

What Does Literacy Mean in My Content Specific Discipline? Applying Literacy Modalities during Instructional Practices

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Abstract: In this study, we examined the application of literacy modalities and strategies during instructional practices in middle and high school discipline specific classrooms. The modalities include listening, speaking, reading, writing, viewing and visually representing. We used social interactive, cognitive and constructivist models as a frame to explore teachers' shared knowledge about applying literacy modalities during instruction. Initially, many content area teachers (i.e., math, science, social studies, history, language arts) did not know how to apply literacy modalities and strategies in teaching and learning. After professional development, teachers integrated the literacy modalities with appropriate strategies within and across their content disciplines and found that most students were better able to effectively understand and communicate the content. They realized that the integration of the six literacy modalities were necessary tools for teaching and learning the content, and not an added responsibility.

Key words: disciplinary literacy, modalities, literacy practices, content area literacy

1. Introduction and Background

In this study, we examined content area teachers and students' dialogues about literacy modalities and literacy strategies for instructional practices in middle and high school discipline specific classrooms. In each content area, teachers are expected to have the ability to apply effective literacy strategies to assist students in learning and critically interpreting materials (Ming, 2012; Fang & Coatoam, 2013). This ability includes three cognitive components: general literacy skills, content specific literacy skills, and prior knowledge (McKenna & Robinson, 1990). Some teachers may implicitly include reading and writing strategies, but not explicitly acknowledging that it is their responsibility to teach reading and writing (O'Brien, Stewart & Moje, 1995). Even those who believe it is their responsibility may not feel adequately knowledgeable to use literacy instructional practices in their specific disciplines (Moje, 2008). Additionally, they may not know ways to teach to meet the needs, interests, and potential of each student (Conley, Kerner, & Reynold, 2005). Content area teachers may not be well prepared because certain discipline norms discourage the use of reading strategies (O'Brien, Stewart, &

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Moje, 1995; Kletzien & Dreher, 2004). Content teachers may not even realize the benefit of incorporating literacy strategies in their teaching and student's learning (Hall, 2005; D'Arcangelo, 2002). Even though research continues to emphasize the use of literacy instructional practices for teaching content, many do not integrate them in their lessons (Graesser, Golding, & Long, 1991).

While Shanahan & Shanahan (2008) view content literacy as teaching reading using subject matter texts, and the emphasis is on the use of general reading or study skills in different classes or in different kinds of books, however, literacy is broader than just reading and is no longer a static construct in the ways in which we read, write, view, listen, compose, and communicate information (Kesler, 2003; May, 2011; Wilson, 2011; and Coiro, Knobel, Lankshear & Leu, 2008). Disciplinary literacy is the use of specialized literacy practices, background knowledge, and interpretation of text within each discipline. For instance, science and math texts present information with one "truth" or interpretation based on accepted methods for using evidence and the interpretation of a literary text may rely heavily on the individual's world knowledge and perspectives. Msengi and McAndrews (2014), however, developed a more refined definition of content literacy as the ability to use the integrated modalities of listening, speaking, reading, writing, viewing and visually representing to comprehend and communicate information within and across disciplines (Table 1). When learners are given opportunities to critically and aesthetically listen, read, and view others ideas and speak, write about, and visually represent these ideas as well as their own, they become more able to participate in and contribute to society. Not only do teachers need to use and model these modalities during instruction, they need to provide opportunities for students to apply them in authentic contexts.

Table 1 Literacy Modalities

	Oral Mode	Written Mode	Visual Mode
Receptive Comprehension	Listening	Reading	Viewing
Expressive Composition	Speaking	Writing	Visually Representing

2. Theoretical Base and Rationale for the Study

This study applied interactive (Rumelhart, 1977), cognitive processing (Rumelhart & McClend, 1986) and socio-cultural linguistic (Au, 1997; Brofenbrenner, 1979) theories. Based on these theories, we believe that learners simultaneously use expressive and receptive literacy modes and their background knowledge to construct meaning. Children experience cognitive, sociological, psychological, and linguistic processes as they strive to enhance their learning in the content areas regardless of their background (Thomas & Collier, 2001). Learners require complex skills that enable them to deal with the specialized and sophisticated reading and learning of literature, science, history, and mathematics (Perle, Moran, & Lutkus, 2005; Cisco, 2016). When using literacy modalities and strategies, learners are better able to understand and communicate the content.

Typically content teachers rely on lecture and independent practice without engaging students in the multiple expressive and receptive literacy modes. Previous research on content area literacy indicated that students in math classes do not use many of the literacy modes (Moje, 2008; May, 2011). While, a few students mentioned that they use graphs to aid the understanding of the concepts in mathematics, they do not frequently use all of the modes. Content area teachers, with the help and support of literacy educators, can learn ways to engage and support their students in applying literacy modes to create, express, negotiate and understand disciplinary content (Draper, Broomhead, Jensen & Siebert, 2010; Siebert & Draper, 2012).

