

Dark Matter and Dark Conflict in Poetry: A Comparison

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Introduction

Our universe is expanding, but our students' writing portfolios are contracting. Every day, scientists and astronomers share new information with society that challenges or reaffirms prior theories about relativity and dark matter. How do we process this information? Is our imagination stirred or still stunted? Students are often analyzing and processing information through analytical or informative essays. Students are not channeling the beauty and chaos of science in poetry. There is a void; a black hole in their writing.

I think it is refreshing to know that there are many aspects of the universe, including our own galaxy, that are unknown and still bewilder astronomers and physicists. There are many aspects of an adolescent's life that are confusing and complicated. The importance of discovery and trial are often overlooked and disregarded. I want to create a space for my students where they are able to process and discover something new about the universe and themselves. I want them to read complicated informational text about gravity and dark matter and in turn develop a writing journal or "Captain's Log" of poetry based on the complicated nature of the articles.

Poetry is being overlooked by many educators, including myself. Poetry is disregarded as a form of analytical expression and synthesis. My students are lacking poetry in their daily reading and writing portfolios. For several semesters, the administration and teachers at The Lea School in West Philadelphia focused on curriculum outlined by Next Generation Science Standards (NGSS) for grades K-8. For

two years in a row, my instruction was heavily focused on the informational standards for Pennsylvania Common Core for English, because we were reading complicated, data driven texts with challenging domain specific vocabulary. This unit will fuse the two forms of thought: informative and creative thinking. I was drifting away from poetry in our students' writing workshops and this stray is detrimental to our students' critical thought and scope of their writing portfolios.

This curriculum unit is designed for students in an eighth grade English Language Arts class. Students will analyze a selection of informational articles about dark matter and the theory of relativity while also reading excerpts from science fiction prose pieces. Intertwine throughout the course, students will close read a celestial sonnet by William Shakespeare and poems by Walt Whitman and William Wordsworth. While reading, students will keep a writing journal or "Captain's Log" for their poems. The journal will contain rough draft, peer edits, personal revisions, and some published poems about dark matter, gravity, or any of the cosmological terms discussed in the readings. The poetry will render a very emotional and imaginary approach for analysis of very complicated cosmological terms.

Content Objectives

Students do not make connections between their classes. It isn't their fault; their schedule of 45-minute classes or 90 minutes of math and reading are often taught in isolation. This isolating schedule is the major reason why students are unable to develop cross-curricular connections. Students are not seeing the whole picture. Teachers need to work with their colleagues to develop units or weekly lessons that combine standards from Next Generation Science Standards, English, Math, and Social Studies. There is more value and critical thought in a unit or weekly lesson that challenges the student to synthesize informational text with literary principals with social policy. Teachers need to communicate and explain this shift, because many students would be confused about the cross-curricular approach. I think many of my students will be confused that their writing assignment is not an informational essay but a series of writing workshops dedicated to poetry.

This unit would be difficult to execute in the beginning of the school year for a teacher with a new class. Second semester would be an ideal time for teachers to implement this unit, because students will have a stronger foundation for interpretation of informational text and can synthesize the central ideas of the articles with the poetic themes. More importantly, this unit correlates with NGSS timeline for "Earth's Place in the Universe" and ELA Common Core Standards for poetry and figurative language.

For the first week, students will be able to identify and define characteristics of gravity and dark matter through the use of close reading of informational articles. Each 90-minute class period will be devoted to one or two informational articles along with

visuals from NASA's website. This will be a very tedious task, and I will call upon the science teacher to help with the proper use of vernacular and domain specific terms based on the NGSS standards. Each student will start to develop his or her writing journal midway through the first week. Each student is encouraged to focus on one or two central ideas of the informational articles that they can start to explore in their poetic verse.

