Integrating language arts across content areas for upper-elementary students

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It is generally understood that language arts, mathematics, science, and social studies are the four core subjects. Because each of these have an important role in the academic development of students, it is reasonable to believe that the subjects should work together within a cohesive system.

This study asks, “how can integration and cross-curricular methods be implemented so that language arts and another subject can work in tandem to provide meaningful and engaging learning opportunities that meet the needs of students?” A classroom schedule can be set in accordance to how education officials see fit. Yet, that does not mean that certain subjects should be bound into a specific time slot. The purpose of this study is to evaluate why and how language arts and other subjects should be integrated, allowing for students’ content knowledge across subjects to have new platforms to work together and be displayed.

Therefore, this study will attempt to define what the foundation of the language arts classroom is, as well as the other core subjects, and our teaching practices for all subjects. Then, it will transition into the role of the educator in understanding the needs of students, the importance of integrating language arts across subjects, and how a class of students responded to a series of questions regarding these topics. Finally, there are a multitude of strategies listed that could be used to integrate subjects, enhancing the learning opportunities for students.

What is literacy and how can our practices benefit students?

To accomplish the goal of this study, it is first important to make meaning of what each of these components are. Literacy, commonly confined to a language classroom in the form of reading and writing, is no longer inclusive enough. According to Rebecca Alber, a professor at UCLA's Graduate School of Education, a literacy specialist, and consulting editor at Edutopia, states that, “today it's about being able to make sense of and engage in advanced reading,

writing, listening, and speaking" (Alber, 2014, para. 3). To meet the needs of these methods, we must understand how to do these. Generally, the "key to multimodal perspectives on literacy is the basic assumption that meanings are made (as well as distributed, interpreted, and remade) through many representational and communicational resources, of which language is but one" (Jewitt, 2008, p. 246). So, incorporating different forms of interactions, and specifically texts, within the confines of a classroom will enhance what has traditionally been understood to be literacy skills, but also appeal to the construct that Alber described as reading, writing, listening, and speaking.

This description of literacy and its new interpretation according to the needs of people are useful, but only if applied appropriately. But, what could this look like? Although literacy and its skills can be applied well beyond a school, this study will remain focused on formal education. The American Association for the Advancement of Science notes that throughout the advancement of a student's education, "literacy demands change, vocabulary demand increases, texts become longer, sentence complexity increases, structural complexity increases, graphical representation becomes more important, conceptual challenge increases, types of texts used vary widely across content areas" (DeBoer et al., 2010, para. 4). To supplement these ideas, according to an online publication, "Literacy instruction [should]...support students' development of academic language and facility with nonfiction text genres...[and] provide students with authentic reading and writing experiences in science to reinforce that evidence can be based on both firsthand information and text-based resources" (University of California Berkley The Lawrence Hall of Science and Graduate School of Education, n.d., para. 6). However, the potential of these ideas is at times overridden by student disinterest or inability to perform well with literacy for whatever reason.

To meet the literacy needs of all students, there must be specific ways to combat the intrinsic and external troubles met by individuals. Again, referring to the formal education of students and the texts that they encounter, "if texts are well organized, have a logical flow, and include relevant information, they are inviting and reader friendly" (Cullinan, 2000, p. 7). Although there is little a teacher can do with creating the texts, a teacher attempting to enhance the literacy skills in their students can play an active role by surrounding students with enriching forms and opportunities to be immersed in literacy.

Dr. Bernice Cullinan, former president of the International Reading Association (now International Literacy Association), noted in an article with the American Library Association, that "the amount of independent reading students do significantly influences their level of reading performance" (Cullinan, 2000, p. 5). Educators do not always come in the form of teachers. At times, and in the case of independent reading, educators need to be facilitators, allowing that necessary time. Building off that point by Dr. Cullinan, "It is well established that students need extensive practice with reading to develop reflexive pattern recognition of a large vocabulary of words and phrases. As their encoding becomes more automatized, their minds are freed to deal with higher-order aspects of the text" (Ackerman & Perkins, 1989, para. 7). This point is furthered in Literacy and Science Connections in the Classroom, an article published by two professors researching different practices in education, which states that "students who interpreted reading as making meaning rather than a symbol-to-sound approach were better readers" (Plummer & Kuhlman, 2008, p. 101).

Typically, it is the more symbol-to-sound, traditional approach that has been used to teach literacy and when giving assignments associated with certain texts. *Interdisciplinary Curriculum* adds that,

> "students typically approach a reading assignment by beginning at the beginning and reading every word until the end. However, research shows that this is not a very effective way to read for either retention or understanding. Restructured patterns of reading that include a preliminary scan, the formulation of questions, and only partial reading of the body of the text can be much more effective" (Ackerman & Perkins, 1989, para. 25*)*.

So, in short, the more opportunities students have for practicing literacy, and in this case in the form of reading, the more likely over time that they will become proficient in the basic skills of literacy. From there, student learning can increase exponentially, thinking about the ideas and purpose of the text rather than the language arts skills.

But truly, what is the significance of these ideas and practices beyond the classroom? Students do not stay students forever. They should take what they learn beyond the walls of a classroom, to be able to thrive in a diverse and multicultural setting. Dr. Carey Jewitt at the University College London added that literacy should "connect with the culturally and linguistically diverse landscapes and the multimodal texts that are mobilized and circulate across these landscapes" (Jewitt, 2008, p. 245*)*. Students must communicate above all else; be more than literacy-proficient readers.

A primary tool to transfix any potential cultural limitations is technology. An increasingly important aspect of the modern classroom, technology is a learning tool and a way to meet the needs of students. It has become commonplace inside and outside of the school that traditional literacy items, such as printed books, textbooks, and articles, are becoming obsolete and disengaging to many students. Also, technology has introduced and furthered other forms of literacy, such as "information literacy, visual literacy, digital literacy, new literacies, critical

literacy, and media literacy (Holum & Gahala, 2001)" (Moran et al., 2008, p. 9). So, if it is truly believed that literacy is not bound by a language arts textbook or novels from the library, this new realm of technology and the various forms of literacy should be embraced by educators across all levels. The goal of the classroom teacher is to prepare students for any real-world experiences that they may encounter. Therefore, whatever mode literacy is necessary to benefit student learning is what needs to be done.