In this study, we seek to support teachers' understanding that learning content is enhanced by using the integrated literacy modalities of speaking, listening, reading, writing, viewing, and visually representing (Moje et al., 2008; Brozo & Simpson, 2007). We developed our definition of content literacy by combining linguistic and content learning research. While the elementary language arts standards included reading, writing, speaking, listening, viewing, and visually representing (National Council of Teachers of English and the International Reading Association 1996), these modalities have not been explicitly taught, especially in content area classes. The oral, written, and visual linguistic modes are all part of effective comprehension and communication. As a result of the Common Core State Standards, there is now a greater emphasis on incorporating literacy in the content areas K-12, yet teachers still do not know how to apply all of the literacy modalities in their teaching and learning. Listening, reading and viewing are receptive comprehension modalities for constructing meaning through processes such as interpreting, evaluating, and integrating information. While, speaking, writing, and visually representing are expressive composition modalities for communicating a message to inform, persuade and/or entertain. While each of the six areas can be defined separately, it is clear that they do not stand alone, but are integrated. The least understood of these modalities are viewing and visually representing. Viewing involves observation and interpretation of visual information beyond just written words such as photographs, diagrams, videos, websites, demonstrations, visual presentations, realia, paintings, art, architecture, drama, and gestures to name a few. The reciprocal of viewing is visually representing, or the creation of these materials. Literacy strategies that integrate these modalities are an integral part of subject area teaching and learning. A person can use a variety of literacy modes to communicate their learning and to question and challenge their understanding of the subject (Faggella-Luby, Graner, & Dew, 2012).

3. Study Sites, Population Sample, and Procedure

This qualitative action research identified and interpreted the current literacy practices in middle and high schools and supported teachers with students in using literacy modalities, strategies and practices to enhance content teaching and learning. This recursive cyclical process included planning, acting, observing and reflecting. To apply this process, we began by identifying concerns and/or needs that content area teachers had, and then supported them in understanding the literacy modalities and aligning them with strategies. While our study focuses on the process (including teacher and student interactions) related to lessons and dialogue in specific content discipline, the data collected used the voices of the participants to inform the research. Two research questions guided this study:

- (1) What are the perceptions of applying literacy modalities and literacy strategies among middle and high school teachers in specific disciplines?
- (2) How can literacy faculty and literacy specialist support content teachers in using the six integrated literacy modalities and strategies to teach content?

The study was conducted in Midwestern USA middle and high schools and a public university. Participants for the study included 27 undergraduate secondary education students in a content literacy course, 16 practicing teachers in a graduate content area literacy course, 3 practicing teachers who were conducting their action research Master of Science in Education (MSEd) projects in literacy, 12 high school teachers, 4 middle school teachers, 3 special education teachers, and 2 university literacy faculty. Pseudonyms were used in place of all participants' real names in order to ensure confidentiality.

Data was gathered from inservice and preservice teachers through surveys, reflections and artifacts. The primary instrument for collecting data was a literacy survey developed by the authors. The twelve items of the survey were based on the identified concern regarding applying literacy modalities and strategies. After the survey was refined for accuracy, it was administered via email to middle and high schools teachers, undergraduate and graduate students to gather information regarding perceptions and knowledge about the literacy modes of writing, reading, speaking, listening, viewing, and visually representing, and to determine whether or not these elements were explicitly present during the teaching and learning process. A Likert scale (4-Strongly agree, 3-Somewhat Agree, 2-Somewhat Disagree, and 1-Strongly Disagree) was used to determine whether or not participants had experiences using literacy modes and strategies. Open ended, short answer questions were also included for participants to provide additional in-depth information on how they used the modalities and strategies and to describe any concerns. Teachers, undergraduate and graduate students were asked follow up questions to clarify some areas of their responses if they were vague or incomplete. We coded the surveys for modality and strategy use (Charmaz, 2002; Glaser & Corbin, 1998). We then identified connections between the categories and subcategories in the survey questions to determine if the strategies used in each content area class integrated both receptive and expressive literacy modes in order to enhance students' understanding of the subject matter

Additional data was gathered from written reflections from observations in high school classrooms, reflections from undergraduate content literacy course sessions, graduate literacy course sessions, interdisciplinary unit commentaries, discussion notes, and action research projects. Undergraduate education major students observed their specific discipline classes and took notes that reflected the interactions between the students and their teachers to determine if they were all engaged in the literacy and language modes during class dialogue. The data from the observations and reflections were coded for the type of modality used and the related strategy. We also analyzed teacher candidates content unit plans to determine any shift of perspectives since the beginning of the class. We compared notes from what was reported by the teachers, undergraduate and graduate students to find out if there were any discrepancies. The results helped identify participants' needs which led to professional development sessions of the integration of the literacy modalities and application of related strategies and changes to graduate and undergraduate literacy course syllabi.