Later in this curriculum unit, I will provide background information about gravity and dark matter. Due to the complex nature of these two subjects, my analysis will be accessible to teachers who normally teach reading and writing. I struggled with a many websites and journals that were very technical, but I was so fortunate to discuss these two topics in great detail with my Teacher's Institute of Philadelphia seminar leader, Masao Sako. I think there is trepidation amongst English teachers to broach topics about cosmology and physics, but I am a firm believer in creating a unit that takes both the educator and student into a new challenge.

Teachers using this unit can vary their approach according to the needs of their students, but my students will start their writing journals or "Captain's Log" before reading an assortment of poems from famous poets about celestial themes. During the second week of this curriculum unit, students will close read and analyze the use of figurative language in "I Wandered Lonely as a Cloud" by William Wordsworth, "A Clear Midnight" by Walt Whitman, and "Not from the stars do I my judgment pluck," a sonnet by William Shakespeare. I am not using these poems as mentor texts, because I want the students to draw upon the complexity of the informational texts for their inspirations. The purpose of reading these poems is interpretation of style. The students will compare the different stylistic approaches of the poets in order to analyze the use of figurative language and unique syntax. During the second week of the unit, students will transition into the writing portfolio, because students will have a greater understanding of gravity and dark matter. They can focus solely on their development of poetic forms in terms of celestial themes through the use of the writing workshop model: brainstorm, draft, review with teacher and peer, revise, self edit, and publication.¹ Students can use their writing journal or "Captain's log" as their springboard for their poems.

Demographics

Henry C. Lea Elementary is located in West Philadelphia. It is a neighborhood school; children must live within a certain radius to attend Lea Elementary. English and Math classes for seventh and eighth grade are 90 minutes. For the past two years, I taught the same group of students. I will be teaching the same group of students for the third year. I already taught them twice: sixth grade, seventh grade, and now they will be eighth graders. In schools, this process is called looping. Three years ago, I advocated for looping due to the extensive research I was complying for my graduate studies in Masters of Reading. Based on my students' DRA (Developmental Reading Assessment) results,

45% are on reading level, 30% are one or two grade levels behind, and 25% are multiple grade levels behind. This does not include the 11% of my students who are English Language Learners (ELL). Looping provides stability and strong expectations for the students and the teacher. Our fourth and eighth grade students take the PSSA English, Math, and Science. Since Lea adopted teaching NGSS, scores in Science improved steadily. Eighth grade scored 19% proficient; fourth grade scored 30% proficient. I know these percentages are still very low, but not one student scored proficient two years prior.

Rationale

Our students are growing up in a time when our President and prominent political figures are often making speeches about terrorism, gun violence, and police brutality. These are very pertinent topics for our society, but the tone of many political and social speeches lack inspiration and discovery.

In 1961, President Kennedy announced before a joint session of Congress the ambitious and competitive goal of sending an American safely to the Moon before the end of the decade. People gathered around their televisions to watch Neil Armstrong land on the moon, and it changed people's lives. It renewed a sense of patriotism, pride, and appreciation for discovery. In 2003, two rovers were sent to Mars to study its surface and geology. Eleven years later, two new rovers, "Curiosity" and "Opportunity" are searching for evidence of ancient life and ancient water on Mars. My students and I really do not know what that means or the implications of what it means to find water on Mars. There is a lack of interest and understanding that needs to be addressed. If students think critically about the central themes of discovery and exploration, they can develop a greater understanding of astronomer's research, the engineering process, data collection, and what it means to study unknown territory.

Why Dark Matter?

Dark Matter is unknown. The existence and composition of dark matter is debated amongst the most prominent astronomers and physicists. There is much to hypothesize and discover about dark matter; its topic is contemporary and relevant on popular television shows like *Big Bang Theory* and *Dark Matter*. Dark matter and dark energy make up approximately 96% of our universe and its contents are unknown.² I find this very humbling, and I think my students will as well. Its relevant for students read about current findings and new discoveries about dark matter and energy for them to appreciate the scope of scientific method and engineering process. Many of our students do not read articles about discoveries in space or new images and data retrieved by the Hubble Space Telescope, but they need to know astronomers and scientists are often times stumped and confused just like them. I cannot wait to show my students some of the power point slides shared by our seminar leader in our Teacher's Institute class. I was shocked when

I found out only four percent of our expanding universe is “normal matter.”³ This statistic alone will stir conversation, debate, reflective writing, and hopefully, poetic verse.

