachers to remember to use good strategies and the variety of choices that they have to select from. Second, it helps college professors of education to recognize tensions that abound in today's classrooms, as well as struggles of today's students, and share that information with budding teachers and administrators in our college classrooms.

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