How can our practices in other core subjects benefit students?

It is crucial to understand the construct we have of math, science, and social studies in an educational setting. Each of these will be looked at separately, but with the understanding that integration is possible within each.

Beginning with math, teaching should encompass a few different concepts. Math instruction should "(1) develop conceptual understanding, often building on children's informal knowledge; (2) support conceptual knowledge and develop informal strategies to solve problems within the domain; and (3) refine the informal strategies to develop fluency with standard procedures" (Kanold, et al., 2012, p. 15). Through the course of these ideas, students are being introduced to concepts that relate to what they already understand. What makes math instruction effective is that educators allow the students opportunities to connect their old and new content knowledge. Like other subjects, math must be viewed as a series of building blocks. Whether through past education or informal experiences, upper-elementary students tend to have a vast knowledge of mathematical concepts. Using what they already know to teach new material makes math more reasonable.

Furthermore, building off student experiences is just as important as their content knowledge. Math teachers can provide situations to solve problems that are realistic and

meaningful to them. In this way, math is more than a series of steps to be memorized. The concepts and procedures are important, but finding the applicable nature of the content is equally necessary. Within these practices, educators are afforded additional chances to pose purposeful questions. These can "assess and advance students' reasoning and sense making about important mathematical ideas and relationships" (National Council of Teachers of Mathematics, 2014, para. 5). Through these combination of methods, math instruction elevates student comprehension.

Science instruction should be designed to "immerse students in in-depth investigations of essential science concepts...engage students in guided and open inquiry and in learning about the practices of science...enable students to search for evidence using sensory information as well as text...[and] provide students with opportunities to learn with engaging science text" (University of California Berkley The Lawrence Hall of Science and Graduate School of Education, n.d., para. 5). In each of these different ways, investigations, inquiry, research, and texts, students have the chance to experience science from a variety of angles, showing science is inclusive beyond what students might expect. When teachers are facilitating science through many different methods and positively approaching the work of students and other, diverse individuals, students begin to comprehensively interact with the limitless potential that science possesses.

One method for teaching science is the inquiry approach. Through the methodology of this practice, the educator still plays an important role of including science in the classroom, but the focus has been shifted away from a teacher's ability to lecture, using their own scientific understanding. Instead, students and their explorations have reemerged as the centers of attention, allowing educators to act more like facilitators. SciMathMN, a partner with the Minnesota Department of Education, notes that "inquiry-based science requires students use the

tools of science to seek answers to their questions about real world phenomena" (SciMathMN & Minnesota Department of Education, 2017, para. 2), accompanied by the teacher instructing them how to "record questions, document how they have set up investigations, incorporate information they have read, display collected data, create drawings, tables, and graphs, and supplement a written product with an oral or visual presentation" (SciMathMN & Minnesota Department of Education, 2017, para. 18). Inquiry is not necessarily an easier way to teach science, but it does provide more meaningful encounters for students, the clarified focus of the instruction.

Finally, social studies are an equally important for students to be actively involved with. "If the young learners of this nation are to become effective participants in a democratic society, then social studies must be an essential part of the curriculum throughout the elementary years...Knowledge, skills, and attitudes necessary for informed and thoughtful participation in society require a systematically developed elementary program focused on concepts from the four core social studies disciplines: civics, economics, geography and history" (National Council for the Social Studies, 2017, para. 2). Students must understand the role they can play within a complex social dynamic.

Social studies education can be fostered through many different approaches. What a teacher decides to implement largely depends on what the specific focus from the curriculum is being taught. As acknowledged previously as the purpose of social studies, educators want students to feel like active participants in their communities. So, teachers need to empower them with the background knowledge to productively function within a set of diverse individuals who impact them and whom they could impact. Much like with the other subjects described, students need the balance off content knowledge and experiences to demonstrate understanding.

Understanding the needs of students

Creating an environment that is conducive to the learning of all individuals so that upper-elementary students can develop and grow as accurately-informed academics is the purpose of local and national school systems. This creation bears many forms though: curriculum, instruction, and physical situation. Although the idea of each of these may seem common sense, there needs to be an in-depth curriculum, engaging instruction, and a positive physical situation with profound, thoughtful depths. Firstly, there needs to be an established difference between curriculum and instruction. Then, there will be an investigation into what curriculum should be, what inclusive and captivating instruction includes, and finally, how to produce an environment that feels welcoming that simultaneously includes everyday experiences of its students.

Speaking of curriculum and instruction, it's noteworthy to understand the difference between the two. *Interdisciplinary Curriculum,* edited by Heidi Hayes Jacobs, states that "curriculum is *about* important topics and ideas, and instruction aims to make these ideas come alive in a manner appropriate to children of different ages, developmental stages, and degrees of background knowledge" (Ackerman & Perkins, 1989, para. 12*)*. Curriculum can establish what is important, what needs to be included throughout the course of a school year. Furthermore, "The curriculum is comprised of substantive content and concepts—of knowledge about the world deemed vital for students to acquire" (Ackerman & Perkins, 1989, para. 12*).* Truly, curriculum and instruction go together. Curriculum specialists and classroom teachers can establish what needs to be taught, but without a high quality of instruction, it could be squandered.

