Oral Science Stories
Using culturally responsive storytelling to teach socioeconomically disadvantaged students

By Rénard Harris, Cynthia Hall, Tristan Hawkins, Megan Hartley, Willie McCray, and Hammed Sirleaf

There are about seven million people living in urban poverty, and students in those districts are traditionally in the bottom half of every standardized test (Haberman 2007). Culturally responsive teaching emphasizes teaching to and through the students’ strengths (Gay 2002). Teachers must exercise a heightened awareness of students’ interactional styles, relational patterns, and forms of communication in order to attain cultural competence. Many teachers of color engage in topic-chaining communication, a pattern of engagement that sounds like storytelling and uses feelings of intensity, advocacy, context, and passion to convey ideas (Gay 2002).

“Storytelling is rooted in a cultural framework,” (Curenton 2006), and being able to identify the audience’s culture or “ways of being” will allow the teller to shape the story. Telling a story makes more of an impact than sharing facts (Rabinowitz et al. 2010). The listener has the opportunity to go on the journey with the teller and emerge with new insights and understandings. Kokkotas, Rizaki, and Malamitsa’s (2010) investigation of storytelling strategies in science found that “Storytelling helps develop a romantic understanding: a blend of curiosity, imagination, and wonder—the foundation of science exploration.”

T.A.L.E.S., Teaching And Learning with Engaging Stories, is an alternative teaching method that focuses on enhancing learning by teaching science, math, ELA, and social studies through story. A six-week research study investigating socioeconomically disadvantaged students’ responses to oral stories was conducted during an after-school tutoring program in a Title I school. The four-member team who conducted the study consisted of an associate professor of teacher education, a director of a Lowcountry Hall of Science and Math, a middle grades education major, and an elementary education major. This research study consisted of six science stories, all of which were embedded in the state’s fourth-grade standards (in the Next Generation Science Standards, these topics are covered in fourth grade). Topics included experiment design; light and shadows; day and night; and seasons and weather. There were six classroom visits once a week for one hour each. The method of story creation and delivery was consistent every week. The research team would preview terms, deliver an engaging story, make cultural connections, implement a hands-on educational activity, and formatively assess students’ understanding of the content.

The stories were told to eight students in a Title I school during an after-school program. The students, defined as bubble kids, those who were close but not passing the state’s standardized test, were selected by the school administrator and after-school director. The teachers shared that the content would be new to some, a review for others, but a benefit in either case.

Oral Stories That Teach Science

Education and entertainment are significant characteristics to effective storytelling. (McDonald 2009). Stories to enhance learning are creatively designed to do both. Teachers are encouraged to use their imagination, content knowledge, and physical body to deliver a story that can engage, entertain, and inform students. Prior to conducting this study, a team of writers, consisting of a teacher educator, a science/math educator, two science undergraduate majors, and four preservice educators, three in science education and one in elementary educa-
Engagement starts with interesting characters. Students want to follow characters that are persistent, those that laugh and cry out loud, and those to which they can relate. They are drawn to characters that deal with the conflict in the story. Oral stories are entertaining when the students are either listening passively and in complete silence or listening actively and creating their own dialogue with the story. Laughter, expressions of fear, or making predictions to a neighbor are indicative of an audience that is being entertained.

Although entertainment is an important element of using storytelling to teach, exposing students to content is equally important. The storyteller should carefully walk the line between entertaining and educating, delivering the content in creative ways such as repeating important information, personifying inanimate content, making grand physical gestures, and dramatizing specific words.

**Preview Terms**

Key words were previewed before the story. Teachers were able to assess students’ background knowledge and determine if and where misconceptions presided. Students were able to foreshadow questions asked after the story and hear the words that would be used within the context of the story. Sharing key words before the story assisted the listener.

