Using the ELA Common Core to teach a Science lesson about Venus to fifth graders in Integrated Special Education Classrooms

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According to McCosker and Diezmann (2009) the value of investigations for students lies in their complexity. This emphasis on complexity is emphasized in the six ELA Shifts required by the New York State Education Department Common Core Standards. The Common Core Standards requires that teachers align what and how they teach with their instructional materials and their classroom instruction. The six Shifts in the ELA standards include:

1. Balancing Informational and Literary Text
2. Building Knowledge in the Disciplines
3. Staircase of Complexity
4. Text-based Answers
5. Writing from Sources
6. Academic Vocabulary

The first shift states that teachers must balance what they teach their students. There needs to be an equal emphasis on both fiction and nonfiction texts taught in classroom instruction, especially at the elementary and middle school grade levels. Shift two states that teachers need to focus on what Bloom referred to as the Literal or Knowledge Level of Comprehension. At this level, students are simply remembering the facts about a topic that they are learning. They are building knowledge about the world by reading the text rather than from the teacher instruction or activities (NYSED, 2013).

Shift three, this author believes, asks teachers to use Scaffolding techniques in the teaching of a text and close reading to examine what is most important for them to learn. According to the New York State Education Department, the students read the central. Grade appropriate text around which the instruction is based. In this shift the teachers need to be patient and organized, using more time and space to support the Curriculum for close reading (NYSED, 2013). Shift four wants students to engage in rich and rigorous evidenced based conversations about what they are reading. Shift five states that teachers need to emphasize expository writing using evidence-based information from the text. And, finally, Shift six wants teachers to help their students build an increasing academic vocabulary. According to the New York State Education Department, this can be done by most effectively by spiraling like or similar content in increasingly more complex contexts (NYSED, 2013).

In order to effectively teach students using the six shifts, teachers need to focus on classroom instruction that is consistent and organized. An effective approach to consistent and organic instruction is through the use of Scaffolding. Scaffolding plays a key role in supporting students' high-level engagement by encouraging divergent and creative thinking (Henningsen & Stein, 1997). Scaffolding is also "a process that enables a child or novice to solve a problem, carry out a task or achieve a goal which would be beyond his

[or her] unassisted efforts" (Wood, Bruner & Ross, 1976, p. 90). Scaffolding provides the opportunity for students to develop their independence, sense-making and self-confidence whilst working mathematically (McCosker and Diezmann , 2009).

In the classroom, scaffolding is a process by which a teacher provides students with a temporary framework for learning. When scaffolding is done correctly, students are encouraged to develop their own creativity, motivation, and resourcefulness. As students gather knowledge and increase their skills on their own, fundamentals of the framework are dismantled. At the completion of the lesson, the scaffolding is removed altogether; students no longer need it (Lawson, 2002).

How teachers interact with students and how students interact with one another as they complete a task is important to students' ability to perform an activity. Scaffolding is an instructional technique whereby the teacher models the desired learning strategy or task and then gradually shifts responsibility to the students (Vacca, 2008). This type of interaction is consistent with Vygotsky's (1978) belief that learning and cognitive development are culturally and socially based. This means, moreover, that learning is a social process and not an individual one, and it occurs when students interact with their teacher and with one another in the classroom.

Although Vygotsky (1978) did not use the term *scaffolding*, it does have a theoretical basis in his description of the Zone of Proximal Development (ZPD). He defined the ZPD as the distance between the actual development level of the learner, as determined by independent problem solving, and the level of potential development, as determined through problem solving under teacher guidance and interaction and collaboration with more capable student peers (Doolittle, 1997).

Scaffolding can be applied in a variety of ways to a variety of lesson formats. The following is a lesson on Venus that was used in three sixth grade Science classes at the Westbury School District on Long Island, New York, USA. The Science lesson compares and contrasts the scientific facts about the Planet Venus with the fictional account of the planet in the short story *All Summer In A Day* by Ray Bradbury. The lesson requires that the teacher teach knowledge by asking the right questions. For some students, to discover or acquire new information seems to be a challenge. This lesson was designed to activate the discovery process by using a comparison-contrast approach with close reading and a series of vocabulary- and comprehension-directed reading and thinking activities. The lesson was scaffolded according to Vygotsky's four stages for the ZPD, Herber and Herber's three levels of comprehension and the Six ELA Shifts (Figure 1).