Why Develop a Student Portfolio with Poetic Verse?

The most significant and relevant part of this curriculum unit is the development of the student’s writing journal or “Captain’s Log.” I remember watching Star Trek with my brother on Friday nights with a couple slices of pizza, and I really liked the narrative approach of the “Captain’s Log.” It reinforces the connection between science and writing, between discovery and journaling about the adventure. Simultaneously, students will analyze several informational articles, and record their questions and interpretations into a “Captain’s Log.” These informal writings will act as the prewriting or brainstorming milieus for their poetic verses. “Students also benefit greatly from the portfolio’s providing a concrete place in which they can see their own work grow...students review their work to write the self-reflexive essay, they can see for themselves how much more sophisticated their thinking has become.”⁴ This means writing poetry enhances all other forms of writing for the student; their informative and argumentative writing will benefit from the different processes of emotional thought. I know this will be a tremendous stretch for myself and my students, but I really want to access the mystery and beauty of these scientific topics in poetic verse.

Poetry is not one of my students’ strengths. Collectively our time spent on analysis and interpretation of poetry is minuet compared to the amount of time spent on the other forms of writing. This is unacceptable and damaging to the students’ imagination and creative expressions. “The language of science is metaphorical in nature. Due to the nature of certain abstract concepts, metaphors are used constantly by scientists to help them understand and conceptualize knowledge.... Scientific models are essentially equivalent to the metaphorical language used in poetry.”⁵ Once the students develop a foundational understanding of gravity and dark matter, they will be able to transform their interpretation of the information into poetic verse, just like some of the most famous poets of our time.

Content

Our universe is expanding; a statement that is widely influential in the understanding of dark matter and dark energy. Almost 80 percent of the mass of the universe is composed of material that scientists cannot see: this is dark matter.⁶ This material is the gravitational bond which holds together galaxies and clusters of galaxies and many believe it determines the fate of the universe. The existence of dark matter and dark energy explains why our universe is expanding; not static. Scientists originally thought the universe would run out of energy, and gravity would cause the universe to slow down

as it pulled its objects together. This theory was disproven in the late part of the 1990s with images from the Hubble Space Telescope.

In 1998, the Hubble Space Telescope collected images of a very distant supernovae which allowed astronomers to conclude that the expansion of the cosmos did not slow down since the Big Bang. For over 40 years, astronomers sought this information but could not obtain it due to the lack of technology and imaging until the Hubble. Supernovas are perfect markers for astronomers and scientists to use to measure the vast cosmic distances because they are the brightest elements in the universe. According to the first observations of the American Astronomical Society, the team, led by Peter Garnavich of the Harvard- Smithsonian Center for Astrophysics, the most distant supernova originated 7.7 billion years ago, approximately halfway back to the Big Bang.⁷ This supernova belongs to a class called Type Ia; there is a direct link between its inner brightness and rate of dimming following their explosions.⁸ "In other words, we'd bet \$100 against your \$5 that the universe isn't bound by matter—dark matter, bright matter, matter that clusters, or matter that's spread out," says co-investigator Robert Kirshner.⁹ Million of years ago, the universe was expanding more slowly than it was today. Gravity did not slow down the expansion of the universe; the expansion of the universe is actually accelerating.

