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Increasing Engagement and Retention: Teaching Classic Literature through the use of Geoinquiry

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Increasing Engagement and Retention:

Teaching Classic Literature through the use of Geoinquiry

by

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Abstract

Traditionally taught texts in the average public-school classroom tend to include *Of Mice and Men* by John Steinbeck, “The Mask of the Red Death" by Edgar Allan Poe, and *Fahrenheit 451* by Ray Bradbury. These classic texts, recognized by the literary community for their merits and accolades, have been brought into the schools for their universal themes and ability for students to be exposed to genres they might not otherwise choose to immerse themselves in independently. Fostering engagement with these texts can be a challenge, but engagement can be increased by adapting lessons to include cross-curricular elements. Geography, maps in particular, allows for a more in-depth connection to teens lives which not only makes a lasting impression but gives students a reason to care. Through cross curricular instruction, with the use of geoinquiry, there is an increase of student engagement of classically taught texts within the public-school system ultimately leading to higher student achievement.

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Chapter I: The Basic Principles of the Neuroeducation Framework

Education is changing. Research is showing students need to be able to create personal connections to what they are being taught in addition to being exposed to various topics across content areas. The high-school English class is changing. No longer are students asked to memorize and regurgitate: in order to be college and career ready, they are being taught to think critically and build bridges independently between the variety of content they are being taught. Technology is ever changing. Digital tools are frequently being used within the classroom that allow teachers to challenge the way their students are thinking and learning in the 21st century fashion. The understanding of the brain and its application towards education is changing. Using what scientists have discovered, using neuroscience and educational psychology, teachers can instruct students based on what their brain needs to collect, recollect, and apply the things they are learning in the classroom in a more universal and personal manner.

Neuroeducation is the use of brain science to inform educational practices to better meet the academic needs of students. Catherine and Miriam Beauchamp in their "Boundary as Bridge: An Analysis of the Educational Neuroscience Literature from a Boundary Perspective" share various scholarly definitions to arrive at defining neuroeducation as a "multifaceted linking of diverse yet related disciplines" (28). Other than what the terms suggests, neuroeducation encompasses psychology in addition to neuroscience, and educational components. Each of the three fields previously mentioned include smaller sub categories establishing how a single word can be rather expansive in meaning. Ali Nouri's "Defining the Boundaries for Neuroeducation as a Field of Study" identifies that before continued research in neuroeducation can take place, a common language among researchers and educators need to be developed in order to avoid misrepresentations (3). The current terminology incorporates many different disciplines, each

with their own terminology and way of explaining things, research lends to the confusion depending on which area of study it came from. The terms and varied definitions can quickly lead to confusion and inaccuracies; key terms that are at the focus of this conflict will be included in the glossary.

Recently ESRI, Environmental Systems Research Institute, has created geographic-information systems called ArcGIS where students are able to use professionally curated digital maps about the settings, themes, and topics within the novels they are being asked to study in high-school English classes. The maps are layered with data that allow for a more interactive and inquiry-based lesson. For example, if the class was reading the classic American short story "The Mask of the Red Death" by Edgar Allan Poe a map creates an opportunity for analysis as well as personal connections. Poe' short story reflects the outbreak of tuberculosis during the 1800s and a map layered with data about the population infected during the time in which it was written in comparison to those infected today establishes a relevance that students need as they read the difficult text. Analysis and interconnectedness is the very basis of geoinquiry. Students become engaged with what they are reading by using maps to explore the main ideas in classic novels while delving deeper into modern-day issues through the themes established in the text.

Furthermore, geoinquiry gives students the skills to craft and explore in a digital setting. Technology-based programs create opportunities within the world of literature to provide a way for students to actively participate in their own education. In addition, the use of technology in a structured setting allows for the development of 21st-century skills, making the students marketable in a variety of career fields after graduation. The opportunity for student engagement and retention of information greatly increases through making events from classic fictional stories relevant to the students, through the use of interactive technology-based maps.

Students who are actively engaged in the content are being taught to remember and retain more information. Understanding how the brain develops memories encourages teachers to be purposeful in the structure of their lessons as well as the activities they provide. Teachers can lead their students to higher academic achievement through encouraging memory development in relation to the content being taught. When students are asked to demonstrate what they have learned in a summative assessment, geoinquiries provides students with memories to recall based on their engaging experience.

The following chapters present research-based insight as to how the brain functions in addition to explaining how the needs of the students are met based on using geoinquiry programs like Google Story Maps and ArcGIS. The goal is to substantiate how these programs lead to and increase engagement and retention of classic literature when paired with the geoinquiry process. Additionally, taking into consideration that educators may not be aware of the benefits that geoinquiry offers across content areas, practical resources are provided throughout as an easy way to incorporate geoinquiries into any classroom.

Chapter II: The Role of "The Classic" in the Classroom

The typical high-school English class has a negative reputation with the general public. The media and field of entertainment greatly influences the public's view. Movies like *Bad Teacher* or *Ferris Bueller's Day Off* paint an image of teachers as ones who could care less about their job and even less about their students. The lack of energy and concern that these fictional teachers give is received as comical, but what lasting damage does this create when it comes to the perception of teachers? To make matters worse, personal experiences of having "that teacher" the one who lacks care and empathy in the classroom only magnifies this negative perception. Teachers, especially those who teach English, have developed an adverse reputation because people who are now out of school are able to draw only on dated personal experiences and images delivered from popular films.

Memories of being forced through a book, a book that was published by an old white man hundreds of years ago, tends to be a reoccurring memory for most people. Unable to connect to the text they are being asked to read, students today become more frequently disengaged leading to a decline in academic progress. Teachers are struggling to engage their students when at surface level many of the books that students are asked to read do not appear to be about themselves. The unfortunate reality of public education is that the media portrayal is not far off from reality. Increasingly teachers are asked to follow a prescribed curriculum that leaves students with little chance to actively engage with what is being presented to them and what they are being asked to read. State-mandated standards and their correlated benchmarks establish unrealistic goals for educators who are asked to complete duties beyond classroom instruction. Research is showing that teacher shortages are caused by educators who leave the profession prematurely meaning that there are plenty who enter the profession but a staggering number who

leave after a few short years (e.g. Watlington 23). Teachers are set up for a career of long hours, little appreciation, frustrating parents, and more on the job training their first few years of teaching that college is unable to prepare them for. The focus on students and their educational experiences becomes less of a focus as the teacher burnout rate continues to climb.

Outside influences factor into teachers leaving the profession but there are obstacles they face within the classroom that contributes to them leaving the field of education as well. Ultimately students and learning are supposed to be the center of education, but they too are hindering positive experiences in the classroom. Reading among teens has decreased over recent years. A 2003 study completed by the National Endowment of the Arts reported "marked decline in the American public's engagement with literary texts and claimed that the young adult population showed the steepest decline for reading in recent years" (qtd. in Groenke and Maple 56). Time has passed since the publication of this study but with the current distractions, like the accessibility to technology and social platforms, no substantial changes have occurred to suggest that teen reading has increased. Lack of reading is something to be concerned about from a societal and educational standpoint. If students won't read books of their choice, then educators are set up for failure when they are supposed to encourage students to read the books recommended by the state. Teen entertainment is not a factor in the selection process for novels taught in the classroom; rather the books taught are chosen for educational and humanitarian purposes. The bottom line is that adults need to help foster a passion for reading, and the classroom is one consistent place to do that. Even if teachers have little say in what is being taught, the method of delivery and support activities can attempt to change students' views of reading.

Politics have become so highly involved in education that schools and their teachers have little power and influence tied to finances such as curriculum. In 2019 the US Department of Education set aside 59.9 billion dollars for “discretionary appropriations” with the intent to return previously held national power back to state leaders (President's FY 2019 Budget Request for the U.S. Department of Education). With the power being put back into the hands of educational experts such as teachers and administration, these designated funds will influence local education in a positive manner. Over time this shift in power will lead to academic achievement based on supporting teachers and their students through fiscally relevant changes. The more money in the hands of the school the easier it becomes to retain and support teachers and their needs. Despite what the blockbuster films might portray, time and energy is always being spent on providing enriching educational experiences for students.

What are students being asked to read and what qualifies those texts?

The license teachers earn recognizes them as highly qualified individuals. English teachers need to attend numerous pedagogical as well as literature specific courses in order to prepare them for the rigorous testing mandated by the state in order to prove their competence in their content area. Throughout an English Teacher’s educational experience, the notion of what is a classic novel is challenged. Becoming widely read, soon to be teachers are exposed to literature that not only confirms what is commonly thought to be a classic but new ways of viewing any literature they read as potential classic material. According to the Minnesota State Standards, which are a slightly modified version of the Common Core standards adopted nationally, texts that are read in English Language Arts grades 6-12 need to have a combination of complexity, quality, and range (MN K-12 Academic Standards in English Language Arts). Complexity is the level of difficulty that the students are asked to grapple with throughout the

reading of the piece. There are several things that make a literary piece complex like the language or content. Quality is a label that is earned through a high standard of writing established by readers whose vast experience qualifies them to judge literary pieces and make such distinctions. Range is defined by the variety of subjects, cultures, and time periods that different literature covers. A combination of these three benchmarks establishes why the ideal books for the classroom are classics. In addition, using complexity, quality, and range the opportunity for any text to be added into classroom curriculum allows teachers to incorporate a variety of culturally relevant texts.