Part of making the curriculum more meaningful and extensive is to develop it with a cross-curricular approach. This means that, for example, literacy and science are not confined to their own spaces, but they should find ways to intertwine casually and rationally. Dr. Winifred

Montgomery suggests curriculum have "an interdisciplinary, or cross-curricular, theme with students participating in meaningful reading, writing, listening, and speaking tasks as they explore the theme through a variety of activities and books" (Montgomery 2001, p. 5). In Montgomery's statement, he notes general instructional strategies to pair with this interdisciplinary approach to make a diverse set of experiences worthwhile. The crucial aspect of his idea though is that through this type of curricular set-up, students of different backgrounds and learning styles can have several opportunities to work in the ways that they do best while also having chances to practice with other methods as well.

In a clarifying statement for these sets of curriculum-centered ideas, Rebecca Alber adds "content is *what* we teach, but there is also the *how*, and this is where...instruction comes in" (Alber, 2014, para. 8). Again, as Alber articulates, the curriculum will determine what content is necessary to learn, but the instruction is reliant upon the classroom teacher understanding how to best communicate such ideas to meet the needs of all students.

Dr. Montgomery's ideas on how to implement a cross-curricular system are dependent on classroom instructors' abilities to "recognize the differing learning styles of their students and develop instructional approaches that will accommodate these styles" (Montgomery 2001, p. 4). These approaches include how to best present the content, as well as determining how to assist students with comprehending and retaining the content. One avenue to support students is through appealing to "certain thinking skills, which include decision making, problem solving, [and] creative thinking" (Ackerman & Perkins, 1989, para. 17). When it comes down to student learning, certain skills are as important to teach as the content is. These skills may not be explicitly listed within the curriculum, but the value of having them can transcend subjects.

Interdisciplinary Curriculum goes into further depth about these skills, what they are and how they look within the context of the classroom. Accordingly, "In *implicit* skills integration, activities are planned that require students to use the skills deemed important, but the teacher does not present lessons on the skills and students do not do assignments whose main purpose is skill building" (Ackerman & Perkins, 1989, para. 45). In other words, implicit skills are built into the instruction, used to supplement the content laid out by the curriculum. On the other hand, there are explicit skills, which "are taught formally; that is, they are identified, defined, modeled, and coached...The more explicit the skill teaching, the more demanding of instructional time from the content area teacher; the more implicit, the more ambiguous the skill development program" (Ackerman & Perkins, 1989, para. 46*).* The conversation should not be which of these types of skills are better, but how they can both be incorporated whenever a circumstance that needs them arises.

A final example given by this source to summarize the point of skills and content necessities within instruction, is the piano student analogy. In this context, "the curriculum for the piano student involves a sequential series of exercises aimed at developing technical skills *and* one or more whole pieces that require skills integration and application (and much more). The pieces—the real music—are analogous to curriculum content. Metacognitive and other learning skills are not necessarily ends in themselves, but they may be essential to virtuoso content learning" (Ackerman & Perkins, 1989, para. 60). It is the balance within the instruction of content and skills that make for a masterful opportunity, as either option without the other is only somewhat useful.

Finally, regarding the environment that needs to be set up, much like the curriculum and instructional strategies given, educators need to have an inclusive setting that supports all people.

Firstly, “to ensure maximum learning potential, student interest must be an important consideration” (Plummer & Kuhlman, 2008, p. 98). It is once students feel that they are the focus of the class and instruction that their own academic effort levels will match their desire to be a part of the community. Relating this idea of a structural comfort zone to instructional strategies, it is important to find ways to allow “student identity, cultural practices, and community to enter the school context in ways that are significant for literacy and teaching” (Jewitt, 2008, p. 250*)*. By doing this, educators ensure student interest but also provide meaning to the content and instruction.

Some of the methods of achieving this might seem unusual to some teachers, but the atypical nature of certain incorporations might seem normal to the students. Relating to the technological advances in classrooms, these methods can integrate several media methods to match students’ comfortability with the common use of technology in everyday tasks. Take social media for example. Although many people maintain some form of online profile, using it in an everyday school setting might not seem appropriate. Yet, social media could “allow users to create digital content themselves and publish it online, giving rise to a huge resource of user-generated content from which learners and teachers can mutually benefit, also encouraging more active and pro-active approaches to learning” (Redecker et al., 2010, p. 8). Furthermore, social media can “connect learners with one another, and to experts and teachers, allowing them to tap into the tacit knowledge of their peers and have access to highly specific and targeted knowledge in a given field of interest” *(*Redecker et al., 2010, p. 8*)*. So, since this, and other forms of media, are vastly present among the lives of students outside of school, it makes sense that there is a potential to constructively integrate it into education.

Importance of integration

As mentioned in the introduction, the goal of this study is to evaluate why and how language arts and other subjects should be integrated. This portion of the study primarily addresses why there is a tremendous amount of awareness and practice needed to meet the specific needs of upper-elementary students. Along with many experts who have been involved in other various research forms about this subject or have been in the classroom making integration happen, this section will argue strongly in favor of why integration is indispensable.

SciMathMN declares that "language allows students to clarify their ideas, make claims, present arguments, and record and present findings (Worth, 2006)" (SciMathMN & Minnesota Department of Education, 2017, para. 2). Each core subject matters, math, science, language arts, and social studies, as well as supplementing subjects, such as art, music, and athletics. These are all forms of expression and allow students to appeal to their interests, the basis in all areas is the concept of language. Like literacy, and in tandem with it, language allows an individual to express precisely what they find important. Language may be what drives these abilities, but it is literacy that commonly provides the methods to take form. So, if this is indeed true, then incorporating language and literacy opportunities across subjects is inevitable.

To work most effectively, "the reading/English program is the hub of the operation and attention focuses on whether there is follow through by content area teachers on the periphery" (Ackerman & Perkins, 1989, para. 44). Since it is language and literacy that are the initial transcendent of subject boundaries, this seems within reason. Even when speaking of the reverse integration of another subject into language arts, which is important and will be discussed, it will be hinging upon the methods of language arts program to seamlessly integrate this subject to provide meaningful text. However, there is still a certain level of responsibility assigned to the non-language arts educators: "while English teachers might continue to assume greater than

average responsibility for instruction in reading and writing, [for example,] science teachers could assume the same degree of responsibility for skills of empirical inquiry" (Ackerman & Perkins, 1989, para. 44). Though the literacy instruction typically falls elsewhere, a science teacher must recognize which methods implemented in the language arts classroom could carry over well into the science classroom. This same idea carries over to social studies and math classrooms as well.