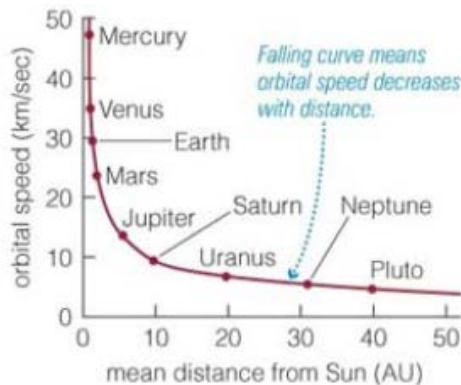
Dark energy and dark matter are not interchangeable terms. Dark energy composes approximately 73% of the universe.¹⁰ There are several explanations for the existence and composition of dark energy: property of space, quantum theory of matter, or a new version of dynamical energy fluid. All of these explanations presented by astronomers and scientists are underdeveloped and inconclusive. Dark energy is an unknown form of energy that seems to be the source of a repulsive force causing the expansion of the universe to accelerate.¹¹ Since dark energy energy is a repulsive force, it balances the attractive force of gravity. If dark energy is a property of space, then it is a cosmological constant. Dark energy would then contain density and pressure and as space continues to expand, so does the energy. In 2013, the Planck space mission shared its most current and specific map of the oldest light in the universe-it stated that the universe is 13.8 billion years older (100 million years older than originally believed) and expanding more slowly. There is less dark energy and more normal and dark matter, but dark energy could still be a property of space.

Like dark energy, little is known about the makeup and origin of dark matter. The nature of this material is one of the largest unresolved conflicts in science. Dark matter is an undetected form of mass that emits little or no light, but whose existence is infer from its gravitational influence.¹² Dark matter may or may not be composed of protons, neutrons, or electrons, also known as baryonic matter. Most scientists think it dark matter is composed of WIMPS (weakly interacting massive particles).¹³ These particles have ten to a hundred times the mass of a proton, but they are extremely difficult to detect because they have weak interactions. These particles were in great abundance right after

the Big Bang.¹⁴ Another possible composition for dark matter is dead stars. Massive Astrophysical Compact Halo Object (MACHO) are remnants of an early generation of stars or primal black holes which are only slightly detected with microlensing.¹⁵ Microlensing is a crucial tool in determining whether or not dark objects within our galaxy are baryonic.

Scientists determine the mass of a large object in space by studying its motion. In a galaxy, which orbits around the sun, the rotation curve measures the orbital circular velocity of stars or gas clouds at different distances from the center.¹⁶ In the 1930s, Fritz Zwicky studied the Coma cluster, a massive cluster of over 1,000 galaxies which are all gravitationally linked to one another. Zwicky estimated the total amount of matter in the cluster and measured the velocities of some of the galaxies. These galaxies were moving exceptionally fast and escaping the gravitational pull of the other galaxies. This means that the cluster had way more mass than Zwicky thought. Astronomers consistently see other galaxies, including the Milky Way Galaxy, have masses that are significantly larger than their light matter content can credit. This discrepancy attributes to the existence of dark matter.

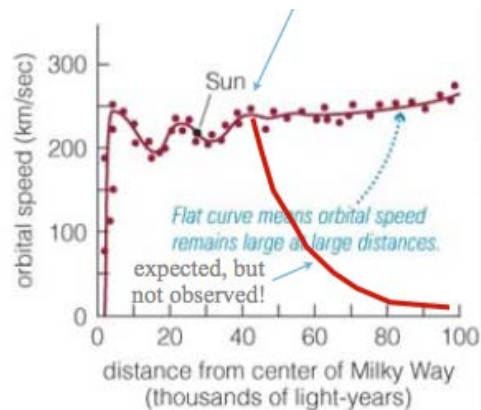
The Milky Way's mass interior to the Sun's orbit is approximately 10^{11} solar masses, or 100 billion times the mass of the Sun.¹⁷ When scientists compare and contrast the motions of the planets in the Solar System to the motions of the stars in the galaxy, they are able to determine the orbital period also known as the orbital velocity of any object. The orbital velocity of planets furthest from the Sun is slower. Orbital velocity as a function of distance from the center is known as the rotation curve.¹⁸ The planets in the Solar System exhibit the Keplerian rotation. Scientists predicted the same for the Milky Way Galaxy, the velocities of the stars should follow the Keplerian rotation. There is a significant difference, however, between the Milky Way's rotation curve and what was measure. There is momentous additional mass in the Milky Way because objects far from the center of the galaxy are moving faster than predicted. This mass is not visible in light; this mass is dark matter.