When it comes to complexity, three factors are used to evaluate a text to see if it meets the standard. These evaluational pieces include analyzing for difficulty, using qualitative and quantitative measures, and matching readers to text and task. The Minnesota state standards go on to say, "texts need to be selected around topics or themes that generate knowledge and allow students to study those topics or themes in depth" (78). A work that is complex asks the readers to study it in depth. In order to access the layers of meaning as well as the historical context, the reader cannot take things at surface value. Students need exposure to various degrees of complexity, scaffolding provided by instructors from entry status to mastery, in order to become college and career ready as identified by the standards.

In order to determine whether a piece of literature is a classic, a committee uses a series of constraints to measure texts of the same nature to identify their quality. Rick Gekoski in his "What's the Definition of a Great Book?" takes into consideration when evaluating literary text for quality the following constraints: how well written the text is, how accessible its theme is, how universal its storyline is, and how memorable the text is overall (Gekoski). Language used in a piece of literature reflects the time period in which it was written along with establishing

quality through word choice. The wording in a book does not need to be overly complicated to earn the quality label, however it does add a layer of complexity when studying the storyline and theme. In addition, the text must convey an enduring and memorable storyline in order for the audience to access the themes and connect it to themselves. The standards selection committee takes the different evaluative constraints into consideration when choosing which classics to recommend for classrooms, what the 2010 revised Minnesota standards call "exceptional craft and thought" (49). Not every piece of classic literature will contain the four established criteria, the presence of all or some of these constraints allow a richness of choices when incorporating classics into the classroom. The quality pieces of writing stand out among its peers when literature is ranked using the mentioned criteria.

Finally, the state standards recognize that students must be exposed to a range of literature in order to become college and career ready. The 2010 revised Minnesota standards identifies that "range extends across genres, cultures, and centuries. Such works offer profound insights into the human condition and serve as models for students' own thinking and writing" (49). Literature selected to be read in school was meant to provide messages that assisted students in developing a strong moral compass. Exposure to fictional scenarios that cultivated critical thinking around the topics and experiences shared within the pages of a classic novel, allows students to foster personal and academic growth. Classic literature hits the mark on the three mentioned specifications, genre, culture, and century when teachers remember that variety is essential in the classroom. Literary classics encompass an array of genres, provide cultural experiences vastly different from today, and comes from a period where time where the text has proven its value creating an opportunity for students to grow as readers and develop awareness as human beings.

A piece of literature is subjected to a rigorous process in order to make it into the classroom. The standards, which were created, selected, and evaluated by a committee put together by the Minnesota Department of Education Commissioner, go on to give examples of such novels, poems, and nonfiction pieces that meet these requirements. Table 2.1 identifies these literary works by their title, author, and year they were published organized by banded grade levels.

Table 2.1

Compiled Suggested Texts from the MN Language Arts Standards

Grade Level	Literature: Stories, Drama Poetry	Year
9-10	*The Tragedy of Macbeth* by William Shakespeare	1592
	"Ozymandias" by Percy Bysshe Shelley	1817
	"The Raven" by Edgar Allan Poe	1845
	"The Gift of the Magi" by O. Henry	1906
	The Grapes of Wrath by John Steinbeck	1939
	Fahrenheit 451 by Ray Bradbury	1953
	The Killer Angels by Michael Shaara	1975
11- CCCR	"Ode on a Grecian Urn" by John Keats	1820
	Jane Eyre by Charlotte Brontë	1848
	"Because I Could Not Stop for Death" by Emily Dickinson	1890
	The Great Gatsby by F. Scott Fitzgerald	1925
	Their Eyes Were Watching God by Zora Neale Hurston	1937
	A Raisin in the Sun by Lorraine Hansberry	1959
	The Namesake by Jhumpa Lahiri	2003
	Ceremony by Leslie Marmon Silko	1986

Source: "MN K-12 Academic Standards in English Language Arts." *Minnesota Department of Education*, education.mn.gov/MDE/dse/stds/ela/, 2010.

The texts featured are written before any of the children ask to study them were born suggesting that the literature that has complexity, quality, and range to be "qualified" is not contemporary.

Modern texts were excluded from this list since they have not had the time to develop a deep level of complexity that many of its classic peers is recognized for. In addition, many of the modern texts are focused on easy readability and clear storylines in order to be marketable to buyers. Not using modern literary texts in the classroom was not the message the committee intended to send to teachers or students; however, these particular texts were offered as examples due to their level of sophistication, complex character perspectives, and multiple levels of meaning.

Macbeth by Shakespeare is on the recommended literary text list and considered a classic that covers all three of the elements: complexity, quality, and range. The complexity of Shakespeare's works is undeniable, from the language to the intricate storylines. Quality is reached when the literary text being examined stands out amongst like literary pieces. Christopher Marlowe and Ben Jonson are names that might stand out to someone who studies literature, but when comparing the works of the other playwrights of the time to Shakespeare, his work has an identifiable quality over his peers. Range is developed when works that exhibit complexity and quality, like that of Shakespeare's *Macbeth*, are placed next to other texts within a classroom curriculum that offer other merits. Range cannot be established by an individual piece of literature, once other complex and quality pieces are incorporated into the reading collection it will be clear to English Teachers why *Macbeth* has earned the label of classic and is recommended to be taught in an educational setting.

When English teachers start in a new district, whether this is their first teaching position or fourth, previously established curriculums and traditional practices in their new place of employment will determine what they will be able to teach in their classroom. Depending on the school, finances, and freedom English teachers may not have any say as to what books they

teach. Books, especially those that have earned the label classic, are intimidating. New instructors develop a reluctance to teach the classics that can be attributed to lingering confusion from when they initially read the book or wanting to provide justice to a text that has earned the title of beloved classic. A career in education is fueled by passion and an English teacher's passion is literature. Regardless of the curriculum or preconceived notions surrounding classic literature in the classroom, the one thing that remains clear about literary texts is the value that they bring to students.

What is the value of reading classic literature?

The types of literature recommended by the Minnesota Department of Education are identified as classics because they stand the test of time, offer universal themes and storylines, and are accessible to the students asked to read them. Classic novels are held in esteem as the standard for writing at that time. Readers are exposed to three values as they read a text that has earned the title of classic. In their 2019 "Value Review of Literary Classic Education at the Basic Stage of English Major in the New Era," Yonghong Gao finds that classic literature has aesthetic, ethical, and social values. These values are what teachers hope to share with their students when incorporating classic literature into the classroom.

Aesthetics is the triggering of emotions in response to something profound or beautiful, something teens are more than capable of doing. Emily Brady in her book *Aesthetics of the Natural Environment* states that our response to the aesthetic is emotional: we feel "pleasure in response to beauty and displeasure in the response to ugliness" (11). Any sort of reaction, whether it be happy or sad, is an emotion, which occurs in response to the work. Steinbeck's novella *Of Mice and Men* is an example of a literary text that offers an aesthetic experience for its readers. Audience members encounter a sense of "displeasure" as the author incorporates the

death of a puppy and Curley's wife, things that are described as beautiful and wholesome. This reaction is a response to the aesthetic relationship that the author develops between the reader and the classic. Classic literature provides the reader an opportunity to engage in introspection through the layers of literary elements that offer something new every time the piece is read and reread. Complexity like this cannot be found in every text. The relationship that is formed between the author and the reader of their piece is developed due to the complexity and quality of a literary text that is traditionally thought of as a classic. The challenge that develops out of assigning a classic that offers emotional responses like these is how to bring it to a level where high-school students are able to understand and appreciate the complexity: a difficult challenge but not an impossible one. Reading classic literature develops students' ability to recognize aesthetic value when they feel empathy, or not, towards the characters and their situations.

Secondly, students are able to develop ethical values when their morals are challenged by events in a classic text. Morals are one person's sense of right versus wrong that are developed based on personal experiences during adolescence. DiCicco and Taylor-Greathouse claim in "The Moral of the Story: Young Adult Authors Speak on Morality, Obligation, and Age Appropriateness" that "fiction can help readers determine and understand their own ideas about morality and can help them work through moral quandaries" (75). Books shape the way readers interact with the world around them. Many literary texts that earn the classic label include conflicts that challenge the traditionally accepted moral norms of society. For example, almost everyone believes that taking someone's life is wrong. In *Of Mice and Men*, which is categorized as a classic American text, one of the main characters, George, kills his brother-like companion, Lennie, as an act of mercy. Moral code is challenged by understanding the relationship between the characters as well as the motivation behind the action. Readers know that murder is wrong,

but sympathizing with George allows them to ethically reconsider their previously held opinions. Students will be able to develop ethical values by being put in situations that allow them to question the beliefs that they hold. A strong sense of ethical values allows people to see the world differently in addition to fostering empathy to those in conflicts. Moral questioning causes a literary text to develop in its readers a sense of timelessness and values based on the guidance and influence that it can have on its young adult readers.