4. Findings

The findings below illustrate a general descriptive analysis which provided knowledge of undergraduate and graduate students, and classroom teachers regarding their application of literacy modalities and strategies, observation of these modalities and strategies in classrooms, analysis of content unit plans, commentaries and content literacy course syllabus, as well as content literacy professor notes during observations and class discussions. The results were grouped based on the two research questions: (1) What are the perceptions of applying literacy modalities and literacy practice among middle and high school teachers in specific disciplines? (2) How can literacy faculty and literacy specialists support content teachers in using the six integrated literacy modalities and strategies to teach content? The first question was answered by survey data from undergraduates, graduates, and classroom teachers, observational data, and instructional artifacts.

4.1 Undergraduate Teacher Candidates' Perceptions and Knowledge of Using Literacy Modalities

The following data summarizes the survey data from undergraduate teacher candidates' perceptions and knowledge of using literacy modalities in grade 6–12 content classrooms (Figure 1). They ranked their responses

using a 1–5 scale based on frequency of modalities (1 = never, 2 = less than 25% of the time, 3 = 25–50%, 4 = 51–75% and 5 = 76–100% of the time in six different subject areas. This data indicated that teacher candidates believed that students in most of the content areas predominantly listened to instruction. In general viewing and visually representing were the lowest. In science, it was perceived that students did not speak, read or visually represent ideas frequently.

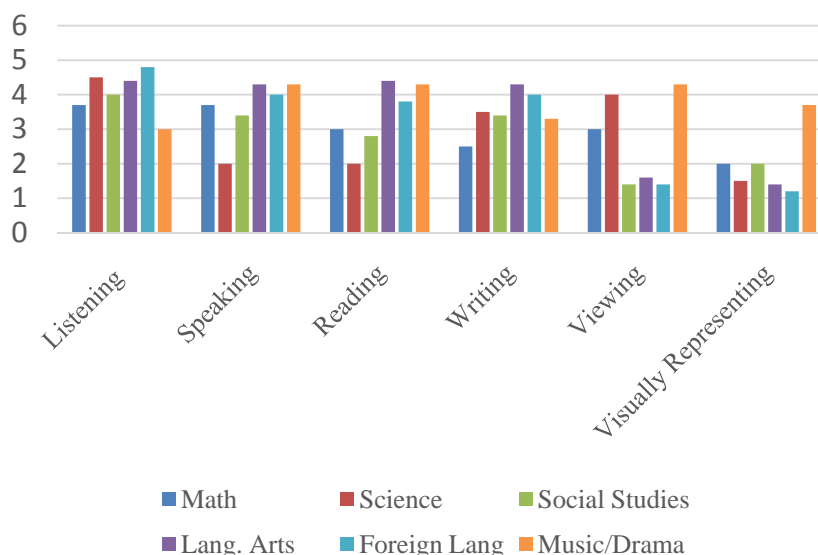


Figure 1 Undergraduates Perceptions of Use of Language Modalities Survey Data

4.2 Undergraduate Observation Data of Grade 6–12 Classrooms

Undergraduate students were asked to visit and observe a classroom teacher in their academic discipline and note how the teacher applied reading, writing, speaking, listening, viewing and visually representing during the lesson to enable students to interpret, analyze, evaluate and understand the content of the lesson. The analysis of the undergraduate observation data indicates some relative strength from 5-subject specific teachers (US History, Math, Biology, Spanish, and Language art teachers). One U.S. History teacher had students respond to a poem of “The Jungle” and provided opportunities for student to analyze, interpret and connect to class content, while another teacher used a poem “Paul Revere’s Ride” but did not make connections to the concepts. A math teacher used visual aids, while students created graphs and worked in groups, however, the teacher did not make any connections to the purpose for learning. The biology teacher taught the morphology of dinosaur words and chemical compositions to determine their meaning (prefix, suffixes, and roots), but did not make connections to how you could use morphology to understand the meaning of other words. The Spanish teacher had students watch videos and listen to Spanish music, however, the students were not asked to respond in any way after these experiences. The Language arts teacher had students identify figurative language, but not apply it to any texts they were reading.