b The rotation curve for the planets in our solar system.

$$v \sim 1/\sqrt{a}$$

Figure 1.1 Plot of the orbital velocities of the planets in the Solar System¹⁹



c The rotation curve for the Milky Way Galaxy. Dots represent stars or gas clouds whose rotational speeds have been measured.

Figure 1.2 Plot of the rotation curve of the Milky Way galaxy²⁰

Just like the rotational curves of galaxy, gravitational lensing, proves the existence of dark matter. Gravitational lensing measures light travelling along the curvature of space and time. Light passes nearby a massive object and is deflected slightly towards the mass. Gravitational lensing is a metaphor for a magnifying glass. Researchers use gravitational lensing to see galaxies created at the same time of the Bing Bang. Gravitational lensing also allows us to observe invisible things in our universe. Dark matter doesn't emit or absorb light on its own; researchers used the effect of gravitational lensing to map out dark matter in the universe. Only four percent of our universe is known-only four percent! Our students will use this information, therefore, lack of information for inspiration for their writing. This lack of knowledge can trigger a student's imagination and poetic spirit for his or her writing portfolio.

The necessity for analysis in poetic form is unique for the students. Students are often asked to write analytical or informative essays about scientific topics, but this curriculum unit challenges them to write poetry about the conflicts and mysteries surrounding dark matter and dark energy. William Wordsworth once wrote, "the appropriate business of Poetry, (which, nevertheless, if genuine, is as permanent as pure science), her privilege and *duty*, is to treat of things not as they *are*, but as they *appear*; not as they exist in themselves, but as they *seem* to exist to the *senses*, and to the *passions*." This is a perfect connection for students studying the existence and composition of dark energy and dark matter, because there is a great lack of understanding. Scientists and astronomers are continuously studying gamma rays, cosmic infrared, primordial black holes to learn more about the composition and the significance of dark matter.

Dark matter and dark energy is unseen. There are many conflicts within our lives that are also unseen. Often times, a poet will express internal conflict in relationship to celestial objects. “Not from the stars do I my judgment pluck” is Sonnet 14 by William Shakespeare. In this sonnet, the speaker is unable to determine his future or destiny. The speaker is unclear what the future will bring and what the universe has planned. Yet, the speaker believes he has the wisdom and gumption to make decisions about love, “But from thine eyes my knowledge I derive.” Shakespeare repeatedly describes love as a celestial marker; the fate of love is in the stars. Students can connect the composition of dark matter to this poem because many scientists and astronomers believe dark matter is composed of dead stars. It is ironic for the speaker to compare his love to the death of star. Students can use this sonnet as a sounding board for their poems if they want to write a rebuttal that love destined by the universe will end up in betrayal or death. They can write a poem from the point of view or perspective of the one who is receiving this affection; maybe the other person sees this love as a primordial black hole or a WIMP. Some students may think it is completely erroneous to believe that “truth and beauty shall together thrive” when compared to a “constant star.” My students can make a counterclaim in their poems that stars are not consistent, and they are surrounded by dark matter, conflict that is unseen.

Teaching Strategies

I am an English teacher, and I follow the Children’s Literacy Initiative Framework that was adopted by the School District of Philadelphia for teaching reading and writing in a middle school classroom. It has taken me four years to really utilize and execute this framework to the best of my abilities and my students’ abilities. It is an excellent structure with routines and prompts the teacher to follow the gradual release module. This Literacy Framework is part of my formal observation by my principal and is adapted each day for my 90-minute block. It is crucial to note that each component of the literacy block is not executed everyday. It varies due to the needs of my students and how I need to adapt the instruction post assessments.