Finally, classic texts assist readers in shaping their social values. Literary content has the ability to convey to the readers the "Complex struggles in social relationships" (Gao). Literature offers a cultural and social lens that might not otherwise be obtainable. Viewing the characters in complex situations and seeing how they handle them assists the reader in developing a set of values they may not be able to acquire based on personal experience or observation. The concept of social value is expanded further when one considers what the average teenager regards as valuable. Gracy Olmstead's 2016 "There's Never A Good Time To Take Classic Literature From Classrooms" makes the point that another key feature of the classic is the ability to explore different worlds and cultures (Olmstead). High-school students, or teenagers in general, have the tendency to be focused on themselves and the issues they encounter. Having this mindset allows little room to experience other cultures and develop a sense of empathy towards those who differ from themselves. When teachers incorporate texts like *Of Mice and Men* students are able to step back in time, develop an understanding of the conflicts the characters are facing, expand their sense of empathy, and experience vastly different cultures.

Classic literature needs to be in the classroom to assist students in developing their own moral compass, to help them feel about the injustices they experience in the context of history, and respond to everyday issues with empathy that establishes a socially balanced generation.

The difficult reality our world is facing drives us into numbness. Books force people to feel, to remember, to think and classic literature reminds us that feeling is a range of emotions. Teens are at an age where they have had little opportunity to really experience the vastness of the world around them. Classics introduced in a classroom setting presents students with a chance to start understanding how writing is an outlet during difficult times and relates to future generations what society valued.

Why do students struggle reading the classics?

The value of classic literature has been outlined from the perspective of literary experts and English teachers, the problem with classics in a high-school English class begins to surface when the students are asked to read them. Moans of displeasure and loathing fill the classroom when titles such as *Romeo and Juliet* are mentioned. Educators would anticipate that students would enjoy a story filled with death, action, and plans gone awry all because of a couple of teenagers, when in reality students give up before they even crack open the cover. Daniel Willingham in his *Why Don't Students Like School?* identifies basic elements of how our brains function as a way of explaining why some students have come to not only dislike the classics but school in general. Two reasons that Willingham identifies for students struggling with school include the process of learning and the challenging nature of the material.

First and foremost, it is important to recognize that the process of learning is arduous on the brain and cumbersome for most. Within his first chapter Willingham outlines the difficult process of thinking, the first component of learning. He states that "Thinking is not only effortful, it's also slow and unreliable"; in fact, adults struggle with thinking just as students do (4). Recognizing that adults have a hard time learning new concepts makes it understandable that students struggle in a classroom environment when multiple new concepts are introduced.

Students who face this difficult process can experience a sense of hopelessness or feelings of failure causing students to check out and stop paying attention. Willingham goes on to say, "Despite the fact that we're not that good at it, we actually like to think" (9). Learning new content that is not only relevant but perceived to be helpful later in life is met with personal determination that unhelpful information does not garner. This potential for determination needs to be used to a teacher's advantage when they frame and introduce new content. Teachers need to have an increased awareness of how their students think when introducing literary texts because their students have little prior knowledge on the setting and themes. The learning process will be covered in more detail in the next chapter, the profile of an engaged student.

Another key issue that turns students away from learning the classics, which Willingham identifies, is the challenging nature of the language. Students need work that is difficult but not so difficult to cause them to give up. *Why Don't Students Like School?* goes on to say that our brains like challenges but only when they get the satisfaction of solving whatever problem they are facing. Once students take a look at the language Shakespeare uses, or the phrasing from a novel written centuries ago, intimidation can set in and cause them to dismiss the text before they even have a chance to try it. Students at one point or another have felt overwhelmed in the classroom, and presenting them a lengthy piece of reading with words that are not recognizable causes the brain to accept early defeat. Classic literature needs to be taught with guidance from instructors trained to use different techniques to ensure that the brain gets that needed element of success, training based on research.

Learning has earned the label of being difficult and as students' progress though elementary years, it loses its fun and alluring nature. The views of the students matter. Willingham's question "Why Don't Students like School?" is answered using brain-based

research, which provides ample ways to mend the broken relationship students have with school. What sets Willingham apart from other researchers is his ability to bring in-depth and complicated theories and psychological concepts to a level that is accessible to someone who is versed in education. Student mindset can impact how much they learn as majority shareholders of learning in a public-school setting. All content areas must consider students mindsets and the ways in which students learn as new information is presented. Teachers who incorporate brain-based best practices into their classrooms are able to introduce educational psychology, engagement opportunities, and cross-curricular instruction to their students, resulting in a change of perception.

Teachers have the ability to change the way that they are represented in popular media and it begins by changing the way students perceive school. Geoinquiry paired with classic literature is a way to combat negative media stigma by actively engaging students in their English classes. Works that have earned the title of classic, provide students with a chance to explore different cultures and experience storylines that connect to their lives. There is a sense of buy in from students when they feel that what they are learning is about them. Teachers need to find a way to get the attention of the students in a meaningful way that allows them to connect the content to their lives as well as seeing the practical applications of what they are learning. This is accomplished by understanding what an engaged student looks like and how to use the way their brain functions as an advantage when structuring and planning lessons. The following chapter will identify the different types of engagements as well as what it takes to get students there.

Chapter III: Profile of an Engaged Student

Before an in-depth discussion can take place as to how the use of geoinquiry increases student engagement, a profile of what a highly engaged student looks like needs to be created. The basis of establishing and retaining attention is founded on how the brain functions based on the stimuli provided. The transformation of information gathered via direct attention is how short-term memories are developed and later turned into long-term memories. Attention and therefore engagement is a key factor in learning. After having a better understanding of how the teenage brain functions and processes new information, educators will explore practical strategies in this chapter to successfully engage students in the content they present in their classroom.

As an influence on educational practices, neuroscience, the study of the brain, can be dated back to 1895. Catherine and Miriam Beauchamp in "Boundary as Bridge: An Analysis of the Educational Neuroscience Literature from a Boundary Perspective" credit the early research efforts of Henry Herbert Donaldson and educator Ruben Post Halleck to examine the connection between neurobiological research and education (45). It is this pioneering work that has led additional scientists and educators to study this field with fervor even today. Since then major technological advancements create even more opportunities for research and understanding what is known about the brain and how that knowledge can be applied to education.

Two modern texts are going to be referenced throughout this chapter to explain how people learn on the scientific level. David Schunk's *Learning Theories: An Educational Perspective* goes into detail about the anatomical structure of our brains and the central nervous system and how all of the parts work together to perceive, process, and retain information. In addition, this is a text written for teachers as a way to improve their instruction based on the

primal way in which each and every person's brain functions. The second text is Eric Jensen's *Teaching with the Brain in Mind.* Very similar to Schunk's work, *Teaching with the Brain in Mind* uses diagrams and education-based examples to convey how students learn. This book takes into consideration the students' experience in the current education system while providing realistic solutions to solve students' lack of engagement. With both of these texts written as a way to inform teachers of brain-based best practices, references to support engagement come naturally for this chapter.

How does the teenage brain function?

Educators, parents, and the general public have been trying to answer this question for some time. Understanding and applying what has been learned about the brain — neuroeducation — becomes a practical way for instructors to reshape what engagement looks and sounds like in their classroom. Neuroeducation is the science behind how people learn and using that information in the field of education can help improve teaching practices. Jordynn Jack argues in her 2010 "What are Neurorhetorics?" that the purpose behind the study of the brain is to figure out how students learn best and expand on techniques within the classroom that purposefully use this information to structure lesson delivery and content (406). The science portion of *neuroeducation* is rooted in *neuroscience,* the study of how the brain is wired. In *Learning Theories: An Educational Perspective* in the chapter "Neuroscience of Learning", Dave Schunk explains the basis of how memories are formed and stored. This information is significant when applied in the classroom setting, especially considering memory retention. As educators, if we are able to apply this science to our everyday practice, if we operate in a way that considers teen brain function, then we are using neuroeducation. Two main topics will help inform educational

practices based on how the teen brain functions including the development of the brain during adolescence, and the creation and retention of memories.