A number of concerns were raised from the above observation data. While the history teacher had an orderly classroom, there was a lack of participation from students, when the teacher just called on an individual student to respond. Several teachers used the smart board or PowerPoint to deliver information, but elicited very little discussion. In the math class, the students predominantly listened to the teacher talking and copied notes from the board to use for tests, however, there was very little student interaction or guided practice. Students

strived to work independently to solve problems without any guidance from the teacher, and the teacher did not have students visually represent any of the mathematical ideas. A Spanish teacher had students simply repeat phrases but they did not compose ideas on their own. Students repeatedly participated in isolated verb conjugation drills. The French teacher utilized very little reading or writing composition in class, just frequent repetition of vocabulary words. There was limited evidence of students reading and discussing texts. Writing often included simply filling in worksheets or copying from the board.

This data indicated that a few classroom teachers integrated some of the literacy modalities, however, the majority of them used teacher-centered approaches of listening or copying information.

4.3 Content Teacher's Perceptions of Language Modes Survey Data

Teachers were asked to evaluate their own instruction and identify frequency of the modalities they used during instruction. Figure 2 represents content teachers self-reported use of literacy modalities in their classrooms. The 1–6 scale was based on frequency of self-reported modalities (1 = never, 2 = very rarely, 3 = rarely, 4 = occasionally, 5 = frequently and 6 = very frequently).

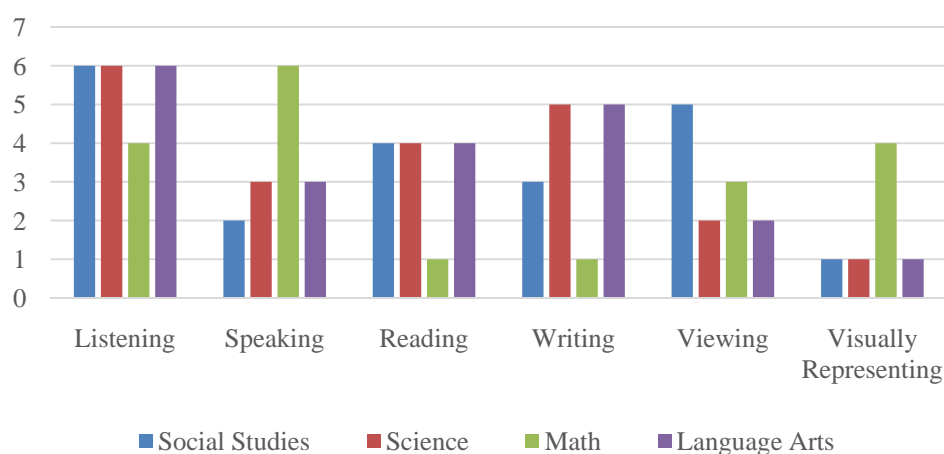


Figure 2 Content Teacher's Perceptions of Language Modalities Survey Data

The analysis of the data indicates that teachers are not consistently applying all of the modalities during teaching and learning process, which shows that there is an imbalance. Teachers indicated that the listening modality was used most of the time, while visually representing was used the least. It is interesting to note that in math the teacher indicated that the speaking mode was used the most and reading and writing were used the least. Several teachers did not provide appropriate examples of strategies for students to implement the modalities.

4.4 Teacher Professional Development Needs

We used the survey and observational data to identify professional development needs and answer our second research question, “How can literacy faculty and literacy specialist support content teachers in using the six integrated literacy modalities and strategies to teach content?” As part of the teacher survey, teachers indicated that they would like to have professional development on strategies to balance the use of modalities in the classroom, especially the viewing and visually representing modalities. There was some confusion about who was applying the modalities, the teacher or the students. For example, in Mathematics the teacher indicated that the speaking modality was used most. This was interpreted as the teacher was doing most of the speaking and not the students. Therefore, there was an imbalance between speaking and listening during instruction. Teachers indicated

that due to the demands of Common Core State Standards, they needed to integrate more literacy in their content classes, but didn't know how they could add more into their already full curriculum.

4.5 Providing Professional Development to Shift in Teachers' Understanding

Based on these findings, as literacy faculty, we took several steps to facilitate teachers' shift in their perspectives from teaching content using a traditional lecture model to teaching content by using the integration of the literacy modalities. To achieve this goal, we examined and enhanced the syllabi for our undergraduate and graduate literacy courses. In our latest revision of our syllabi, we shifted from a focus on reading and writing, to the integration of all six literacy modalities. Our syllabi included the following new objectives:

- Teachers will define and provide examples of the six literacy modalities, which are listening, reading, and viewing (for receptive comprehension) and speaking, writing, visually representing (for expressive composition).
- Teachers will articulate how applying the literacy modalities enhances content learning, in contrast to instruction in traditional lecture classes.
- Teachers will align the literacy modalities with cognitive, linguistic, motivational, and sociocultural theories and research when planning their teaching.
- Teachers will apply knowledge of the five language systems (phonologic, syntactic, morphemic, semantic, and pragmatic) when planning instruction that includes the literacy modalities.
- Teachers will select and apply strategies that are aligned with integrated literacy modalities in teaching and student learning.
- Teachers will create and evaluate lessons that represent a balanced integration of the modalities during their teaching and student learning.
- Teachers will provide peer coaching to support others in integrating the literacy modalities to scaffold student learning.