Consider this, "reading to explore science topics, combined with firsthand investigation and discussions, can help students acquire reading strategies even better than direct instruction in those strategies can" (SciMathMN & Minnesota Department of Education, 2017, para. 8). As stated previously, inquiry prepares scientifically literate citizens who can use language to articulate thoughts, lead explorations, and then present their findings. Based on what makes for effective science instruction, omitting literacy from daily science instruction seems improbable and refusing to build on literacy appears irrational.

When it comes to a math classroom, teachers should be engaging students "in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies" (National Council of Teachers of Mathematics, 2014, para. 2). When giving problem solving situations, there must also be occasions to present a student's findings. This is where the integration of language arts comes in. Whether a written report or another form of communication, a student's literary skills are crucial to presenting what they know and have learned, as well as understanding what their peers are communicating during their reports.

Social studies revolve around the circulation of ideas to create a comprehensive picture of culture, all that it does or could encompass. Students, individually and with others, should be

"problem solving to address complex social, economic, ethical, and personal concerns" (National Council for the Social Studies, 2017, para. 2). Much like with mathematics, if educators are facilitating opportunities to problem solve within the context of subject specific material, they also need to express themselves through literacy-based activities. To display what they are actively learning and doing, students need multiple modes of expression, and the integration approach allow that.

Furthermore, subjects cannot be taught only with a textbook and slideshow, nor can it be exhaustively understood with only experiments. "In the context of science or history, it is not uncommon to focus students' attention on causes or categories. But often the activities have more to do with memorizing the answers suggested by the text than engaging students in their own explorations" (Ackerman & Perkins, 1989, para. 22). It is the balance that is maintained by classroom educator between direct content instruction and exploration, testing and presenting that makes a successful experience possible.

Most of the ideas on instruction and curriculum mentioned thus far have centered on what content knowledge and methods of application students need to be familiar with. Another crucial aspect of education is empowering students to know what a professional does and feel like one as well. Part of this is becoming familiar with reading, writing, and speaking (the basics of literacy) like an expert is. This is not as difficult as it may seem though. Many of the same skills used by professionals are exceedingly like that of a reader. "For example, students are taught skills such as posing questions, making predictions, or making inferences that are useful for both science inquiry and for reading comprehension" (University of California Berkley The Lawrence Hall of Science and Graduate School of Education, n.d., para. 3), thus the importance of literacy instruction and the necessity to teach implicit and explicit skills that can cross subject borders.

Other skills that SciMathMN expand upon, which can be applicable regardless of subject matter, include how to "activate background knowledge, observe, ask questions, search for information, design investigations, note details, compare and contrast, sequence events, distinguish fact from opinion, make inferences and predictions, link cause and effect, and use language to communicate their findings" (SciMathMN & Minnesota Department of Education, 2017, para. 9). Questioning, predicting, and inferencing skills, as well as many others that can be taught, are what will ultimately enhance their opportunities to greater understand the content and why it is being taught.

Understandably, there are some natural difficulties that come with integration. Most of these difficulties can best be served with the continued and daily integration of subjects. From a student's perspective, reading and comprehension could be a struggle. For example, when this struggle encounters science, this gets more difficult as well. "Students have difficulty reading and communicating about the science if they don't have science knowledge. Likewise, students have difficulty learning science if they don't have literacy skills" (SciMathMN & Minnesota Department of Education, 2017, para. 13). Literacy, defined as reading, writing, speaking, and general modes of communication, will naturally fit into any subject. But, it is persistent use and opportunities to practice in a comfortable environment that allow this to occur.

Some teachers could also possess apprehensive feelings towards integration because it sounds like more time consuming and effortful on their part, much like the concept of inquiry science instruction. However, the benefits associated with integration are well worth it, and the process of incorporating more meaningful texts or literacy opportunities, are worthwhile. When it comes to time of instruction and application in the classroom, the concern is legitimate. But again, this is resolved once the classroom teacher prioritizes their goals for the students.

Another aspect of the time argument is that science and social studies are not always viewed as important or worthwhile as math or language arts because these are state testing subjects in upper elementary grades. But, for example, "if students read and write about scientific topics, science has a higher place and importance in the classroom. Students also become better prepared for tests that measure reading comprehension using informational texts" (Marohn, 2015, para. 3). Instruction for each content area will always require a certain amount of preparation and implementation, but doing them with integration techniques will enhance their quality and student interest.

Student interviews and data collection

An additional component to this study was a survey of a fifth-grade class at a suburban elementary school in Oklahoma. This class was chosen because of an internship I am completing there. Three surveys were distributed over the course of three days. Each survey presented a different set of questions, which students answered knowing that their names would not be included in this study, nor would their responses impact their grade in the class. Follow up interviews were also done with students to get more extensive understanding of their responses.

The demographics of this group include 12 males and 12 females. 14 of these students are enrolled in the Gifted and Talented program. Four students see a reading specialist on, at least, a weekly basis. One of the students who goes to the reading specialist also has an Individualized Education Program (IEP), and another has been retained. There is one other student who has an IEP, but does not see a specialist for any services. Two other students have been retained at some point, but are all performing on or above grade level now. The final three students in the class have not had any modifications made to the educational experiences. The surveys conducted, a

short description about the purpose of each, student interview responses, and the student responses are displayed and charted below.