Figure 1

Herber's Three Levels Vygotsky's ZPD NY State ELA Shifts

Comprehension Levels	Stages of ZPD	ELA Shift
Literal level-"On the Page"	Stage 1: High level of teacher interaction with Students	Shifts 1 and 2- Non-fiction Texts Authentic Texts
Interpretive level-"Reading between the lines"	Stage 2: Teacher engages in guided reading with students	Shifts 3 and 4- Higher Level of Text Complexity Paired Passages Text-based Answers
Applied level-"Going beyond the lines"	Stages 3 and 4: Students participate in small group Interaction	Shifts 5 and 6 Writing from Sources Academic Vocabulary

Lesson objectives

The students will be able to

• Observe and describe what they see from pictures of the planet Venus.

•· Develop and ask a series of additional questions about Venus to seek answers about what they want to know

• Inquire through the use of other sources additional information about Venus.

• Based on information that they have gathered about the planet Venus and from the short story, make comparisons and contrasts about the real planet Venus verses the fictional planet as described by Ray Bradbury.

Activities and Procedures

Activity 1. Where is the planet Venus in relation to the other planets in the solar system and what facts should we know about the planet? Discussion activity (high level of teacher interaction with students; ZPD stage 1, literal level, Shift 1 ELA). The students were divided into small groups of four. The solar system diagram (**Figure 2**) and Venus facts worksheet shown in **Figure 3** were distributed to the students. Each group of students was asked to discus among themselves both worksheets.