In the graduate and undergraduate content area literacy courses, we reflected and changed some of the literacy topics to reflect the objectives above. The changes on the syllabus and modifications to the topics and class discussions had a positive effect on both the graduates' and undergraduates' understanding in applying literacy modalities that aligned with strategies in their teaching. As a result of these changes, not only did we enable teachers to select and teach content and language objectives that were observable and measurable (Echevarria, Vogt & Shearer, 2012), but also select and use a range of strategies, materials and resources (print, digital, and visual) that were aligned to the six literacy modalities. In addition, we modeled more strategies during our instruction and provided more resources and journal articles for applying multi-modal literacy strategies in their content classrooms. We spent additional time modeling and discussing strategies that incorporated viewing and visually representing ideas. Teachers demonstrated the ability to align objectives, procedures, and assessments, with the integration of the modalities to meet students' needs. Teachers began to see the value in having students speak about and visually represent their ideas more in class. One teacher explained how her students collaboratively discussed ideas and visually represented them before writing in their science journals. She went on to say that before, her students just independently wrote or copied notes. The teachers became more empowered by the discovery of the integration of literacy modalities and strategies to enhance the teaching of their content. They realized literacy was not an addition to their content, but was a tool to support content learning. As teachers peer coached and consulted one another during planning and reflecting on teaching, teachers developed their

leadership abilities and confidence. The following are two artifacts from teachers. The first artifact is an example of an undergraduate's written commentary of a Holocaust unit plan that showed the shift of the student's perspective from teaching content in a traditional manner to using literacy modalities to teach content. The second artifact is a summary of the peer coaching sessions.

4.5.1 Holocaust Unit Commentary

"The six literacy modalities (reading, writing, listening, speaking, viewing, and visually representing) are the heart of the entire unit. There is a focus on reading literary and informational texts. The unit stems from the reading of *Anne Frank's Diary*. The students also read many articles and were instructed to do research, which entailed reading about the Holocaust on their own. There are also assignments to enhance the reading that included writing. The writing assignments in this unit included developing descriptive paragraphs, reflections, quick writes, and journaling. Writing is a way to further develop students' critical thinking skills and comprehension level. We have also included lessons that revolved around viewing images from the Holocaust (specific events in lesson 1 and propaganda in lessons 4 and 5). We also used visual representation in lessons 2 and 3 by asking the students to demonstrate in a chart exactly how much money they would get, items they have, and food they can eat. Speaking and listening are used throughout all of the lessons as informal discussions and group collaborations took place. These forms of speaking and listening are a way to get students to express verbally what they know and to allow students to hear and rephrase the ideas of other students, which they may not have previously thought of. Speaking and listening are used, along with reading, writing, viewing and visually representing in the final project of the unit. The students presented a poster on a topic they read about. This poster included information they wrote and pictures they selected to visually represent certain concepts. On the final day of the unit the students orally presented their posters, which means they spoke about them about them while everyone else listened and viewed their posters. The audience orally shared what they learned and posed questions to the speaker. I believe that the six modalities are most effective when combined and used together. Content learning is enhanced when students are taught and allowed to express themselves in multiple different ways through reading, writing, viewing, visually representing, speaking, and listening."

4.5.2 Peer Coaching with Literacy Specialist and Content Area Teacher

Literacy Specialists met with content areas teachers to consult about using strategies to enhance student learning. During consultations, the literacy specialist first explained the different literacy modalities. Next, they helped the teacher to identify specific examples of strategies they already used that incorporate the modalities. They also asked about any concerns they had with student learning. The classroom teacher then selected a topic they wanted to teach in the future and together the teacher and the literacy specialist brainstormed ways of teaching that topic and incorporating all of the modalities to meet their student's needs. The literacy specialist then demonstrated the strategies and pointed out how they incorporated specific modalities. The specialist emphasized that the literacy modalities were not used in isolation, but were integrated within the strategies. The following list provides example strategies and the predominant modalities that are correlated with them. The modalities are abbreviated: Listening = L, Speaking = S, Reading = R, Writing = W, Viewing = V, and VR = Visually Representing

- Think-Pair-Share, Think-Alouds (L, S)
- Reader's Theater (R, L)
- What or Who am I? Illustrated riddle book; How To book with Visuals (W, VR, L, V)

- Reciprocal Teaching , Debates (R, W, S, L)
- Illustrated Content Journal, Frayer Model with illustrated vocabulary (R, W, VR, V)
- Multi-media presentation; Web Entry with diagrams, graphs or charts; persuasive advertisements (R, W, VR, S, V, L)

The following are examples of four literacy strategies that were modeled to content teachers: a) *Reciprocal teaching*, b) *Frayer Model*, c) *Semantic Feature Analysis Grid*, and d) *Concept Map*. Abbreviations for each modality are written in parentheses.