Survey 1: Integration Across Subjects

This survey's focus was to gauge how students view reading on different topics, how their academic strengths play into their reading habits, and generally what they think about literacy. Unexpectedly, math and science were common answers for topic choices when reading. Both subjects are particularly strong for this set of students as an entire class, but I did not expect that to transcend reading boundaries as much as the results indicate, with science being preferred to social studies 9:2 and to math 7:4. During the follow up interviews, most students indicated that they preferred writing or talking about science over reading about it. Yet, students would still prefer to read about it than other subject matters. The survey is below.

1. Would you rather read a book that involves science or social studies (SS)?
2. Would you rather read a book that involves math or social studies?
3. Would you rather read a book that involves math or science?
4. Do you think literacy only applies to books?
5. Do you think literacy could be applied to social media?

Response Options	Science or SS	*Response Options*	Math or SS	*Response Options*	Science or math
Always Social Studies	0	Always Social Studies	3	Always Science	2
Usually Social Studies	2	Usually Social Studies	3	Usually Science	5
Usually Science	8	Usually Math	5	Usually Math	4
Always Science	1	Always Math	0	Always Math	0
Neither	13	Neither	13	Neither	13

Response Options	Literacy only to books?	Literacy to social media?
Yes	9	17
No	15	7

Survey 2: Impactful Literacy

Literacy, as discussed in this study, is not bound by the printed-nature of books. Without disclosing this information, the students were asked to simply answer the questions, which largely pertained to making meaning and different platforms for literacy to be presented. Also, students were asked about how the reading of others might be impactful. Interestingly, as noted in the chart, 18 students said that talking about what they read after they finish never, rarely, or sometimes helps them understand it better. Yet, when doing the student interviews as a follow up, many of the students indicated they prefer talking about science to reading about science. The survey question below was not subject specific, so that could account for the difference. The survey is below.

1. Which do you think is easier to understand: an artist's purpose from a photo/painting or an author's purpose from a book?
2. Which do you think is easier to understand: an author's purpose when reading a book or an author's purpose when listening to a book?
3. Which do you enjoy more: Reading hard copies of books or digital copies of books?
4. Do you feel that images in books help you understand it better?
5. How often do you see your family members or friends reading outside of school?

6. Does talking about what you have read after you're done reading help you understand it better?

7. Would you read a book if one of your teachers recommended it?

Response Options	Understand Photo/Painting or Book	*Response Options*	Understand read book or listen book	*Response Options*	Hard copy or digital copy
Painting	6	Read	16	Hard Copy	17
Book	16	Listen	6	Digital	5

Response Options	Images help?	Often family read?	Talk after reading help understand?	Teacher recommended?
Never	0	3	2	0
Rarely	6	5	8	1
Sometimes	9	6	8	9
Often	3	7	2	8
Always	4	1	2	4

Survey 3: Science and Literacy

Finally, this survey goes back to the main concept of this study: evaluate why and how language arts and other subjects should be integrated. For the sake of gaining insights into a specific content area and realizing this group of students' interests in science, as well as their responses to the first survey, it was appropriate to ask them about if what they do in science class provides or connects to meaningful literacy experiences. Furthermore, during the student interviews, most students indicated that they do not tend to enjoy books that others select for

them. They want to maintain the autonomy of selecting what is best for themselves. Therefore, if the students are not trying to read books involving science, then they probably will never get that experience, or at least enjoy it. Also, they were interviewed about the specific science textbook they use, *Oklahoma Interactive* Science. Although most of them said they do not think they read it too much, nearly all of them noted that they tend not to find the content interesting. As one student said, "Sometimes it is really cool, but sometimes some of the things are common sense, so that's boring to read." The survey is below.

1. Does the amount of reading we do in science make the class more difficult?
2. Do you feel there is too much reading in our science class?
3. How often do you find any of our science vocabulary in the books or passages you read?
4. How often do you use any of our science vocabulary in the conversations you have?
5. Does learning about different lifeforms and how things work make you want to read more?
6. How often do you try to read books involving science?

Response Options	# read harder?	Too much reading?	Vocab read?	Vocab speak?	Read more?	Often read science books?
Never	4	6	0	4	0	4
Rarely	7	8	4	8	5	9
Sometimes	11	5	8	5	12	6
Often	0	2	7	4	3	3
Always	0	1	3	0	2	0

Strategies for integration

The purpose of the core subjects, student needs, and integrations sections throughout this study has been to inform about and justify the need to enhance student learning using a cross-curricular approach between the two specified subject areas. In this section, specific strategies are presented to provide guidance for educators seeking methods for instruction. By having these detailed methods for integration across content areas, educators have ways of "increasing the accessibility and availability of learning content...providing new formats for knowledge dissemination, acquisition and management...allowing for the production of dynamic learning resources and environments of high quality and interoperability...embedding learning in more engaging and activating multimedia environments...[and] supporting individualized learning processes by allowing learner preferences to be accounted for" (Redecker et al., 2010, p. 8*).* As emphasized throughout this study, having a balance of resources and methods is crucial.

From content knowledge to vocabulary, reading comprehension to writing abilities, integration strategies will achieve this goal if done consistently in all subject area classrooms. The strategies provided below are extensive, but by no means complete. Individual teachers know the students of their class, what their own communities are like, and how to alter these suggestions to meet those needs. Simply, these are, at least, introductory to intensive strategies to begin or extend integration. These strategies, listed in alphabetically, have a short description.