Shared Reading: Whole Group Instruction

The teacher reads out loud and models close reading based on the objective and standard. Sometimes, the students have the text in front of them and sometimes they do not, it depends on the length of the text. Due to the complex nature of many of the informational articles about gravity and dark matter, students will have the article in front of them. Teachers model for students repeatedly through this shared reading approach, meaning I will often read out loud the first page or excerpt and model close reading for the students. What I highlight, the students highlight. What I annotate, the students annotate. I will model repeatedly a shared reading of the articles, along with the poems, and I will share read my “Captain’s Log.”

Collaborative Reading: Whole Group Instruction

The teacher and students read out loud excerpts of the text and share their close reading interpretation and analysis about the text to the whole class. Students are highlighting, making notes on the side, and can foster a debate. The teacher is a facilitator and calls on students to read and share their interpretation. Teacher might also ask clarifying questions and reiterates the objective and purpose of the lesson. Collaborative reading should not be confused with literature circles. Literature circles is part of small group instruction where each student within the four-to-five-person circle has a specific role. In the classroom section of this unit, I will describe some of the possible roles students can fulfill in the literature circle.

Cooperative Pairs and Guided Reading: Small Group Instruction

Teachers assign students a cooperative pair based on reading level and skill ability. For example, a teacher will pair a student with similar reading levels and comprehension abilities to work with each other on a text. While students are working with their partners, a teacher can have a guided reading section with four to five students. Again, this guided reading group is a combination of two cooperative pairs that need additional support with the main idea, vocabulary, or summarization. A teacher presents a different mini lesson for each guided reading group based on the need. This unit starts with a series of informational articles and excerpts with highly technical language. This is a perfect time for teachers to use visuals or additional manipulatives to help students further their understanding of dark energy and dark matter in the small guided reading groups.

Independent Assessment and Independent Reading: Individual Instruction

Once a week, students are assessed based on the objective and standard. During this time, students are reading independently a text at their reading level. Students respond to the content of the text and answer assessment questions that are developed based on the objective and standard. In the classroom activity section of the unit, there is a list of questions for writing prompts for the student's "Captain's Log" based on the informational texts. Teachers can check the student's "Captain's Log" once or twice a week to assess if the students are understanding the characteristics and implications of dark energy and dark matter. During Independent Reading, students are annotating and asking questions that could inspire their poetic writing.

The Children's Literacy Framework for writing follows the exact same format for writing. A teacher will use a mentor text for a particular writing style and demonstrate the skill to the whole class first. There is an emphasis on revising and editing with your cooperative pair and through a writing conference with your teacher. Students are independently assessed with a final draft based on the writing rubrics of the Pennsylvania System of School Assessment.

Classroom Activities

Close reading is the continuous process of interpreting and analyzing a literary work based on the syntax and structure of the literary work. Students focus on the text in front of them. They identify and annotate for unfamiliar domain specific words and repeated phrases or images in order to determine the purpose of the literary work. In the teacher resource section of this unit, you will see a worksheet that I use often in my classroom to help students with their close reading. At first, students can make a prediction about the central theme of the sonnet in the first box. Once students read the sonnet for the first time, they can identify words or phrases that they do not understand or need help with clarification. Students then read the sonnet or poem again, and annotate patterns and figurative language in the third box. Once students are identifying patterns and figure language, they are starting to feel comfortable with the poem. It is very important for students to close read the poem or literary work three to four times to deepen analysis. Close reading can also be out loud, especially for poems and sonnets who are meant to be read out loud so students can hear the meter and rhyme.