4.5.3 Collaboration between the History Teacher and the Literacy Specialist

History Teacher: Several of my students do not know how to summarize information in our history text or how to answer the chapter questions at the end.

Literacy Specialist: It often helps if students can collaborate with others when reading and understanding a text. Have you tried the Reciprocal Teaching strategy? (Table 2)

4.5.4 Reciprocal Teaching

Palincsar & Brown (1984): Reciprocal teaching is a scaffolded discussion technique that involves four strategies that good readers employ when they read: predict, question, clarify, and summarize. Each is first modeled by the teacher (L), then practiced by the students with one another (R, W, S, L), and finally individually applied (R, W, S, L). For the best results, four foundations must be in place think aloud, cooperative learning, scaffolding, and metacognition. During the social studies lesson, the teacher asks teams of students to take on the roles of predictor, questioner, clarifier, and summarizer as they read the assigned chapter. As they read (R), each team fills in a chart with their responses (W), and individuals mark their texts with sticky notes to track their individual reactions (W). The teacher periodically stops to model how to clarify difficult words and concepts and how to ask relevant questions (L). The class works together on a “twitter” summary (L, S, W, R) that they will post on the class blog along with student illustrations (VR, V).

Table 2 Mary Ann Shadd Cary: An Abolitionist, a Chapter Written by C. Harness (2003)

Role	Student Responses
Predictor	Mary Ann Shadd Cary would make a difference in the lives of black people. In the pictures it looks like she had to travel by foot with her family and at the end she was important because she was sitting at a big desk with lots of books. She was probably a slave. (After reading, learned she was born to parents who were free, but helped slaves.)
Questioner	Why couldn't Mary Ann go to school? Black people couldn't go to school in Delaware.
Clarifier	What is the fugitive slave law of 1850? Slaves who escaped to the North, were returned to their slave owners in the South. What is civil equality? Providing equal opportunities for all people, including black people and women.
Summarizer	Mary Ann Shadd Cary had to move to Pennsylvania in order to go to school. She returned to Delaware to teach other African-American students. She was the first black newspaper woman and started a weekly newspaper in Canada, writing about how blacks can build new lives in the North. She made speeches about civil equality, to end slavery, and give women the right to vote. She later became the 2nd African-American to earn a law degree.

4.5.5 Collaboration between the Biology Teacher and the Literacy Specialist

Math teacher: My students did not do well on the vocabulary test.

Literacy Specialist: What do you do to help them prepare for the test?

Math teacher: Students look up the bold words, write the definitions from the glossary, and study them.

Literacy Specialist: What is your goal for your students?

Teacher: I want students to understand the vocabulary and use it appropriately.

Literacy Specialist: One collaborative strategy for helping students understand the depth of a vocabulary word and be able to apply it, is the Frayer Model (Table 3).

4.5.6 Frayer Model

Frayer and Colleagues, in 1967, developed this strategy. They stated that students, in each of the four squares, be able to pronounce it, identify the part of speech, list examples of strategies they at 1967: This vocabulary strategy is a four-square model that prompts students to think about and describe the meaning of a word or concept in each square by (1) Define the term, (2) Describe its essential characteristics, (3) Draw or write examples of the idea, and (4) Draw or write non-examples of the idea. Adaptations of this model would be to do this strategy collaboratively and/or select other aspects of the word to include in the squares such as: write the definition in your own words, write synonyms, write antonyms, write the semantic category the word belongs to, write other words in that category, write other words using the same root or word part. This model enhances the depth of word knowledge, is not beneficial to just be able to restate the definition of the word, but know how it is used in different contexts, how it is related to other words, be able to pronounce it, and identify the part of speech.