Audiotape

As mentioned, speaking is a form of literacy and a method to enhance comprehension. As students explain, for example, a summary of a text that they have read, allow them to audio record their summary instead of writing it (Carrier, 2011, para. 12). Although writing does have its advantages and should be implemented, audio recording student work across subjects gives

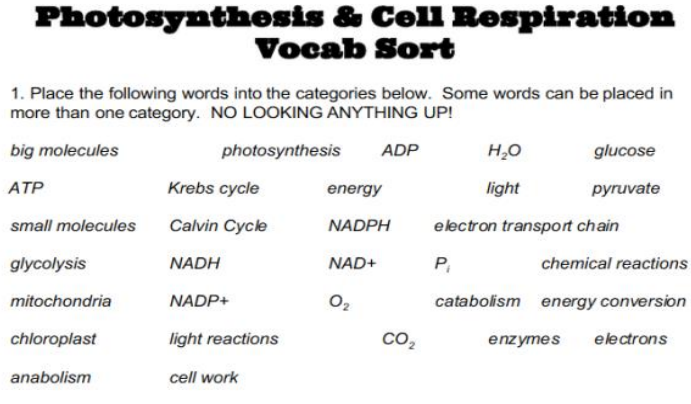
opportunities to orally explain their thinking processes. They essentially work the same as a writing assignment, but their uniqueness can grab student interest and work on articulation skills.

Brain Dump/ One-Minute Essays / Quick Write

Across subjects, educators intend to find ways to teach content. What gets lost, at times, is the retention of ideas. For example, a teacher may have a three-day lesson over solids, liquids, and gases, each getting one day of instruction. But, once the third day comes around, the students may not remember much about what they learned about from the solids and liquids days. A brain dump, also called a one-minute essay or quick write if that phrase would make the task more worthwhile, helps with this situation (Alber, 2014, para. 16). In a brain dump, students can take a paper, sticky note, etc., and quickly jot down at the end of the lesson the main points. These do not have to be complete sentences and can be done in accordance with a one-minute timer. This way, students must think about what they learned about, write them down, and reference it later.

Category Sort

The purpose of a category sort is to display similarities and differences between items (Reading Rockets, 2011, para. 4). These items could be vocabulary terms, examples from the lessons, etc. The categories could be item characteristics, root words, etc. There can be open sorts, which means that students create their own categories for a set of items, or closed sorts, which means the categories are already determined. An example of an open sort is shown below.



Photosynthesis & Cell Respiration Vocab Sort

1. Place the following words into the categories below. Some words can be placed in more than one category. NO LOOKING ANYTHING UP!

big molecules	*photosynthesis*	*ADP*	*H_2O*	*glucose*
ATP	*Krebs cycle*	*energy*	*light*	*pyruvate*
small molecules	*Calvin Cycle*	*NADPH*	*electron transport chain*	
glycolysis	*NADH*	*NAD+*	*P_i*	*chemical reactions*
mitochondria	*NADP+*	*O_2*	*catabolism*	*energy conversion*
chloroplast	*light reactions*	*CO_2*	*enzymes*	*electrons*
anabolism	*cell work*			

(Harris, 2015)

Current Events

Content-related events and announcements are being released daily. From natural occurrences, like a hurricane, to a discovery of a new species, students can bring in these types of events to connect to what is or has been learning (Scott et al., p. 3). Current events provide context and liveliness to a subject matter. The integration aspect of the current event strategy is that the event is usually announced in some sort of news release or video clip, so students must be actively looking for and investigating these events, normally through reading or listening. Also, in response to the current events, students could write about how it relates to what they have been learning about.

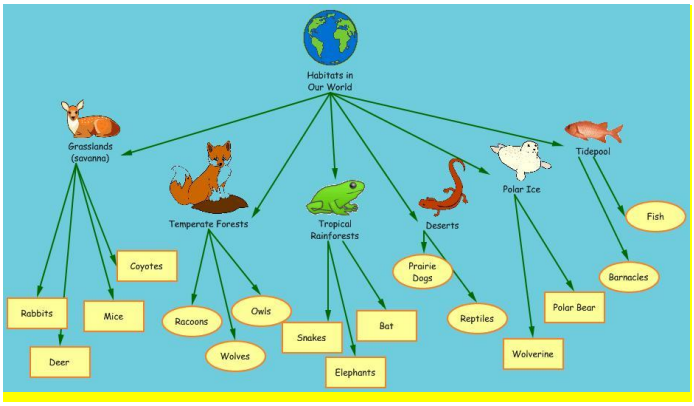
Field Trips

Science, in some form, is everywhere. So, no matter the physical circumstance, students will always have some means to do field trips and investigations. How teachers handle these field trips determine the integration level of subjects. It would be appropriate for upper-elementary students to be actively taking notes and recording what they are sensing, forming connections between what they learned in their classroom to the application they are engulfed in, and seeking answers to questions that may arise or that the formed before arriving. What might be a limiting factor for field trips is the financial resources. But, technological innovations have made virtual field trips available. Not all students can go to, for example, the American Museum of Natural History. But, the capabilities, provided on their website are readily available to anyone with computer access (American Museum of Natural History, 2017). From there, the same integration strategies can be implemented as if the students were on an in-person field trip.

Graphic Organizer- BIG Picture & Concept Map

A graphic organizer is an umbrella strategy that includes the big picture idea and concept map. These help students visualize the different elements they are working with and how they are connected. These can be particularly useful when attempting to organize an individual's thoughts before a writing assignment. When students can manipulate and interact with the elements of their map, drawing branches and connections, they better understand the concepts and how to organize them. So, when it comes time to write, students already have a logical flow mapped out. An example of a concept map is shown below.

Often, the phrase "look at the bigger picture" is used metaphorically. But, what if it wasn't? Students could literally draw a big picture that shows "unifying concepts such as systems, form & function, models & their limits" (Scott et al., p. 3). Since visual literacy is becoming increasingly important, allowing the opportunity to draw out concepts in a big picture format, labeling connections, and presenting it, potentially in a gallery setting, accomplishes multiple subject ideas.