Figure 2

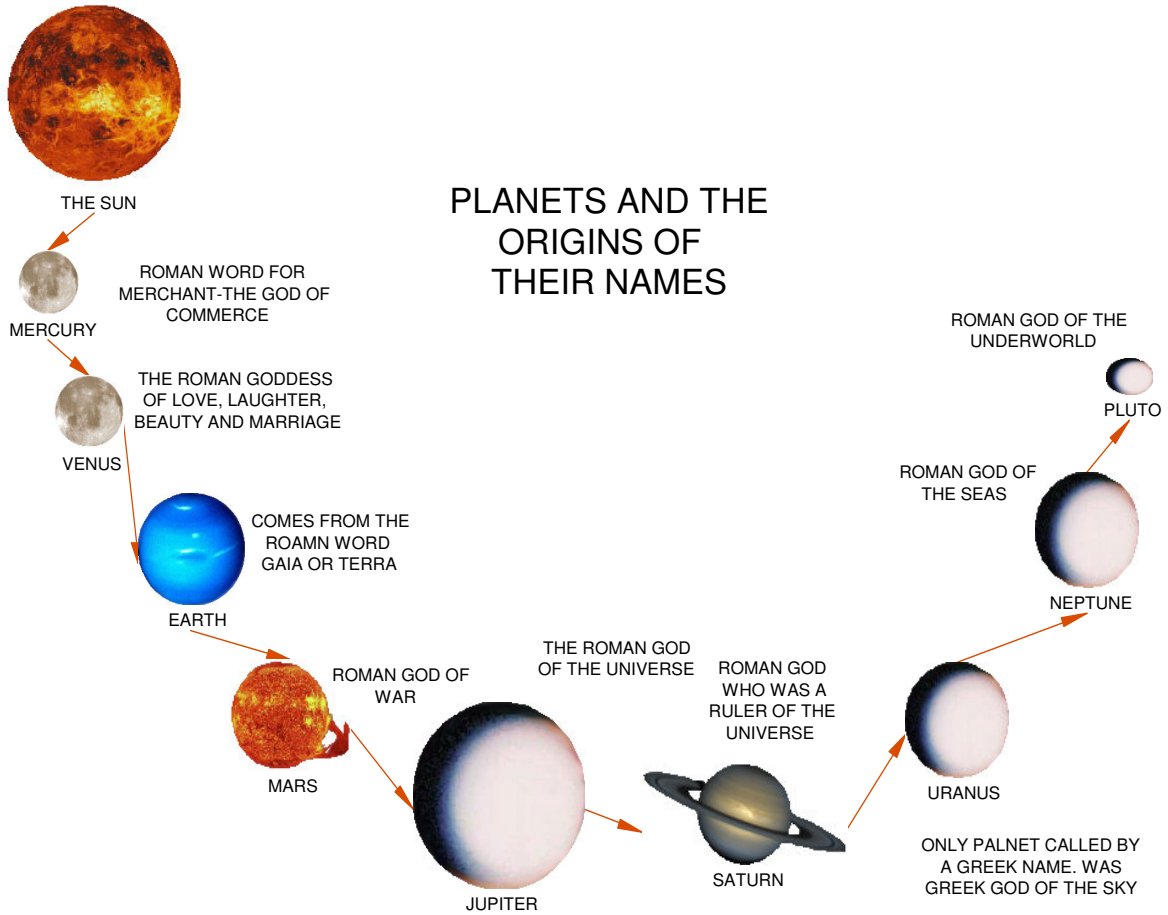


Figure 3*

Fact One	**Venus and Mercury are the only two planets in the Solar System not to have moons orbiting them.**
Student Notes	
Fact Two	**If you were able to stand on the surface of Venus, it would feel like being 1 kilometer under the sea on Earth, a depth deep enough to sink a submarine. A person or a creature would immediately be crushed by Venus' amazingly strong pressure.**
Student Notes	
Fact Three	**Venus may have such a thick atmosphere because it spins so slowly. In fact, a year on Venus is shorter than its day. It takes the planet longer to turn on its axis than it takes it to orbit the Sun. The slow rotation means that atmosphere does not have a force to spin off into space.**
Student Notes	
Fact Four	**Venus is the only planet in the Solar System to turn clockwise. All other planets turn anti-clockwise. It rotates clockwise on its axis extremely slowly, suggesting that something might have once collided with it to disrupt its regular rotation.**
Student Notes	
Fact Five	**People once believed Venus to be two different stars known as the Morning Star and the Evening Star, because it can be seen in the morning and the evening.**
Student Notes	
Fact Six	**After the Sun and the Moon, Venus is the brightest object in the night-sky from Earth.**
Student Notes	
Fact Seven	**The Americans have only ever landed one probe on Venus. This was Pioneer Venus 2, launched on 8th August 1978 which was to probe the planet's atmosphere, not examine its surface. All other landings on Venus were made by the Russians.**
Student Notes	
Fact Eight	**Venus' axis hardly has any tilt at all, unlike Mars**

Student Notes	**and Earth. This means that, if it had a thin atmosphere, the planet would not have seasons.**
Fact Nine	
Student Notes	**There are more volcanoes on Venus than on any other planet in the Solar System, although it is not yet known whether any of these volcanoes are still active**.
Fact Ten	**Venus may now resemble what** Earth **will become in millions of years time, when the** Sun **expands, heats the** Earth**, turning all of its surface water into a vapor which will trap sunlight and heat in its atmosphere, causing suffocating conditions like those on Venus.**
Student Notes	

*Retrieved October, 2013 from http://www.bobthealien.co.uk/venusten.htm

Activity 2. Who is Ray Bradbury? Introduction of the author and the short story "All Summer in a Day." (High level of teacher interaction with students; ZPD stage 1, literal level). The teacher asked the students to look at the two words, *Sun* and *Venus* that were displayed on the Smart board in the front of the classroom. The students were told that the corresponding pictures that were displayed next to each word represented both pictures of the real planet Venus and the Planet Venus as described by Ray Bradbury in the story (**Figure 5**).

Activity 3. Guided practice and metacognition (ZPD stage 2, interpretive level). The teacher read the story to the students and instructed them to use a colored highlighter to mark key vocabulary from the information that corresponded to the italic vocabulary words in the text. Using the QAR (Question-Answer-Response) questioning format, the teacher also asked the following Guided Questions throughout the reading of the text:

1. Right there-What vocabulary words in the story best describe Margot?
2. Think and Search-What problem is Margot having in her mind?
3. Author and You-How would you advise Margot, and why would you advise her so?
4. On My Own-How would you deal with Margot's teacher?

All Summer In A Day
By Ray Bradbury*
"Ready?"
"Ready."
"Now?"
"Soon."
"Do the scientists really know? Will it happen today, will it?"
"Look, look; see for yourself!"
The children pressed to each other like so many roses, so many weeds, intermixed, peering out for a look at the hidden sun.
It rained.

It had been raining for seven years; thousands upon thousands of days compounded and filled from one end to the other with rain, with the drum and gush of water, with the sweet crystal fall of showers and the concussion of storms so heavy they were tidal waves come over the islands. A thousand forests had been crushed under the rain and grown up a thousand times to be crushed again. And this was the way life was forever on the planet Venus, and this was the schoolroom of the children of the rocket men and women who had come to a raining world to set up civilization and live out their lives.