During the early years of brain development, two age groups of school aged children have defining features: elementary/middle school years and teenage years. *Teaching with the Brain in Mind* by Eric Jenson identifies that between the ages of 5 and 12, adolescent brains increase their cognitive capacities, social skills, and ability to make informed decisions (29). These significant changes occur as the brain further develops, but it is not until the teen years that remarkable transformations take place. Hormones are often to blame for the fluid emotions associated with being a teenager when in reality research has revealed that the brain may have a large part in the emotional instability. Jensen shares further that "The rapid and massive structural change occurring in the brain during the teen years is actually the biggest reason for often-bizarre teen behaviors" (30). The way that the brain is able to catch up with all of these day-to-day changes is by increasing the amount of sleep to recharge and capitalize on what was learned throughout the day. Overall, by understanding the types of changes that the brain is going through in school aged adolescents, teachers are able to make informed instructional practices to benefit all parties involved in learning. When it comes to how students learn, it is important to recognize that students are more alike than different in the ways that they learn and the function of their brains. One of the first concepts that Willingham introduces in *Why Don't Students Like School* is the idea that the brain does not like thinking. They state that "Thinking is slow and unreliable" (3). Oftentimes within the school setting many lessons are set up in a fashion that encourages students to try and fail and try again. Willingham goes on to say, "people enjoy mental work if it's successful" (3). If students lack the affirmation of success, the brain is less receptive to the information that is being presented. Students experience mental strain due to

the sheer volume of material that they are being asked to process and recall on a daily basis. The main difference in comparison to adults is that adults have more of a say and control as to "how to maximize the pleasurable rush that comes from successful thought" (3). Thinking attentively is a skill that is developed by processing information as well as having more control of where people's attention is directed. How to achieve such cognitive conditions in the school setting will be described in greater detail in chapter five of this text.

Memory creation and retention is the next element of understanding how the teenage brain functions. In her 2018 *Beat Boredom Engaging Tuned-Out Teenagers*, Martha Sevetson Rush states that

> Although every individual's information processing is slightly different, we all basically learn by attending to new information to our environment (physical, visual, or auditory), processing it in our short-term memory, relating it to information we already know, and filing it away in our long-term memory for future use. (14)

Students must first be paying attention to what is taking place around them, then be able to experience content association, connecting prior knowledge to what they were just exposed to in order to process it properly. Attention and connection to prior experiences seem to be the main ways in which to ensure the longevity of memories. A key element in retaining information is to note what material constitutes as significant enough to be moved from short-term to long-term memories. As educators we like to believe that everything in our content area is important for student success beyond their lives in high school. The reality of education and the process of learning is that we are not built to remember every stimulus that our brain encounters and process it into a memory. When they redesign their curriculum to acknowledge the way the brain functions, teachers are incorporating components of neuroeducation. Lessons, units, and

assessment standards need purpose, and with that sense of purpose students knowing where their learning is headed will help them be more successful.

Neuroeducational practices can be implemented more successfully when teachers understand the way short-term memories are turned into long-term memories. The memory formation process is not overly complicated and begins with a stimulus. Schunk's *Learning Theories: An Educational Perspective* describes that when our sensory receptors perceive a new piece of information that is being input, it causes the brain to start thinking about what has been introduced and starts trying to connect it to prior information already stored in the brain (33). From there, the stimulus is sent to various parts of the brain for processing, including the thalamus for initial processing and different cortical and subcortical structures. If the stimulus is perceived as a threat, then it is routed to the amygdala, which asks for help from other parts of the body to react appropriately. If the information is not a threat, it is then routed to the hippocampus for more detailed analysis. In *Teaching with the Brain in Mind* Eric Jensen states that over time the hippocampus will use this new data to "organize, distribute, and connect the memories with other appropriate areas of the cortex for long term storage" (15). The time that it takes for this process to occur is astonishingly brief, which means the strategies used to create an engaged student need to take place before the new information is presented or in a way that ensures that the hippocampus has plenty of time to process the information as valuable. The key to student engagement and classroom success is moving short-term memories into long-term memory storage. Jensen goes on to say that "If the information isn't novel or interesting — or if it doesn't relate to anything we already know — it will not connect to existing information in our long-term memory" (14). The brain needs to know in advance that the information being presented is important, and the issue arises when the brain is asked to remain on high alert status

for lengthy periods of time, an unrealistic expectation to place on anyone. The brain can sustain attention for only small chunks at a time, even an adult one, before awareness and engagement drifts. Table 3.1 outlines the amount of time that the brain can maintain attentiveness organized by age ranges. Students are being asked to sit quietly and obediently in a desk for hours at a time while being inundated with content. From middle to high-school students at their very best are able to focus for fifteen minutes at a time and even this amount of time is extremely optimistic. Expecting them to recall information from six to eight different classes is not only unrealistic but ridiculous.

Table 3.1

Guidelines for Direct Instruction of New Content

Grade Level	Appropriate Amount of Direct Instruction
K - 2	5 - 8 Minutes
Grades 3 - 5	8 - 12 Minutes
Grades 6 - 8	12 - 15 Minutes
Grades 9 - 12	12 - 15 Minutes
Adult Learners	15 - 18 Minutes

Source: Jensen, Eric. *Teaching with the Brain in Mind*. Association for Supervision and Curriculum Development (ASCD), 2005, pp. 37.

Public schools are failing their students, from the perspective of neuroeducation, based on what we know about the teen brain, how students learn, and how students form new memories successfully. Matthew Walker in “A Refined Model of Sleep and the Time Course of Memory Formation” argues that “research in the neurosciences continues to provide evidence that sleep plays a role in the processes of learning and memory” (52). Starting schools anytime between

7am and 9am is backwards in effectiveness since teens need more sleep to assist in their rapid brain development. Lessons being delivered have no time to be processed due to the lack of sleep, causing any short-term memories to be cleared out from the previous day. Students who suffer from trauma or not having physical and emotional needs met cannot be placed on the same scale as their peers who are able to be attentive for a longer span of time. Aside from what students experience daily, once they leave they are faced with homework, after-school activities, and sometimes damaging home lives. Expectations only rise as the students age. Students are not as successful as they could be when workload increases and the stress induced demands on the brain results in short attention spans. Considering what the school routine looks like for the average teen, from the moment they wake up to the time they go to sleep, the current education system is setting students up for failure. Public school education is founded in tradition and has proven difficult to change, but with the increasing awareness of how the brain functions, more can be done to assist in making students more successful in the current state of affairs.

What does an engaged student look like?

Michael Lawson and Hal Lawson's "New Conceptual Frameworks for Student Engagement Research, Policy, and Practice" classifies engagement into three categories: affective, cognitive, and behavioral. Taking a closer look at what drives each of these elements will make clear what students need in order for them to be engaged during a lesson.

Affective engagement brings to light the social and developmental requirements of students before learning can take place. Primary needs such as food, shelter, and sleep must be met before engagement can take place. Zoya Faisal explains in "Maslow's Hierarchy of Needs for Learners" that "certain needs (in the lower levels of the hierarchy) must be met before a person will try to satisfy higher-level needs." (Faisal). Abraham Maslow argued that the higher

up someone is within the hierarchy, the happier and more fulfilled they are. The same idea needs to be applied to students in the classroom. Life does not fail to exist the moment the bell rings, motivation to learn is hard to find when students are concerned about making it through the day. The Lawsons convey that

> Above all, research finds that students are not on "automatic pilot" when they are at school. Their feelings and emotional attachments matter. For example, students who are attached to the people at school are more motivated to pursue and complete academic tasks than students who lack similar school attachments (436).

Teachers need to go out of their way to work towards establishing relationships with their students. These relationships will not only assist students in moving up Maslow's Hierarchy of needs, but help them to develop reasons to show up to school and pay attention.

The easiest way to tackle affective engagement is by creating a supportive environment where students feel valued as people as well as learners. In their 2017 “Brain Engagement: A Look at Chemical Reactions in the Classroom” Stephanie Knight explains that serotonin is a chemical in the brain that regulates mood, the more welcoming the classroom setting is, the more open the brain is to obtain and retain new information (Knight). Oftentimes there is little to be done to assist students with their lives outside of the classroom, but students can be made to feel heard and seen with fairly minor efforts from the educator. When students feel this way their esteem is boosted as well as their motivation to succeed. This internal sense of motivation is what creates engagement.

Cognitive engagement — the ways in which students think, reason, and remember — is the second feature of an invested student. Overall, cognitive engagement is the value that

students place on the content that they are working with that leads to cognitive engagement. Dave Schunk's *Learning Theories: An Educational Perspective* defines value as

> the perceived importance or usefulness of learning. Learners do things that bring about what they desire and work to avoid outcomes that are inconsistent with their values. Learners are motivated to learn and perform when they deem that learning or performance important (58).

When the value of what is being taught is lost to the students, their attention span and engagement in the lesson dissipates also. At all levels within the educational system, students need to be explicitly told what they are working towards so they can create a sense of value on what is being taught in the moment. Students are able to become more invested in a lesson when they know that there will be a practical use for the information sooner rather than later. Unit goals or objectives, which are derived from standards established by the state, are curriculum tools that show the students what is important and develops an urgency for them to pay attention. Aside from goals, students also need to know that what they are learning is useful. The more real-world examples, and practical reasons for learning the current lesson that are provided, the more the cognitive engagement will be accessed.

Behavioral engagement — how students physically act or react based on what is being taught in the classroom — is the final category of an engaged student profile. If a student is up out of their seat and detracting from what is being presented, the student is not engaged. Additionally, a silent and motionless class is another behavioral sign that the students may not be fully attentive and therefore engaged. Dr. Robert Marzano, an esteemed educator, researcher, and publisher in the field of education, is able to provide insight as to how a direct link between students knowing the intended target and their behavior. He states in *Designing and Teaching*

Learning Goals and Objectives: Classroom Strategies that Work that "Specific goals provide a clear direction for behavior and a clear indication of desired performance, and as such they serve as motivators" (6). These goals could be for the expected daily outcome of a lesson or even a long-term unit goal. Indicating what students are working towards allows educators to set expectations for what is acceptable classroom behavior in order to reach the set goal.