Table 3 Frayer Model

(1) Definition: Reptiles are tetrapod vertebrate animals that either have four limbs or, like snakes, are descended from four-limbed ancestors. Typically they lay eggs which are surrounded by membranes for protection and transportation on dry land.	(2) Characteristics: cold-blooded, dry scaly skin, most lay soft-shelled eggs on land
Reptiles (noun)	
(3) Examples: Drawings of snakes, lizards, crocodiles, turtles, and tortoises	(4) Non-Examples Drawings of amphibians- they have an aquatic larval stage Birds- they have feathers

Table 4 Description of Modalities in Frayer Model

Modes	Description
Reading	Read definitions and examples of perimeter
Writing	Write definitions, characteristics, and non-examples
Viewing	View examples of perimeter in textbook and view peers' graphic examples
Visually Representing	Draw diagrams of examples and non-examples
Speaking	Orally present the Frayer's model to peers and provide feedback to peers presentation on other vocabulary terms
Listening	Listen to other presentations math vocabulary from peer

4.5.7 Collaboration between a Math Teacher and Literacy Specialist

Math Teacher: Students keep getting all of the geometric shapes confused. What can I do?

Literacy Specialist: Let's try a semantic feature analysis grid. Afterwards the students could draw a picture of each of the shapes to visually represent them. They could also draw objects in their environment that include those shapes.

4.5.8 The Semantic Feature Analysis Grid

Johnson & Pearson (1984): This grid helps students compare features of concepts that are in the same category by providing a visual prompt of their similarities and differences. On the left side of the grid is a list of terms in the chosen category, and across the top is a list of properties that the objects might share. It visually illustrates the relationships between concepts and ideas (Table 5).

Table 5 Semantic Feature Analysis Grid






Term	Side Equal	Angles Equal	Opposite Sides Parallel	Opposite Sides Equal	Only One Pair of Parallel Sides	Four Sides
Parallelogram 			X	X		X
Rectangle 		X	X	X		X
Rhombus 	X		X	X		X
Square 	X	X	X	X		X
Trapezoid 					X	X

Table 6 Description of Modalities in Semantic Feature Analysis Grid

Modes	Description
Reading	Each person read multiple sources on geometric shapes
Writing	Took notes from resources
Viewing	View examples of shapes
Visually Representing	Organize concepts and ideas on semantic feature analysis grid and added graphics
Speaking	Discuss with groups essential elements of each shape. Could a shape be in more than one category?
Listening	Listen to ideas of others

4.5.9 Collaboration between an Earth Science Teacher and a Literacy Specialist

Teacher Concern: The students practice the vocabulary words and answer the questions at the end of the chapter. However, the next chapter they treat as brand new information.

Literacy Specialist: What are the main ideas of this chapter? Is there any relation to the ideas in the last chapter?

Teacher: We are talking about the systems on planet Earth.

Literacy Specialist: Would a concept map be beneficial to show how the concepts are related? We can make one together and then, you could make a blank one for students to fill in as you learn each concept.

4.5.10 Concept Map

A concept map is a diagram showing the relationships among concepts. It is a graphical tool for organizing and representing knowledge. Concepts, usually represented as boxes or circles, are connected with labeled arrows in a downward-branching hierarchical structure. The relationship between concepts should be articulated in linking phrases such as “results in”, “is required by”, “which affects”, “contributes to”, “includes”, “with”, “between”, or “in”.

4.5.11 Concept Map Earth Science Example

Visually illustrates the relationships between concepts and ideas related to the Earth's systems. Concepts include those related to physical characteristics, forces and motion, lithosphere, atmosphere, energy, and scientific inquiry.

Table 7 Description of Modalities in Concept Map

Modes	Description
Reading	Each person read multiple sources on topics of Earth as a System
Writing	Took notes from resources
Viewing	Viewed examples of other concept maps
Visually Representing	Organized concepts and ideas on concept map and wrote the relationships between ideas and added graphics
Speaking	Discussed with groups essential elements of the earth
Listening	Listened to ideas and grouped them by importance

5. Discussion and Implications

It was the purpose of the study to explore content area teachers' understanding in applying literacy modalities and strategies for teaching and learning the content. The findings indicated that initially, some of the content area teachers did not believe it was their responsibility to teach literacy in their classes. Others stated they did not know how to teach literacy in the content areas. Some content teachers indicated that they implicitly taught literacy, but could not provide any evidence or did not have the academic language to explain it. These findings were similar to O'Brien, Stewart, & Moje (1995) who stated that some teachers may be implicitly including reading and writing, but not explicitly acknowledging that it is their responsibility to teach reading and writing.

Based on these findings it can be determined that engaging teachers in professional development through coursework, action research projects, and peer coaching provide them with an ah ha moment, a moment for discovery and the recognition that they were already using some literacy modalities and strategies, however they lacked the knowledge or academic language to articulate them. However, following our modeling of multi-modal literacy strategies, teacher candidates were able to create interdisciplinary unit lesson plans that integrated and embedded the six literacy modalities within their selected strategies. It became clear that by using multi-modal literacy strategies, teachers can support students in learning, especially when using "diverse, sophisticated, complex texts" from within and across academic disciplines (Cisco, 2016, p. 1). We made clear that incorporating the literacy modalities in their instruction was not meant to add extra responsibilities to their teaching, but was designed to support more in-depth learning of the content.