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**Example: A Town Called Spectrum (Genre: Folktale)**

Long ago, before any of us were born, there was a town called Spectrum. In this town, everything was powered by the energy from light. One day the town began to rumble, and when the rumbling stopped, everything went dark. The rumbling and the darkness happened because the family in the sky that gave power to the town was disagreeing. Violet felt like she was putting out more energy than her sister and brother and ultimately doing most of the work.

Violet said, “You know what, I’ve had enough! You all don’t do any work! I do all of the chores, and I do everything to make that town work, from lighting the streets to making the solar-powered cars move. I’m going to do it all by myself!”

She transported herself from the sky down into the town of Spectrum. Red and Green had never been without their sister, Violet, so they also moved from the sky into the town. Red and Green tried to convince Violet to come back to the sky, but Violet had had enough.

Violet said, “I’m through with you two, and I can light this town on my own. I can do anything by myself. I’m going to make that solar-powered car move without your help.”

Violet ran to the car and tried to push it.

“Uhh!” She moaned as she struggled to move the car. She tried as hard as she could but couldn’t move it.

Red said, “Violet, you are super hyper, but no matter how much energy you use, you cannot move that car, but I can.” Red moved slowly toward the car and tried to push it.

“Uhh!” He moaned as he struggled to move the car, but the car would not move.

Green said, “Red, you are much too sluggish to move anything by yourself.” She said proudly, “I’ll move it.” So Green tried to move the car, but the car would not move.

Red was sluggish. Violet was energetic. And Green’s energy level was between Red and Violet’s, yet individually they could not make the car budge.

As they argued, Red looked around the dark town of Spectrum and pointed to a light pole. They all looked, ran to the decorative pole, touched the light, and the light came on.

They all said, “See, I powered that light by myself. I don’t need you two!”

The three of them continued to disagree and Red said, “Wait a minute!”

... all three were needed to power the light ... they moved back into the sky.

The town of Spectrum was full of light.
Example: Before telling the story about a town called Spectrum, the teacher began by inquiring about the students’ prior knowledge on light being a form of energy and white light being comprised of different colors. After the students shared ideas, the teacher defined light as a form of energy. The teacher ended the story by showing the students a prism and shared that they would be using this to see the spectrum and would be making their own spectrometers, as well.

**Story**

It is the teller’s responsibility to deliver a story that educates and entertains. The teller makes an effort to demonstrate cultural competence and the complexities of recognizing diversity within a group culture by avoiding stereotypes and using an interactional style of storytelling that sends a positive message to the students. The goals of creating the stories were to be explicit, objective driven, culturally conscious, and entertaining.

**Pitfalls and Adjustments**

The most difficult part of creating stories to teach is the challenge of blending fiction with nonfiction. Events in stories often happen much faster than in reality—inanimate objects are personified, and thoroughness and accuracy challenge engaging storytelling. It’s necessary to monitor and adjust stories when teaching them: The teacher must describe to students the genre of the story, translate time in realistic terms, fill in what was left out, and clear up inaccuracies. The pitfalls of storytelling are formidable, but the gains of engagement, entertainment, and education are worth telling the tale.

**Bridge to Activity**

Immediately following the oral story, the teacher began a brief discussion bridging the story to the content, making cultural connections, and introducing the students to an interactive, hands-on exploration of the science content within the story.

Example: After the story, the teacher and students discussed the relationship of the characters Red, Green, and Violet, their color strength, and how the colors needed to work together. During this particular session the cultural connections happened when the students began to compare the relationship of the characters with their own family members. A female student shared, “I knew Violet was a female. Women are hard workers.” Other students in the class followed with similar comments, each sharing what the women in their families do. Each student then received a sheet of white paper, a prism, and a flashlight. The students used the prism on the white sheet and the flashlight to identify the visible colors of the spectrum. The students were reminded to look for the colors that the characters represented in the story as well as additional colors in a rainbow. As the students made observations, the teacher discussed how colors are revealed when light passes through a prism.