The profile of an engaged student has been built on the affective, cognitive, and behavioral components of a student. Students need to feel supported within the classroom and be explicitly taught what value the content being taught has to them. Finally, demeanor in the classroom can be a major indicator as to whether or not the two engagement elements, attentive and cognitive, are effective. For example, the classroom that has students who are feeling safe and engrossed in the content may be noisy and busy. Supporting students in these three areas of engagement classroom behavior can manifest itself in a variety of ways.

How can educators purposefully engage their students in their content?

Unfortunately, as educators we have little say in the standards we are being required to teach and at times the curriculum. The sheer volume of content that students are expected to master pressures teachers to move quickly and efficiently to ensure students are prepared for standardized assessments in addition to life beyond school walls. However, content can be delivered in a meaningful and engaging way that meets the requirements set forth by the state while keeping the students interested from bell to bell with the brain in mind. Research is becoming progressively available when looking at how to engage students in an increasingly distracting world. Four research-based suggestions offer ways to purposefully engage students in all types of content: meaningful conversations, problem solving, deliberate technology use, and learning metacognition.

Primarily, meaningful conversations can be identified under a variety of names: debate, discussion, philosophical chairs, Socratic seminars, and many more. These chats with the students are much more than the simple-question, direct-answer dialog that can dominate classroom conversations. Recall of information that occurs with a question and direct answer is a useful tool when used in a meaningful way, however reaching levels of critical thinking are difficult to obtain and need planning. Teachers need to be purposeful in their implementation of higher-level thinking and scaffold their lessons to assist students. Teachers have the opportunity to reflect and change, using tools and resources that are available, what questions they are asking the students. Bloom's taxonomy and Costa's levels of thinking are two widely accepted resources as a way of assisting students think deeply about the content they are learning about. Terry Heick in their 2020 "What Is Bloom's Taxonomy? A Definition For Teachers" shares that the taxonomy was created in the 1950s and has been used by educators as a way to "classify learning outcomes and objectives" (Heick). Table 3.2 presents a practical resource to assist teachers in helping students demonstrate their depth of understanding as well as dive deeper into the topic. The content greatly shapes the way in which dialogue will occur. Teachers who use this resource are able to scaffold with more simple objectives to be used with surface level topics at the left, working towards performance of skills on the right and allowing for a progression of content mastery. In order to develop memories, students need a sense of relevancy surrounding what they are working on and that will result in engagement. Using the blank template of Table 3.2, educators can connect what students have been exposed to in other content courses and see the relationship to their own lives. The easiest way to incorporate the Bloom/Costa resource into the classroom is to select a topic that results in a discussion that has no set answer. Debatable and

controversial topics open up a genuine discourse when structured and facilitated in a meaningful way.

Table 3.2

"Bloom's Taxonomy and Costa's Levels of Question"

Students will:					
Remember	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Create**
Learn specific facts, ideas, vocabulary Recall information or specific facts	Able to grasp the meaning of material Understand information without connecting it to other information	Ability to use information in new and concrete situations	Ability to break down information into parts and perceive interrelationship	Ability to judge the whole of the material for a given purpose Judgement based on given criteria	Ability to put parts together to form a new whole Use elements in new patterns and relationships
Introduction of Knowledge Being asked or prompted to answers:		**Practice Learned Knowledge** Being asked or prompted to answers:		**Demonstrate Mastery of Learned Knowledge** Being asked or prompted to answers:	
Where is . . . What did . . . Who was . . . When did . . . How many . . .	Tell me in your own words . . . What does it mean . . . Give me an example of . . .	How would you solve the problem . . . What would happen to you if . . . . If you were there would you	What things would you have used . . . What things are similar? Different? What other ways could you . . .	Select the best and explain why. Would you recommend the book? Why or why not? What do you think will happen to . . .	Design a . . . . Pretend to live . . . Write a different ending to . . . What would it be like to live . . .

Source: "Bloom's Taxonomy and Costa's Levels of Question." *StudyLib,* 2012.

The second way of purposefully engaging students in content is problem solving. Knight states in "Brain Engagement: A Look at Chemical Reactions in the Classroom" that, by offering them a chance to come up with a solution to a real-world problem, student's brains release dopamine — a feel-good chemical — when the brain is rewarded with a sense of achievement

(Knight). The more that the brain, and therefore the student, is actively challenged and rewarded, the more engaged the student will be in the lesson. Problem solving needs to be structured in a manner that allows room for questioning and multiple plausible solutions. Once students experience a sense of failure, the stream of dopamine ceases to flow. The time for trial and error has its place, of which teachers simply need to be cognizant when posing the question in the first place. Feedback surrounding the solution needs to be delivered in a positive manner so that students feel like they are capable and does not shut down the learning that is occurring.

Another practical way of engaging students in any content area is deliberate use of technology. In 2017 the U.S. Department of Education released an update to the National Education Technology Plan, stating that "To realize fully the benefits of technology in our education system and provide authentic learning experiences, educators need to use technology effectively in their practice" (National Education Technology Plan). The use of technology in the classroom was not meant to create digital worksheets for students to passively complete; the intention is to provide learning that transforms their educational experience. Engagement develops when students are allowed choice and personalization in the lessons that they are asked to complete. Technology has a place in the classroom, but the novel use of it is what keeps the students engaged with the content. Students are all unique individuals who need different things, and technology offers one possible solution to encompass these ideas.

A final practical way of engaging students has to do with metacognition. Metacognition is the awareness of one's own personal thought process. Engaging a student with this process can be connected back to how their brain functions. Massaro and Golombek in their "Review: Educating the Brain" state that by sharing with students the basic functions of their brains and how they learn, a sense of awareness can be developed and called upon when new content is

being presented (376). An example of what metacognition might look like in the classroom could be the instructor mentioning to the students that there are new and important concepts in the lesson. A teacher can activate students' metacognition by instructing them that the content needs their direct attention so that their brains will be more receptive to remembering the information later. As with other practical strategies mentioned previously there is a sense of novelty and intention that needs to be considered when the reference to metacognition is employed.

Teaching is hard. Educators are inundated with resources as a way to aid them in successfully completing their jobs. Trying to figure out how to meaningfully convey at-times-abstract ideas to students in an engaging way is difficult. Ultimately teachers realize that the latest and greatest piece of technology or fad curriculum is not what helps them to deliver content to their students, but the meaningful and relatable lessons. Geoinquiries is a program that offers a way for teachers to engage their students, but like anything else overuse results in wearing out the novelty. Engaging the brain through conversation, problem solving, and novelty allows for an attainable and realistic teaching experience that results in students retaining the content.

Ultimately the profile of an engaged student is complicated with all of the interworking components such as the difficulty of learning, limited attention spans and factors behind motivation. Although the brain functions in the average teenager the same as in their peers, the impact environments have on memory retention and engagement is something teachers need to be cognizant of. Learning is difficult and the current public-school system does not support what the brain needs in order to be attentive and successful in the creation of memories. Schools are measured by academic achievement and the more students can remember the content they are being taught the advancement of the district as well as the student will be evident. The brain

plays a major role in student engagement, and educators have the ability to use this information to their advantage and implement some of the various examples provided into their own classrooms.

Chapter IV: Success of Cross-Curricular Instruction

Traditional public-school buildings are filled with subject-area specialists. As mandated by the state, professionals that seek to teach in a 5-12 setting need specific training in a content that will be delivered to students. The amount of content expected to be conveyed for each subject area and grade level is staggering. Information across the different subject areas is too vast for one individual to lead students to mastery. The use of subject-area specialists creates an inadvertent isolation issue that has been in place for decades. The phrase "silo effect" has become a negative way of describing this logistically easy — yet detrimental way — of separating teachers by subject areas. "Tearing Down the Silos in K-12 Curricula" published by the Association for Supervision and Curriculum Development summarizes the issues clearly when it states that

> Historically, the siloed or segmented curriculum has been fairly commonplace in the classroom. Math teachers focused on math, science teachers taught science, and English teachers focused on English—and never the twain shall meet. Siloing subjects is easier for schools because it's easier to map out curriculum. But as students focus on each topic individually, they may be less proficient with the material, since they do not study complex, real-world applications or understand how interrelated subjects affect each other ("Tearing Down the Silos in K-12 Curricula").

Students are able to make meaning of the world around them by learning content that applies to their lives. Following the traditional and logistically easy curriculum practices puts students at a disadvantage for life beyond high-school. Real-world applications assist students for lives beyond high-school, but it provides an element of engagement as well which has already been proven to be desirable. If public schools continue with business as usual, the result will be

systems that are turning out students not adequately prepared for the complex problems they may face.