"It's stopping, it's stopping!"

"Yes, yes!"

Margot stood apart from them, from these children who could ever remember a time when there wasn't rain and rain and rain. They were all nine years old, and if there had been a day, seven years ago, when the sun came out for an hour and showed its face to the stunned world, they could not recall. Sometimes, at night, she heard them stir, in remembrance, and she knew they were dreaming and remembering gold or a yellow crayon or a coin large enough to buy the world with. She knew they thought they remembered a warmness, like a blushing in the face, in the body, in the arms and legs and trembling hands. But then they always awoke to the tatting drum, the endless shaking down of clear bead necklaces upon the roof, the walk, the gardens, the forests, and their dreams were gone.

All day yesterday they had read in class about the sun. About how like a lemon it was, and how hot. And they had written small stories or essays or poems about it:

I think the sun is a flower,

That blooms for just one hour.

That was Margot's poem, read in a quiet voice in the still classroom while the rain was falling outside.

"Aw, you didn't write that!" protested one of the boys.

"I did," said Margot. "I did."

"William!" said the teacher.

But that was yesterday. Now the rain was slackening, and the children were crushed in the great thick windows.

Where's teacher ?"

"She'll be back."

"She'd better hurry, we'll miss it!"

They turned on themselves, like a feverish wheel, all tumbling spokes. Margot stood alone. She was a very frail girl who looked as if she had been lost in the rain for years and the rain had washed out the blue from her eyes and the red from her mouth and the yellow from her hair. She was an old photograph dusted from an album, whitened away, and if she spoke at all her voice would be a ghost. Now she stood, separate, staring at the rain and the loud wet world beyond the huge glass.

"What're *you* looking at?" said William.

Margot said nothing.

"Speak when you're spoken to."

He gave her a shove. But she did not move; rather she let herself be moved only by him and nothing else. They edged away from her, they would not look at her. She felt them go away. And this was because she would play no games with them in the echoing tunnels of the underground city. If they tagged her and ran, she stood blinking after them and did not follow. When the class sang songs about happiness and life and games her lips barely moved. Only when they sang about the sun and the summer did her lips move as she watched the drenched windows. And then, of course, the biggest crime of all was that she had come here only five years ago from Earth, and she remembered the sun and the way the sun was and the sky was when she was four in Ohio. And they, they had been on Venus all their lives, and they had been only two years old when last the sun came out and had long

since forgotten the color and heat of it and the way it really was.

But Margot remembered.

"It's like a penny," she said once, eyes closed.

"No it's not!" the children cried.

"It's like a fire," she said, "in the stove."

"You're lying, you don't remember!" cried the children.

But she remembered and stood quietly apart from all of them and watched the patterning windows. And once, a month ago, she had refused to shower in the school shower rooms, had clutched her hands to her ears and over her head, screaming the water mustn't touch her head. So after that, dimly, dimly, she sensed it, she was different and they knew her difference and kept away. There was talk that her father and mother were taking her back to Earth next year; it seemed vital to her that they do so, though it would mean the loss of thousands of dollars to her family. And so, the children hated her for all these reasons of big and little consequence. They hated her pale snow face, her waiting silence, her thinness, and her possible future.

"Get away!" The boy gave her another push. "What're you waiting for?"

Then, for the first time, she turned and looked at him. And what she was waiting for was in her eyes.

"Well, don't wait around here!" cried the boy savagely. "You won't see nothing!"

Her lips moved

"Nothing!" he cried. "It was all a joke, wasn't it?" He turned to the other children. "Nothing's happening today. *Is* it?"

They all blinked at him and then, understanding, laughed and shook their heads.

"Nothing, nothing!"

"Oh, but," Margot whispered, her eyes helpless. "But this is the day, the scientists predict, they say, they *know*, the sun…"

"All a joke!" said the boy, and seized her roughly."Hey, everyone, let's put her in a closet before the teacher comes!"

"No," said Margot, falling back.

They surged about her, caught her up and bore her, protesting, and then pleading, and then crying, back into a tunnel, a room, a closet, where they slammed and locked the door. They stood looking at the door and saw it tremble from her beating and throwing herself against it. They heard her muffled cries. Then, smiling, the turned and went out and back down the tunnel, just as the teacher arrived.

"Ready, children?" She glanced at her watch.

"Yes!" said everyone.

"Are we all here?"

"Yes!"