(University of Arizona)

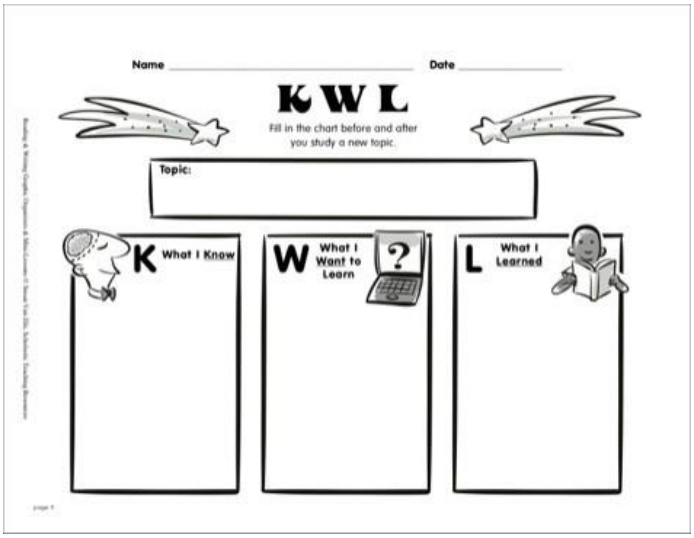
Investigation Report

Within any subject-area classroom, there are chances for students to perform experiments, putting their content knowledge into action. However, simply performing an experiment is not enough to fully gauge a student's abilities and understanding. An investigation report, like a lab report in science, is a way to incorporate writing into the exploration process

that also holds students accountable to keeping detailed track of their work (Carrier, 2011, para. 12). An investigation report's rubric, which determines length, areas of importance, and grading scale, can be differentiated according to grade or ability level.

KWL (Know, Want to Know, & Learned) chart

A KWL chart, which can be done as a class or individual student activity, is a progressive organizer that is filled out before, during, and after a lesson (Scott et al., p. 3). The first category lists everything that the student(s) already know about the subject, what they want to know, and finally what they learned throughout and by the end of the lesson. "The strategy requires students to build on past knowledge and is useful in making connections, setting a purpose for reading, and evaluating one's own learning" (Connecticut State Department of Education, 2007, p. 50). Whether done as a class or individually, it is important for students to be reading and writing on their own KWL chart, engaging them in the experience and building comprehension of the lesson text or experience. An example of a KWL chart is displayed below.



(Van Zile, 2017)

Matching Pairs

Matching games work on skills outside of the typical curriculum: memory, critical thinking, etc. They can also play an important role into integrating subjects. "Students are given

a stack of cards and asked to match a term with its associated function, symbol, scientific name, etc. For example, a stack might include cards with the names of body parts and other cards that name the body parts' functions. Students match each part to its appropriate function" (Carrier, 2011, para. 13). Further involvement for students could be that they create the cards for this game. They must read the text and interpret diagrams, rationalize what the important areas of they are, and then create the cards.

Meet a Professional

An area of education that is not highly emphasized is the people behind the subject matter. Students in upper elementary grades tend to find similarities between themselves and famous people they read about. Meet a professional is an idea that can be done in a couple of different ways. Using science as an example, "by reading and writing about the lives of real scientists, students can learn more about the nature and history of science and how important scientific discoveries were made; the historical view of science, which stretches back thousands of years; how scientists dealt with other people when their discoveries were not aligned with the prevailing view of the world at the time; and how women and members of other underrepresented groups in the sciences were able to persevere" (Cox, 2012, para. 1). Another avenue that can be taken with this is to interview a scientist. This activity would work on communication skills, writing interview questions, reading or listening to responses, and then synthesizing the information gathered.

Multiple Meaning Words

Many words that are identified as scientific vocabulary have more than one meaning. This can cause confusion about what exactly someone is speaking about. Through this activity, students are given the chance to compare the multiple meanings that a single work may have.

"For example, in common use, "theory" means a hunch, while in science, a "theory" is a well-established explanation of the natural world based on solid empirical evidence" (Carrier, 2011, para. 18). This activity would be especially useful for English language learners who struggle to separate the meanings.

OLogy: American Museum of Natural History

This online resource from the American Museum of Natural History takes students on an interactive experience through many different scientific topics. Recently, they have partnered with ReadWorks to "create dozens of OLogy articles and paired them with vocabulary lessons" (American Museum of Natural History, 2017, para. 2) to increase reading comprehension as well. So, with this resource students can be assigned a topic to read about, interact with, and quiz about. The variety that comes with this resource can appeal to student interest, and the depth of the content and multiple methods of interacting will help meet the goals set by the educators.

Open-Ended Projects

Targeted for upper-elementary students, open-ended projects are an engaging opportunity for students to expand their knowledge on a subject beyond the confines of a specific unit. In one of these projects, "students can explore a topic of interest drawn from their readings of culturally rich literature or a content area topic they are currently studying" (Montgomery 2001, p. 6). By letting the students select their own topic that is in some way connected to what is being taught across content areas, they are more engaged and effortful with the work. A project's rubric, which determines length, areas of importance, presentation methods, and grading scale, can be differentiated according to grade or ability level.

Oral Presentations

These do not have to be as formal as they may seem. Oral presentations could be as informal as a class discussion. Classroom discussions might appear more present in some subject-area classrooms then others. But to be effective and give all students multiple opportunities to speak, listen, and learn, they need to occur across subject areas. A source adds that presentations give a "chance to challenge and expand on their understanding of the topic by having others ask questions. And in the world of work, a confident presenter is able to inform and persuade colleagues effectively" (Hayton, 2005, para. 3). Communication of all forms is a part of literacy, so allowing all students to practice public speaking skills, explaining concepts, and reading from a report they have written can be an inclusive integration tool.

Platform

When students find a purpose behind an assignment aside from just a grade, they tend to put in much more effort. A way of doing this placing student work on a platform, giving them an avenue to display their attempts. There are many in-house ways of making sure student work can be viewed. For example, there are online magazines, also called E-zines, teacher or school websites, and newsletters that can be posted digitally and distributed (Moran et al., 2008, p. 10). Fitting the integration mold, have students write about science that are relevant to their community or recent units. Now, the students are engaged in the publication process while bringing the curriculum to life.