The current education system in place does not support what students need in order to be successful. Content needs to be interconnected by subject in order for the pupils to become more proficient. The place to start is with the teachers. Jonathan Savage's *Cross-Curricular Teaching and Learning in the Secondary Schools* explains that "There is no student development when there is no teacher development" (19). Teachers are at the very core of how and what is being taught in the classroom, and cross-curricular instruction could be the solution to slowly changing the silo effect. The focus of education needs to remain on the students, but teachers need to be at the root of changing the dated system if it is to be done effectively. The need for a change is clear, and cross-curricular instruction is one way to start creating that change. The benefits of cross-curricular instruction will be evident after a description of cross-curricular instruction, practical ways to implement it in the classroom, as well as the benefits to the students' brains through this teaching method.

What is cross-curricular instruction?

Cross-curricular instruction, the purposeful combination or layering of multiple content areas in order to support memory retention and deepen understanding, allows students the unique ability to see content they are expected to learn in the context of a big picture. Learning goals seem to get lost in the day-to-day activities of school. However, by interconnecting subjects it creates a way for students to understand the significance of what they are learning. The crossing or combination of two different content areas in order to provide a lesson leads to a deeper understanding of the ideas presented. For example, an English teacher covering the causes of the Civil War, when the setting of the novel being read takes place during that time, is cross-

curricular instruction. Conveying to the students how the fictional story might be based on or even shaped by historic events leads to a deeper understanding of the themes and conflicts presented in the literary text.

Various content areas lend themselves to being taught in conjunction with like subjects such as English and History in addition to Science and Mathematics, or even Health and Economics. Savage explains that The National Curriculum Council introduced the concept of cross curriculum instruction in their 1993 release of National Curriculum stating "Cross curricular themes" are a "strong component of knowledge and understanding in addition to skills" (13). When first introduced, this concept was difficult to implement due to the lack of training provided for teaching professionals, in addition teachers throughout the decision-making process had no input about implementing cross-curricular instruction. Since then, teachers have gained little in successfully integrating this initiative. Regardless of the research and the proven benefits from adopting such a curriculum avenue, the amount of training and support from administration has not been enough in most districts to see a clear and distinctive gain in the area of cross-curricular instruction.

Educators experience a sense of fear when crossing into a more conceptual way of delivering content, which is what cross-curricular instruction is asking teachers to do. By identifying areas of inquiry, the comfort that has developed through being an expert can be lost when the answer to the question strays into other content areas. If a teacher were to pose a question like "How do we grow?" to a group of primary students, then the answer could be explored in a number of ways including researching food consumption, anatomy, or even emotional changes. English teachers have become content experts and take comfort in knowing that they teach English and all of the confines and expectations that go along with it. This idea is

clarified in Trevor Kerry's *Cross-Curricular Teaching in the Primary School* when explaining that "to adopt another epistemological approach is to abandon one's advantage and launch into a sea of change that both demands thought and provokes insecurity about personal worth" (10). No longer are teachers the experts on a subject but facilitators in learning. Stepping out of the subject specific comfort zone needs to be made by the instructor willing to incorporate the change. Teachers need to be at the root of pursuing cross-curricular instruction; success cannot be found in a top-down administrative requirement. The moment a teacher is forced out of their comfort zone, defenses go up and the successful implementation of cross-curricular instruction is lost.

In order to implement cross-curricular instruction successfully, teachers need to be internally motivated to want to try something different as well as have access to resources and support. A common hurdle teachers face is finding planning time with teachers with whom they are teaming. Teachers are trained and licensed for one content area, and partnership creates a way for instructors to expand their pedagogical field in order to accommodate cross-curricular instruction. The English teacher needs a chance to pick the brain of the History teacher and vice versa when embarking on teaching content that allows for collaboration. Although a teacher could incorporate cross-curricular instruction independently, more success will be had if the teachers work with one another in communicating core skill sets. Cross-curricular instruction supports brain-based education, and the interconnectedness that occurs assists students to recall memories more easily when needed. This type of teaching asks instructors to step out of their comfort zone to plan and team up with a professional in another content area, the first time ultimately can be time consuming and effortful, but later collaboration will be easier because a foundation will have been laid. Once first-time collaboration has been established, it is easier for

students to see how previously siloed subjects are actually interconnected, which results in developing unique problem-solving capabilities. Students often question what the content they are learning has to do with their lives, and by teachers implementing cross-curricular instruction students are able to answer the question for themselves.

Geoinquiries is cross-curricular instruction. Using pieces of the plot, themes, and setting from a classic novel and combining it with maps and their corresponding data points brings relevancy to the literature being read. Factors like a teacher's motivation and planning time need to be taken into consideration when incorporating cross curricular instruction into the classroom, but the benefits are numerous. By using Geography as a way to help students understand classic literature, they will be enabled to develop connections between other disciplines that they may not have noticed before.

What does cross-curricular instruction look like in a practical sense?

Cross-curricular instruction develops when teachers see the organic connection between standards, their benchmarks, and the content they are required to cover. The material lends itself to working with other subject areas other than the one teachers are primarily trained in. Table 4.1 displays some of the Minnesota State Standards, in the English content area, that lend themselves to being taught in conjunction with other subject areas. The table includes a variety of different subjects giving teachers the opportunity to not only interpret the means of delivering the content but also use the examples provided within the standards. Namely, Geography, Art, Civics, and Economics are content areas that can be paired with traditionally taught English topics. The skills that are being focused on within the standards allow for the teacher to interpret how they wish to deliver the practice to their students. Additionally, the benchmarks explicitly state what other core content areas can be blended.

Table 4.1

MN Language Arts Standards: Examples of Cross-Curricular Instruction

Grade Level	Standard	Benchmark	Cross-Curricular Content Area
9 - 10	Literature: *Craft and Structure*	Analyze a particular point of view or cultural experience reflected in a work of literature from outside the United States, drawing on a wide reading of world literature.	Geography
9 - 10	Literature: *Integration of Knowledge and Ideas*	Analyze the representation of a subject or a key scene in two different artistic mediums, including what is emphasized or absent in each treatment (e.g., Auden's "Musée des Beaux Arts" and Breughel's Landscape with the Fall of Icarus).	Art
9 - 10	Informational Texts: *Integration of Knowledge and Ideas*	Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.	Graphic Design
9 - 10	Informational Texts: *Integration of Knowledge and Ideas*	Analyze seminal U.S. documents of historical and literary significance (e.g., Washington's Farewell Address, Roosevelt's Four Freedoms speech, King's "Letter from Birmingham Jail"), including how they address related themes and concepts.	History
9 - 10	Media Literacy: *Comprehension and Collaboration*	As an individual or in collaboration, create a multimedia work, a remix of original work and the work of others, or a piece of digital communication for a specific purpose (e.g., to interpret or respond to a piece of literature, to represent thematic similarities between two literary works, to interact or collaborate globally, to critique a current event or social issue.)	Civics
9 - 10	Literacy in Technical Subjects: *Integration of Knowledge and Ideas*	Translate quantitative or technical information expressed in words in a text into visual form and translate information expressed visually or mathematically (e.g., in an equation) into words.	Math

Source: "MN K-12 Academic Standards in English Language Arts." *Minnesota Department of Education*, education.mn.gov/MDE/dse/stds/ela/, 2010.

For example, the first benchmark in the table explains that real cultural experiences need to be considered in the context of a piece of literature. This standard also demonstrates how geoinquiries are built into the standards. Geographical elements in conjunction with classic literary texts is a straightforward way for teachers to incorporate what the benchmark is asking students to do. Further examples in the table establish the ease of incorporating English cross-curricular instruction with other content areas.

Melissa Kelly's 2019 "Cross Curricular Connections in Instruction: Four Ways to Integrate Lessons" states that the Common Core ELA State Standards, adopted by 42 states and additional US territories, were organized to allow for cross-curricular instruction (Kelly). The state and national standards are written with specific intent to cross subjects, which gives instructors agency to implement cross-curricular instruction into practice. Teachers are set up for the initial stages of cross-curricular instruction by having the standards they teach already overlapped with other subjects for instruction. The goal of the MN K-12 Academic Standards is to provide "guidance and technical assistance on implementation of academic standards, current literacy best practices, multi-tiered systems of intervention, and policy administration" (MN K-12 Academic Standards in English Language Arts). Cross-curricular instruction can be considered best practice, which is why instructors need the chance to be purposeful in their method of delivery and clear about the intention of bringing students to a deeper level of thinking. Teachers have the opportunity to convey how these seemingly singular topics can connect by incorporating more than one of the core content areas that students learn about on a daily basis. Recognizing these trends can set students up for success as problem solvers who are able to use their 21st-century skills, such as critical thinking, later as employees in the workforce.