The rain slacked still more.

They crowded to the huge door.

The rain stopped.

It was as if, in the midst of a film concerning an avalanche, a tornado, a hurricane, a volcanic eruption, something had, first, gone wrong with the sound apparatus, thus muffling and finally

cutting off all noise, all of the blasts and repercussions and thunders, and then, second, ripped the film from the projector and inserted in its place a beautiful tropical slide which did not move or tremor. The world ground to a standstill. The silence was so immense and unbelievable that you felt your ears had been stuffed or you had lost your hearing altogether. The children put their hands to their ears. They stood apart. The door slid back and the smell of the silent, waiting world came in to them.

The sun came out

It was the color of flaming bronze and it was very large. And the sky around it was a blazing blue tile color. And the jungle burned with sunlight as the children, released from their spell, rushed out, yelling into the springtime.

”Now, don’t go too far," called the teacher after them. "You’ve only two hours, you know. You wouldn’t want to get caught out!"

But they were running and turning their faces up to the sky and feeling the sun on their cheeks like a warm iron; they were taking off their jackets and letting the sun burn their arms.

"Oh, it’s better than the sun lamps, isn’t it?"

"Much, much better!"

They stopped running and stood in the great jungle that covered Venus, that grew and never stopped growing, tumultuously, even as you watched it. It was a nest of octopi, clustering up great arms of fleshlike weed, wavering, flowering in this brief spring. It was the color of rubber and ash, this jungle, from the many years without sun. It was the color of stones and white cheeses and ink, and it was the color of the moon.

The children lay out, laughing, on the jungle mattress, and heard it sigh and squeak under them resilient and alive. They ran among the trees, they slipped and fell, they pushed each other, they played hide-and-seek and tag, but most of all they squinted at the sun until the tears ran down their faces; they put their hands up to that yellowness and that amazing blueness and they breathed of the fresh, fresh air and listened and listened to the silence which suspended them in a blessed sea of no sound and no motion. They looked at everything and savored everything. Then, wildly, like animals escaped from their caves, they ran and ran in shouting circles. They ran for an hour and did not stop running.

And then -

In the midst of their running one of the girls wailed.

Everyone stopped.

The girl, standing in the open, held out her hand.

"Oh, look, look," she said, trembling.

They came slowly to look at her opened palm.

In the center of it, cupped and huge, was a single raindrop. She began to cry, looking at it. They glanced quietly at the sun.

"Oh. Oh."

A few cold drops fell on their noses and their cheeks and their mouths. The sun faded behind a stir of mist. A wind blew cold around them. They turned and started to walk back toward the underground house, their hands at their sides, their smiles vanishing away.

A boom of thunder startled them and like leaves before a new hurricane, they tumbled upon each other and ran. Lightning struck ten miles away, five miles away, a mile, a half mile. The sky darkened into midnight in a flash.
They stood in the doorway of the underground for a moment until it was raining hard. Then they closed the door and heard the gigantic sound of the rain falling in tons and avalanches, everywhere and forever.
"Will it be seven more years?"
"Yes. Seven."
Then one of them gave a little cry.
"Margot!"
"What?"
"She's still in the closet where we locked her."
"Margot."

They stood as if someone had driven them, like so many stakes, into the floor. They looked at each other and then looked away. They glanced out at the world that was raining now and raining and raining steadily. They could not meet each other's glances. Their faces were solemn and pale. They looked at their hands and feet, their faces down.
"Margot."
One of the girls said, "Well… ?"
No one moved.
"Go on," whispered the girl.
They walked slowly down the hall in the sound of cold rain. They turned through the doorway to the room in the sound of the storm and thunder, lightning on their faces, blue and terrible. They walked over to the closet door slowly and stood by it.
Behind the closet door was only silence.