Following the prism activity, the teacher demonstrated the frequency and energy level of each color in the story by performing a wave demonstration with a slinky. The teacher reminded the students that the character Violet was hyper, Red was sluggish, and Green had medium strength. Next, the teacher put students in groups of three, and after calling out violet, red, or green, the students demonstrated the color’s relative frequency by waving the slinky.

After the wave demonstration, students received a broken CD and a precut template to make their own spectrometers. Teachers handled the setup with the broken CD for safety purposes and assisted students as they folded and constructed their spectrometers, leaving an open window for light to enter where the CD split it into its different wavelengths (see Internet Resources). The teacher explained that the homemade spectrometer worked much like the...
that student engagement and interest decreased at the end of each session. In addition, the researchers also concluded that the objective tests were not indicative and aligned with the progressive alternative teaching method they were employing.

Example: The assessment included a demonstration of using a UV light to make a solar panel car move. Each student was given an opportunity to make the car move while simultaneously answering questions about the energy level of each color/character in the story. The assessment included a picture of a robot with wheels and the following question, “This robot has a solar panel. How can Red, Violet, and Green, make this car move?” The students had to explain, through a model, sketch, or words, how and why the robot actually moved when exposed to light. Students wrote about teamwork, how the colors needed to work together, and that the colors had to touch it to

Instructors demonstrating that light moves in wavelengths.

prism and instructed students to look through and notice how white light had been split into many colors. The students looked for their favorite character from the story.

After making spectrometers, the teacher discussed how energy from light could make objects move and demonstrated that ultraviolet (UV) light could move a small solar powered car. Students were given the chance to hold the UV light and maneuver the car themselves. The teacher discussed the transfer of energy to power the object.

**Formative Assessment**

Upon completion of the activity, the research team conducted an inquiry-based formative assessment. Students expressed excitement at these inquiry-based assessments, as they were completely different from typical assessments. These assessments were so different than the standard multiple choice that it took the entire research study for the students to gain confidence in their abilities for showcasing their knowledge. No summative assessment was conducted. The researchers conducted a similar study at a different Title I school approximately a year prior to this study. During that study, at the beginning and end of each session, the students were given a multiple-choice pre- and post-test. Overall, the findings showed a slight gain in improvement between the two tests, but the researchers also found

Students making their own spectrometers.
power it up.

All formative assessments were collected as data. At the end of the sixth week, each student was interviewed individually. Quantitatively, the story cycle’s impact on the formative assessment was inconclusive because there was no direct evidence that the cycle specifically influenced the final evaluation. Qualitatively, the following themes emerged:

• Engaging and fun: Students looked forward to hearing the stories once a week.

• Preparedness (repetition, independence): Students felt prepared for the formative assessment.

• Problem solving (critical thinking, self-efficacy): Students used the stories as “clues” to understand the content.

• Consistency (versatility): Regardless of who the storyteller was, the students knew what to expect weekly.

Conclusion
Creating oral stories to teach socio-economically disadvantaged students in Title I schools provides opportunities for teachers to deliver content in ways that are engaging, entertaining, and educational. Science has mystery, adventure, and encourages a sense of anticipation and prediction that aligns well with elements of storytelling. As teacher and teller, making the effort to creatively blend education and entertainment through story will not only engage students cognitively and emotionally, but it will give them an experience they can remember, recall, and retell.

Rénard Harris (harrirsr@cofc.edu) is an associate professor of teacher education at the College of Charleston in Charleston, South Carolina. Cynthia Hall is Director of the Lowcountry Hall of Science and Math at the College of Charleston. Tristan Hawkins is an eighth-grade math teacher at Sangaree Middle School in Ladson, South Carolina. Megan Hartley is a third-grade teacher at Mary Ford Elementary in Charleston. Willie McCray is a science education major at the College of Charleston. Hammed Sirleaf is an African American Studies major at College of Charleston.

References


Internet Resources
Lowcountry Hall of Science and Math http://lhsm.cofc.edu