Close reading can happen at any point during the gradual release model. Close reading is often authentic when students close read together either in pairs or in a literature circle. A literature circle is a group of three to four students who are reading and answering questions about one informational text or literary work. Due to the complex nature of many of the articles we will read about dark matter and dark energy, students can seek additional help and support from their peers in literature circles. In a literature circle, each student plays a role and has an assigned task. This variance discourages copying of answers. One student can be the discussion director-a student who is responsible for asking questions or writing down students' questions while close reading. One student can be the wordsmith or word wizard: one who identifies words or phrases that are unknown to the group and uses additional resources like a thesaurus or a dictionary to determine meaning. Lastly, one student can be the literary luminaire: he or she highlights one or two lines from the literary work that demonstrates the purpose of the piece. The literary luminaire would have to justify the selection to the other members of the circle.

While students are meeting in their literature circles, I can pull individual students for guided reading or a writing conference. During the second week or third week of the curriculum unit, students will start to brainstorm and draft their poems for their writing portfolios. I will meet with each student during this time to look through his or her "Captain's Log" and provide immediate feedback on drafts. Each conference should last between five to ten minutes. The teacher will check in with the student and assess his or her comfort level with poetry, the teacher will read some of the excerpts in the "Captain's Log" and the drafts of the poems. The student should leave the writing conference with a clear direction. I will provide for each student a reflection sheet with my comments about his or her poem. During the individual writing conference, students should not

hesitate to ask questions. The conference should be a conversation amongst the poet and critic. I provided a conference reflection sheet in teacher resources.

Bibliography/Teacher and Student Resources

Bennett, Jeffrey O., M. Donahue, Nicholas Schneider, and Mark Voit. *The Cosmic Perspective*. 4th ed. N.p.: Addison-Wesley Longman, 2007. Print.

This textbook was recommended to me by my seminar leader. This is not the most recent updated edition but the graphics for dark matter are consistent with current research.

Cheney, Patrick, and Anne Lake Prescott. *Approaches to Teaching Shorter Elizabethan Poetry*. New York: Modern Language Association of America, 2000.

Choi, Charles Q. "Dark Matter's Invisible Hand." *Nova Next, PBS*. April 13, 2016.

This would be a perfect article for the students to read in literature circles because it is accessible and contains many examples of figurative language within the informational text.

Collins, Billy. "The Companionship of a Poem." *The Chronicle of Higher Education*. November 23, 2001.

Students would really like this essay by Collins because it describes exactly what they are going to be doing in this unit. It is a very sophisticated text, but I think some of my students could read this article with their cooperative pairs and write a reflective journal or an entry in their "Captain's Log."

"Dark Energy, Dark Matter - NASA Science." Dark Energy, Dark Matter – NASA Science. Accessed August 15, 2016. <http://science.nasa.gov/astrophysics/focus-areas/what-is-dark-energy/>.

"Dark Matter." Dark Matter. Accessed August 03, 2016. <http://abyss.uoregon.edu/~js/cosmo/lectures/lec17.html>.

This website contains graphs about the rotational curve of the Milky Way Galaxy.

Griest, Kim. *WIMPs and MACHOs*. Encyclopedia of Astronomy and Astrophysics. Nature Publishing Company. 2002.

This is a very technical article about the different theories surrounding the composition of dark matter and dark energy. This article can be brought to common planning time and used a discussion tool with the science teacher.

Heard, Georgia. *Awakening the Heart: Exploring Poetry in Elementary and Middle School*. Portsmouth: Heinemann, 1999.

I am really glad that I skimmed through this book, because I needed a mini-refresher course on theory and practice behind writing workshops for poetry within a classroom. There is not much difference between an informative writing workshop versus a poetry workshop, but I realized I might need to give plan for extended time for brainstorming and revision.

Kane, Sharon, and Audrey Rule. "Poetry Connections Can Enhance Content Area Learning." *Journal of Adolescent & Adult Literacy*, 8th ser., 47 (May 2004). Accessed August 3, 2016. Wiley.

Krauss, Lawrence M. "Finding Beauty in Darkness." *The New York Times*, February 11, 2016.

This is a phenomenal article for literature circles. Krauss is an exquisite writer and thinker. Your students will enjoy this article.