The first step in setting up a lesson modeled after best practices through cross-curricular instruction is to identify the standard or benchmark that the students will be working towards mastery of. Robert Marzano states in *The Art and Science of Teaching: A Comprehensive Framework for Effective Instruction* that a learning goal — including for example any goal derived from state standards — is "a statement of what students will know or be able to do" (28). After a goal has been established, students are able to demonstrate what they know through activities that are put in place to assist in learning, testing, and questioning the content. The deliberate incorporation of an additional subject can lead to a deeper understanding of what is being taught, expanding the opportunities for real world application. To illustrate, a 10th grade English teacher takes the 9.9.8.8 benchmark, and creates a learning goal that states that students will create an original multimedia piece that expresses a current event issue. The blending between Art and English content areas establishes cross-curricular instruction. For this lesson the literary focus is on finding trusted sources as well as identifying what would be considered "current events." The civic engagement and awareness of issues that are impacting the students personally results in a lesson that increases the amount of retention, which might not have occurred if the teacher handed out nonfiction articles to read. Cyndi Poole and William Russell state in their 2015 "Educating for Global Perspectives: A Study of Teacher Preparation Programs" that it is the duty of the teacher to offer such collaborative lessons (43). The article goes on to say that *"*In today's world, civic competence requires the knowledge and dispositions embraced by global educators, including a thorough understanding of world geography, national and international politics, and the historic foundations of the modern world" (48). This lesson incorporates choice and exploration as well as polishing skills that have everyday real-world

application. Students must be able to function in an increasingly global society, and teachers who have been siloed in their content areas become obstacles.

Standards lending themselves to cross-curricular instruction can also be applied to classic literature. These texts have the settings, themes, and character profiles that make themselves the easy choice for the intentional incorporation of other subject areas. Students are transported to other worlds and time periods that result in the ability to question what is occurring in order to develop a deeper understanding of the characters in addition to the plot line. Since one of the "qualifications" of classic literature is to have themes that stand the test of time, cross-curricular instruction allows students to explore historical and character lenses in greater detail while reading. Once they have been selected, the literature standards target the author and character choices as well as how a theme develops over the course of the storyline. Students are expected to refine skills like supporting their ideas with textual evidence and determining the meaning of words with the use of a variety of literature. An example of what a cross-curricular lesson might look like in a high-school English class begins with selecting a standard that will lend itself to the literature being studied. In F. Scott Fitzgerald's *The Great Gatsby*, character analysis is a major component of understanding the novel. To better understand what the characters are dealing with based on the time frame — the roaring 20s — students need to explore civic as well as historic elements that could impact the way that the characters function within the storyline. To take it a step further, students could even explore the economics of the 1920s and apply that to what the author may have valued based on what was included or left out from the novel.

With cross-curricular instruction students are able to reach a depth of knowledge and a deeper level of thinking that may not be feasible by just completing the reading independently. These lessons are not laborious in terms of prep from the perspective of the teacher. When

standards are read, understood, and carried out as intended by the committee of instructors who created and approved them, cross-curricular instruction is incorporated seamlessly into the curriculum. Teachers are already putting these elements into practice. Recognizing the work that these instructors have already completed establishes the opportunity for collaborative instruction. Teachers need help from their coworkers when attempting new ventures, and the more that they feel supported, the more that cross-curricular instruction can break down the silos teachers have been stuck in. Cross-curricular instruction may be new to some, but others have done pioneering research and work to emphasize the benefits and its status as best practice.

What are the benefits to the students on a neurological and academic level?

Best practice in teaching takes into consideration ways to accomplish high student achievement. As more is discovered about the brain, it becomes clear that using brain-based research in the classroom can not only lead to higher student achievement but be considered best practice. Letter grades have become the traditional unit of measurement in public education today, but this grading practice is relatively recent. Jeffrey Schinske and Kimberly Tanner in their “Teaching More by Grading Less (or differently)” state that the current letter-grade system was only accepted in 1971 (Schinske & Tanner). They go on to say “[i]t is therefore helpful to contextualize the subject to appreciate the relatively young and constantly changing nature of current systems of grading” (Schinske & Tanner). Schools across the nation are responsible for implementing their own grading arrangement, which creates a substantial difference between districts, where the ultimate goal is measuring student achievement. Cross-curricular instruction benefits students and their brains long term based on the creation of neurological pathways, the transformation of short-term memories into long-term memories, and finally personal application that leads to retention. Each of these aspects of learning is activated by a lesson, concept, or skill,

leading to greater academic achievement when all three components as a collective are called upon to work for the student and their brain.

All learning takes place via neurological pathways that develop as memories of content are formed. Paul Howard-Jones in his *Introducing Neuroeducational Research: Neuroscience, Education and the Brain from Contexts to Practice* explains that when students are exposed to new information it goes into a space called the working memory (9). This is a space where new chunks of content waits for assigned value based on prior knowledge. When students learn, content is moved from the working memory — which is a very limited space — to short-term memory after it is associated with prior knowledge (9). The transfer of information from working memory to short-term memory allows neurological connections via synapses in the brain to establish stronger pathways: learning causes a growth of networks. When students are exposed to something, their brains are able to add to the vast network of interconnected neurons through their synapses. In *Teaching with the Brain in Mind* Eric Jensen states that the stronger these pathways are, the easier it will be to recall information (36). This same process occurs in a negative manner as well. Connections that are not frequently used can be weakened and eliminated as the neurons and their synapses compete for space. When cross-curricular instruction is implemented, the pathways being formed through learning are strengthened due to the frequent recall of information from the different content areas. Returning to *The Great Gatsby* example, students in their high-school career should be familiar with some of the historical information associated with the time period of the novel. Since students need to recall information in a context that is new in relation to the novel, old neurological and synaptic pathways are strengthened while at the same time new connections are formed. The process of memory formation and recall will continue to be the same regardless of the content being taught

in conjunction with other subject areas. Students are able to reach a deeper level of understanding, which will benefit them academically, because they can recall information more easily, leading to evaluating and analyzing the content already learned.

Second, the brain needs to create neurological connections in order for memories to move from the short-term to the long-term portion of the brain. After content has been transferred from the working memory to the short-term memory, the goal is for content to be shifted to the long-term memory. Saul McLeod in "Short Term Memory" shares that up to seven pieces of information can last in the short-term memory for 15-30 seconds (McLeod). In the context of learning in the classroom this quantity and time span is not ideal. Long-term memory is the goal due to the sheer volume being added to the short-term part of the brain on a regular basis. Anna in their 2017 "Neuroscientists Identify Brain Circuit Necessary for Brain Formation" Trafton explains that short-term memories are stored in the hippocampus and long-term memories are formed when they are moved to the brain's cortex (Trafton). That is, the higher the frequency of recall, the more information is being moved into the cortex portion of the brain for easy access. *Teaching with the Brain in Mind* says, when it comes to review "Neural connections are stimulated repeatedly, they strengthen significantly [to] make sure the repeated information is accurate" (17). The atypical use of the information reinforces the neuron pathways that have already been created in addition to constructing new synapse avenues that encourage long-term memory formation. Furthermore, for cross-curricular instruction to be impactful students need to have a basic understanding of the two content areas in order to make the learning effective. When students review for a performance assessment, recall becomes easier after cross-curricular instruction due to the repeated stimulation of neural connections.

Finally, the more the content connects to the lives of the students, the more that the students are interested and therefore able to engage. As mentioned in chapter two, in order for the brain to distinguish the important stimuli, students need to actively pay attention to the information being presented. Cross-curricular instruction engages students and therefore their brains through inquiry. Anne Beitlers and Pedro Noguera in their 2015 "Curricular Relevance: Students' Needs and Teachers' Practice" share that students develop intrinsic motivation when the information that they are being taught connects to their communities (Beitlers and Noguera). Students pay attention when the content is about them. Questioning the content, analyzing the interconnectedness, and applying it to their own lives creates the engagement that the brain needs in order to enlist neurons to form synaptic connections that results in memory formation. A practical example of what this might look like in the classroom brings us to a final reference to *The Great Gatsby.* When students see that the events in history can shape the lives of the characters, the question becomes whether or not this same concept is applicable to their reality, whether what is taking place in current events is able to shape their lives. This lesson through inquiry is a purposeful implemented plan to lead students to this conclusion, all the while covering state-mandated standards that will lead them to mastery of 21st-century skills.

Ultimately students who are benefiting from neurological connections, formed through cross-curricular instruction, are able to reach a higher level of academic achievement. Grades and performance scores are external motivating factors that increase when students are able to pay attention and draw connections between subject areas, which results in long-term memory creation. Grades are the gatekeepers for continuing on to earn higher levels of education. Students are smart and have learned how to crack an already broken system by completing minimal work and yet still earn a high-school diploma. The ideology of K-12 instruction needs to

change. An “education” has become a series of hoops that students need to jump through in order to obtain the required diploma. Despite what the current grading arrangement is, by teaching students to be learners rather than complacent beings who have learned to work the system, a change in our educational practices can lead to a much-needed revitalization. Cross-curricular instruction is one of the steps that can be taken in order to achieve this goal.