Plus (+) or Minus (-)

Students should have opportunities throughout lessons to read texts that relate to the topics they have been learning about in class. These could come in many different forms or genres. One strategy to help form these connections between the text and what they learned is the +/- system. Whenever they are reading, "students put a positive (+) sign at the intersection of

ideas that support each other and negative (–) where the ideas are not coordinated" *(*Plummer & Kuhlman, 2008, p. 104*)*. By doing this, students can revisit their texts later to determine applications of their knowledge in their reading, but they will also increase comprehension of the text because they have the background to give support.

Riddle Me This

Logic, puzzles, and riddles are creative methods to engaging students because they can be applied to any subject or topic. By commonly having these in the classroom, students, via reading and listening, become increasingly familiar with their structure, elements, and how to solve them. From there, students will be able to write their own, taking the process full cycle. By incorporating subject-specific content into these riddles, students should think in-depth about the properties of their topics and how to clearly communicate them (Reading Rockets, 2011, para. 6).

Sequencing Cards

Done with hard or digital copies, sequencing cards help students understand order of events, as well as causes and effects. Through either presentation method, students are active in manipulating the sequence of events, moving the parts of the scenario as much as necessary. When it comes to incorporating science, for example, "like the water cycle or the seasons, create one card for each stage in the cycle. Have students arrange the cards in a circular formation to represent the stages of the cycle" (Carrier, 2011, para. 13). Through this strategy, students have a role in creating a science cycle rather than only memorizing a diagram. Although a science example was used, this could be applied elsewhere, like to the events leading up to revolutionary war in a social studies classroom or the steps of how to add fractions in a math class.

Subject Journals

Much of what students in upper-elementary school students understand about a subject comes from their interactions with the content in applicable situations. Playing off student background knowledge, it would make sense to take students to areas around the school and community where they would constructively view and interact in these environments, but with an academic purpose. Subject journals could be as simple as an outlet for taking notes inside the classroom and recording observations and connections outside of it. In a science class, a field journal is a resource for students to record observations, make hypotheses, record data, and so on while exploring the outdoors. “Recording observations and feelings in a field journal can be a powerful way for students to get to know their natural community and the geography of their home environment” (Matsumoto, 2016, para. 2). Essentially, these subject journals provide the literary evidence that comes with an investigation. An example of a nature journal is shown below.


(Beadel, 2016)

Syllabic Analysis

Between all subjects, teachers want students to continuously build upon prior knowledge to form connections between ideas. A way to do this is through syllabic analysis. “A morpheme is a meaningful part or unit of a word that can't be divided into smaller parts. It isn't important

that your child know the word morpheme itself, but it is helpful for your child to learn that words may be related if they share a morpheme. There are different types of morphemes, including root words, prefixes and suffixes. Below you'll find some science words, their morphemes, and some related words" (Reading Rockets, 2012, para. 2).

Science word	Morpheme (meaning)	Related words
Photosynthesis	Photo (light)	Photography, photograph
Thermometer	Therm (heat)	Thermos
Microscope	Micro (small), scope (see)	Microwave, stethoscope
Geology	Geo (earth)	Geode, Geometry
Graph	Graph (write)	Autograph, bar graph

Talk It Out

Talk it out, also known as a think aloud, is more of a teaching and explanation tool than it is a strategy.

> "It is an activity in which the "expert reader" (the teacher) demonstrates for students the thinking that occurs as he/she constructs meaning from a text. The "expert" reader makes visible to the students the thinking, questioning, predicting, reflecting, connecting and clarifying that occurs during reading. A think-aloud allows the student "to see" the reading strategies an "expert" reader uses" (Connecticut State Department of Education, 2007, p. 60).

So, for example, in a math class, whenever a teacher is solving an equation, they vocalize their steps while performing them so that the viewer is getting an explanation as to why the procedures make sense.

Texts About Subject-Area Content

Of these strategies, reading various and engaging texts featuring subject-area content seems obvious. Although a well-recognized practice, books that have content-specific themes still seem to allude the classroom. It is important to note that these books can be nonfiction or fiction, what makes the difference is the participation of the reader, seeking and noticing scientific elements from the story. Also, the types of text read can be diversified, like "big books, novels, storybooks, poetry, popup, inquiry, informational, and discovery and exploration books" (Plummer & Kuhlman, 2008, p. 99).

Video Clip

During instruction in science, videos are often implemented to show realistic events. For example, it is easy to talk about a rocket launch when learning a lesson over forces, but a video would be a nice compliment to watch and use as a guide. There are other uses for video clips, such as digital lessons where another individual teaches the content (Scott et al., p. 3). An opportunity that could be provided to students would be to create their own video over a subject matter where they are the teacher. This process would require them having content-specific knowledge, operating a videoing device, writing a script, reading it while being recorded, and presenting their work to an audience. If done in groups, a single class could create anywhere from 4-12 videos. Then, these could be privately published to a class channel, like on YouTube or another outlet, so that there is an audience, but those viewing can only watch with the link the teacher gives out.

Conclusions and outcomes

After consultation and review of a multitude of sources and other studies, there are some logical conclusions to be drawn. Restating the initially opposed question: how can integration and cross-curricular methods be implemented so that language arts and another subject can work

in tandem to provide meaningful and engaging learning opportunities that meet the needs of students?

Having successful integration of subjects is dependent upon an understanding of how curriculum can be taught to best educate the students. The way people can communicate seems to be increasing daily. Students have a high interest in being an active participant. This shifts the responsibility of designing and employing engaging curriculum and instruction methods to educators, administrators, and other school officials.

There are small, daily strategies that can be implemented to promote the integration of subjects. From bell ringers to comprehension activities, the strategies suggested, and others like them, often convey similar points being taught otherwise. Integration strategies should intentionally find ways to incorporate other subjects, such as language arts in science. In many ways, integrating subjects fits naturally into curriculum and instruction methods, but it takes a conscious effort by educators for implementation.

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