Panek, Richard. *The 4 Percent Universe: Dark Matter, Dark Energy, and the Race to Discover the Rest of Reality*. Boston: Houghton Mifflin Harcourt, 2011.

Redd, Nola Taylor. "What Is Dark Matter?" *Space.com*. N.p., n.d. Web. 10 Aug. 2016.

Sako, Masao. "Unseen Influences." Teachers Institute of Philadelphia Seminar. David Rittenhouse Labs, Philadelphia. 27 Apr. 2016. Lecture.

Villard, Ray. "Hubble Pinpoints Distant Supernovae." *HubbleSite*. N.p., n.d. Web. 8 Aug. 2016.

Worland, Justin. "Scientists Confirm Einstein's Theory of Gravitational Waves." *Time*, February 11, 2016

Appendix

Name:

Date:

Ms. Radebaugh: English

Objective: Students will be able to identify the use of figurative language (imagery and symbolism) in order to determine tone and purpose of the poem

Close Reading: Make a prediction, underline words or phrases that you do not understand or cannot define, annotate the use of figurative language, determine tone and purpose

Not from the stars do I my judgment pluck (Sonnet 14)

By William Shakespeare

Copy and paste the poem in the center of this worksheet

Name:

Date:

Ms. Radebaugh: English

Objective for Individual Writing Conference: Students will be able to revise and edit their personal draft of the writing assignment based on the teacher's feedback in order to develop a final draft

Assignment for student:

Mechanics and style requirements for the student:

1. Use of symbolism or an extended metaphor
2. Development of one universal theme: love or rebellion
3. Two to three stanzas of four lines with similar meters; end rhyme (abab is an option but not mandated)

Student's strengths evident in this draft:

1.

2.

3.

Improvements needed for student to achieve publication

1.

2.

3.

Common Core State Standards for Pennsylvania

Standard - CC.1.3.7.A

Determine a theme or central idea of a text and analyze its development over the course of the text; provide an objective summary of the text.

Craft and Structure: Vocabulary

Standard -CC.1.2.6.F

Determine the meaning of words and phrases as they are used in grade level reading and content, including interpretation of figurative language in context.

Informative/Explanatory Content

1.4.6.C: Develop and analyze the topic with relevant facts, definitions, concrete details, quotations, or other information and examples; include graphics and multimedia when useful to aiding comprehension.

ESS1.B: Earth and the Solar System-The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.

¹ Heard, Georgia. *Awakening the Heart: Exploring Poetry in Elementary and Middle School*.

² "Dark Energy, Dark Matter - NASA Science." Dark Energy, Dark Matter – NASA Science.

³ Ibid

⁴ Cheney, Patrick, and Anne Lake Prescott. *Approaches to Teaching Shorter Elizabethan Poetry*. 62.

⁵ Kane, Sharon, and Audrey Rule. "Poetry Connections Can Enhance Content Area Learning." 659.

⁶ Redd, Nola Taylor. *What is Dark Matter?*

⁷ Villard, Ray. *Hubble Pinpoints Distant Supernovae*.

⁸ Ibid

⁹ Ibid

¹⁰ "Dark Energy, Dark Matter - NASA Science." Dark Energy, Dark Matter – NASA Science.

¹¹ Sako, Masao. "Unseen Influences."

¹² Ibid

¹³ Redd, Nola Taylor. *What is Dark Matter?*

¹⁴ Griest, Kim. *WIMPs and MACHOS. 2*.

¹⁵ Ibid

¹⁶ Dark Matter. (n.d.). Retrieved February 24, 2016,
<http://abyss.uoregon.edu/~js/cosmo/lectures/lec17.html>

¹⁷ Palma, Dr. Christopher. *The Rotation Curve of the Milky Way*.

¹⁸ Ibid

¹⁹ Bennett, Jeffrey O., M. Donahue, Nicholas Schneider, and Mark Voit. *The Cosmic Perspective*.

²⁰ Ibid