This shift in teachers' perspectives was beneficial as they recognized the overlapping relationships between literacy modalities and strategies and the content objectives they had to teach in order for students to comprehend and compose ideas related to content specific concepts. For example, the process of infusing literacy modalities within each lesson objective helped teachers realize that these literacy modalities are needed. By combining the receptive modalities (listening, reading and viewing), with the expressive modalities (speaking, writing, and visually representing), students are better able to construct meaning by interpreting, evaluating, and integrating information and communicate meaning by informing, persuading or entertaining others.

It is noteworthy that the results of this study, in which teachers integrated the six literacy modalities, are supported by the framework of social constructivism, interactive (Rumelhart, 1977), cognitive processing (Rumelhart & McClelland, 1986), socio-cultural linguistic (Au, 1997) theories as well as disciplinary literacy theories. Teachers and teacher candidates from different disciplines interacted during discussions and applied their cognitive abilities to question and solve problems, communicate and develop knowledge that was not based on traditional pedagogy, but through the constructive process of reflecting and integrating their disciplinary perspective lenses with that of content literacy. It is vital that disciplinary expert teachers integrate the literacy modalities to enable learners to analyze, evaluate, analyze, interpret and communicate information. The six literacy modalities are not to be taught separately, but are to be integrated to provide students and teachers, multiple ways of constructing and communicating meaning. For example, using the Frayer Model, Concept Map, Semantic Feature Analysis, and reciprocal questioning strategies, students and teachers can appropriately apply all six of these modalities support students to understand and communicate content in a variety of ways. As Fang and Coatoam (2013) and Ming (2012) pointed out, literacy and content teachers should be encouraged to collaborate so as to bring their expertise to the planning and delivery of disciplinary instruction. Productive collaboration involves a partnership between participants with the shared goals of learning from each other, a commitment to

working from each other's strengths, and the ability to reflect on student learning as a result of their joint work (Siebert & Draper, 2012). Here the process of joint efforts by teachers and students can be facilitated as members of the groups, consciously or unconsciously express and receive information via these six modalities. This research sheds light on how disciplinary teachers can capitalize on using literacy modalities and strategies without sacrificing their time devoted to teaching their content, developing content knowledge and literacy knowledge are inseparable (Brozo & Simpson, 2007).

This study contributes to and expands the limited research on a developing a shared perspective of how knowing and applying the six literacy modalities can enhance disciplinary learning. The teachers realized that the integration of the listening, speaking, reading, writing, viewing and visually representing modalities are necessary tools for teaching and learning the content, and not an added responsibility. After professional development, teachers integrated the literacy modalities with appropriate strategies within and across their content disciplines and found that most students were better able to effectively understand and communicate the content. Teachers learned that students benefit by using a variety of oral, written and visual resources working as they collaboratively negotiate and communicate meaning. In addition, literacy faculty and literacy specialists can support teachers in implementing literacy modalities and strategies by modeling and provide opportunities for peer observation and peer feedback as learn from each other. Finally, literacy faculty and literacy specialists should engage principals, other administrators, and university faculty in supporting teachers or teacher candidates in incorporating literacy modalities and strategies in content area disciplines.

6. Limitations and Suggestions for Future Research

This study was limited in several ways. First, data was collected from a small number of content teachers, and graduate and undergraduate students who were enrolled in two literacy courses. The surveys, interviews, and artifacts were conducted within one semester of the two courses. The undergraduate and graduate students had discrepancy regarding their backgrounds in teaching, as most undergraduate students had less teaching experience compared to the graduate students. The survey asked about use of the modalities in the classroom, but it was unclear as to whether it referred to the teachers' instruction or the students' activities, in the future we will more clearly articulate this. Due to time, we had limited opportunities for professional development during the initial semester and modeled only a few strategies that integrated all of the modalities, however, we have continued the professional development in subsequent semesters. Despite these limitations, this study offers a new way of thinking about applying the literacy modalities across and within content disciplines. The teachers and teacher candidates have new ways to plan and reflect on their lessons and student learning by clearly incorporating the six literacy modalities. The teachers were better able to align the standards with observable objectives; select appropriate oral, written and visual strategies, materials, and assessments to meet the needs of individual learners. As researchers and professors, we continue to enhance our instruction and have incorporated more viewing and visually representing during instruction. It was enlightening to experience the change in teachers' and teacher candidates' perspectives on the importance of incorporating the literacy modalities in their instruction and student learning experiences. There is a need for additional research that involves more participants from both universities and community schools to investigate whether or not teachers have a shared understanding in applying literacy modalities, not only in classes, but also in other non-classroom contexts to understand and communicate information.

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