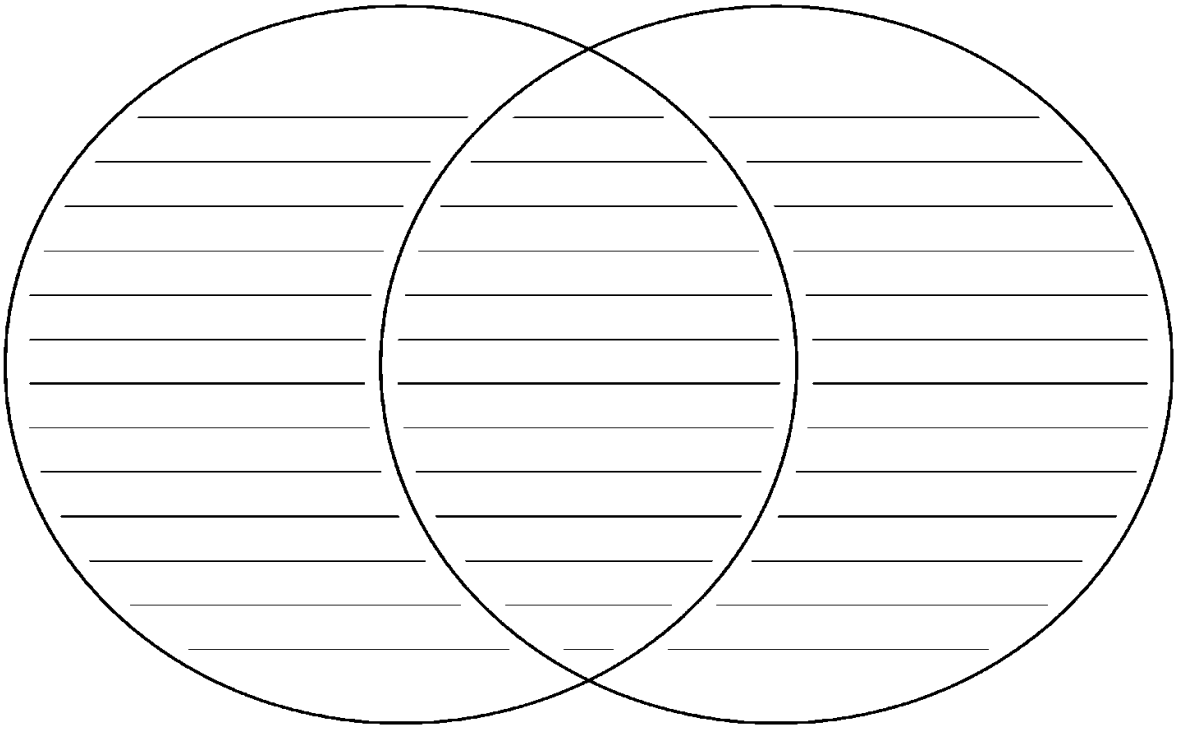
They unlocked the door, even more slowly, and let Margot out.

*****Retrieved October, 2013, from http://staff.esuhsd.org/danielle/English%20Department%20LVillage/RT/Short%20Stories/All%20Summer%20in%20a%20Day.pdf

Activity 4. (Low level of Teacher Interaction with students: ZPD Level 3-Applied Level) Following the reading of the story, the students were divided into small groups of four and they were asked to complete a Venn Diagram comparing the characteristics of the real planet Venus with the characteristics of the planet Venus described in Bradbury's "All Summer In a Day." They also discussed the characters and events in the story as they relate to the topic of "Bullying." (Figure 4)

Figure 4

Real Venus Similarities Bradbury's Venus



Activity 5 (Low level of teacher interaction: ZPD Level 3) Finally, the students will then be asked to change the ending of the story to reflect the concept of "bullying' that is evident in the story.

Reflections

This lesson was interesting because it showed how the students interacted and collaborated with each other throughout the lesson. At each stage of the ZPD they were very active with each task and very interested in what they were learning about the planet Venus and the short story "All Summer In A Day." By the end of the lesson the Special Education students were able to effectively Compare and Contrast the facts about the planet with the fictional planet described by Ray Bradbury. The students made positive comments from the beginning of the lesson until it was completed. In addition, the pace of the lesson kept the students' attention and interest. The classroom teachers commented that they wanted to use more scaffolding techniques in developing other Common Core classroom lessons. Most of all the lesson demonstrated that scaffolding techniques and the Six ELA Shifts are needed to effectively teach content area subject materials to elementary and middle school students in self-contained and Integrated Special education classes.

Final thoughts

Based on my more than three decades of teaching Literacy and Special Education, I believe that the use of scaffolding and other differentiated instructional techniques helps teachers model the desired learning strategies or tasks for the students throughout the lesson. They also teach the Special Education students to focus on and discuss the germane information in levels or stages of comprehension that will then gradually transfer responsibility of learning about the idea to the students. The students learn more about the concept and they communicate more effectively with each other. And finally, with the use of scaffolding techniques it is apparent the students grow in confidence about what they are learning.

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