Supported by curriculum and educational policy makers, cross-curricular instruction and its benefits are widespread. State mandated standards have interwoven cross-curricular practices into what is expected of students to master, which sets the tone of the future workforce. The brain research to back the engagement and opportunities for interconnected thinking results in a way for educators to explore best practices as well as break out of the silo that tradition has placed them in. Students are being failed by the current education system, and teachers are at the root of providing content and lessons that will help prepare them for life beyond the classroom. Trying new things can be intimidating and the risk of failure can prevent instructors from straying from tradition, but in the case of cross-curricular instruction the academic benefits encourage teachers to at least recognize the opportunity for implementation. Geoinquiry is able to help students understand the complex elements of classic literature through cross-curricular instruction. Pairing maps and literary texts, with the support and structure established by state mandated standards, allows students to become more engaged and therefore retain content that helps them become academically successful.

Chapter V: Geoinquiry - What is it? Why use it?

More than ever our world has become a place of interconnectedness, which gives a distinct advantage to those who are able to understand the complex nature between people and their environments. In an increasingly global society, students need to be aware of what they face once they graduate. Geoinquiry uses geographical elements as a way for 21st-century students to question and explore the world, a skill they need to practice developing. Students want to know how the content they are being asked to learn connects to themselves, and if whatever they are studying can be found on a map that includes their location, a sense of urgency surrounding the topic can be developed. Digital interactive maps offer options such as the ability to layer data, which leads to a greater understanding of the concept being studied, resulting in a lesson that is more memorable and engaging. Technology is not the only route in which to provide students with a geoinquiry experience, but it is the best route. Technology not only offers a more engaging experience, via novelty and relevance, but creates opportunities to explore a topic in greater depth. Technology is becoming increasingly accessible to staff and students, which establishes the ease at incorporating digital geoinquiry into the classroom. All subject areas have the opportunity to use geoinquiry in a cross-curricular manner that will lead to retention of memories and the potential to increase academic achievement. This chapter will take a closer look at what geoinquiry is, the benefits of using geoinquiry software, what the brain has to gain, and finally examples of how content teachers can apply geoinquiry to their own subjects successfully.

What is geoinquiry and why should we use it?

Geoinquiry is the use of geospatial technology to provide students with the platform to complete unique and personal inquiry assignments. Interactive maps are just one example of

geospatial technology, the GPS systems in most cell phones is another. Having access to a map is a crucial component in geoinquiry. Historically, any mention of studying maps in literature fell under the term literary cartography. Literary cartography is the scholarly language that is currently being used to explore the idea of notable locations that are depicted in novels. However, geoinquiry offers a different lens to gaze through, a pedagogical and methodical approach. Places and locations in literature allow the reader to have a richer experience by understanding the conflict and characters better. Reader experience — the ability for students to develop a sense of place — establishes the significance of studying maps and locations mentioned in literature, which leads to the importance of the pedagogical process of geoinquiry. The easiest way to understand what geoinquiry is and how it can be used in the classroom is through an example.

Minnesota English standards list Steinbeck's novels *Of Mice and Men* and *The Grapes of Wrath* as recommended texts based on their historical content as well as their enduring messages. Novels establish a strong sense of place though the descriptive elements the author provides as well as the way that the characters interact with the space around them. Taking place during the 1930s, these fictional tales depict how US citizens are negatively impacted by the aftermath of the Great Depression in addition to the Dust Bowl. John Steinbeck is able to craft a distinct sense of location for the reader, making his works ideal projects for geoinquiry. People across the nation were uprooting their families and traveling great distances to locate employment in order to provide for the basic needs of their family. Using digital map programs, students can track the actual events of millions of people who fled their homes, leaving major cities as well as rural farmlands, to find a suitable place to live. An example of what this map looks like, along with a

key containing additional data, is featured in Figure 5.1.

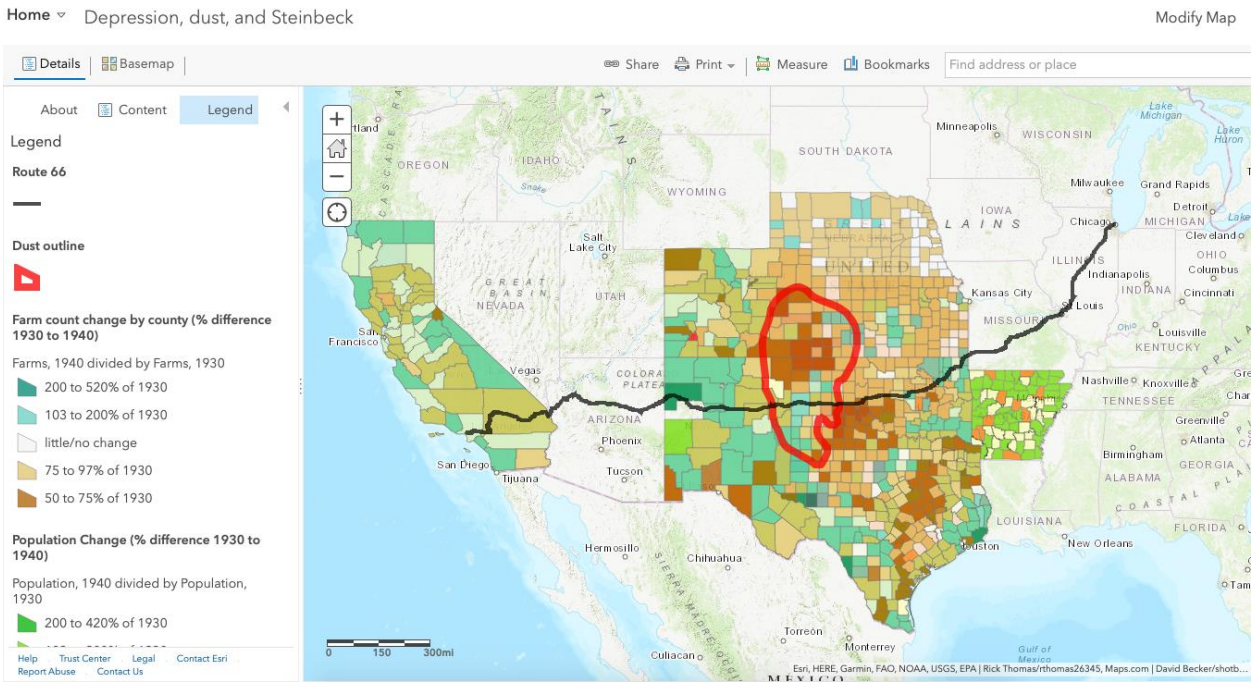

Figure 5.1. Geoinquiry Map based on Steinbeck's Novels

The bold black line marks Route 66, a path taken by people residing in populous cities like Chicago, in an effort to locate jobs in the west. Additionally, the red circle identifies the portion of the country that was the central location of the Dust Bowl. The key provides more data to increase the complexity of the map, such as how many farms were in each individual county. If students were to look at the path of Route 66, they would be able to draw conclusions as to who exactly was using the routes and speculate as to why they wanted to travel through the decimated region.

As an introduction to the novel, students start to understand the severity of the issue with a visual representation of events that the whole country was suffering from. Once they are introduced to the characters and the challenges that they are facing, students develop a sense of empathy by already having an understanding of historical real-life experiences. A teacher can

help their students access and understand this experience, that would be considered abstract without the use of geoinquiry, by connecting the lesson to a very real issue that they are dealing with today, the COVID-19 virus. What was once a foggy and incomplete understanding of how something can so greatly impact a nation becomes accessible and relatable. The possibilities are endless, but this specific example nonetheless demonstrates some of the core aspects and focuses of geoinquiry in addition to how geoinquiry can make classic literature accessible. A more detailed lesson plan that includes a standards-based approach to introducing this particular topic can be found in the Appendix.

The difficult outcomes on the Bloom's Taxonomy hierarchy that teachers strive for are analysis, evaluation, and creation, inquiry skills that are built through the geoinquiry process. Even the most experienced teacher can struggle to lead students to a greater depth of knowledge and the readily available resources, described later in this chapter, lifts some of the burden. The questions provided for in the lessons and overall process use analysis and evaluation of data within the maps to assist students in advancing their understanding of the topic. By applying this information to the novel they are studying, students are creating a new way of thinking about what the characters are experiencing as well as various conflicts that may not be addressed in the literature explicitly, which helps them to recognize the role maps can have in helping them reach their own conclusions.

Main reasons why platforms like this need to be used can be connected back to previous chapters: teaching classic texts, engagement, and cross-curricular instruction. Students need to be able to understand difficult concepts raised within classic texts, engage with content that is relevant to them, and finally, see the real-world application through inquiry founded in cross-curricular instruction. Students are embarking on a journey into a world that has become

increasingly globalized. Ensuring lessons are engaging and that the content they are working with is accessible is key, but the skills being developed are going to be what takes them to success beyond high-school. Geoinquiry is not the only way to lead students to the skills, but encompasses all of them in one experience.

How does geoinquiry benefit the brain?

When students encounter learning difficult tasks, such as trying to understand a complex classic novel, their brain has specific needs during a lesson that need to be met to ensure successful memory formation. Engagement will continue to be a core factor in any lesson, but through the use of technology and collaboration between content areas, geoinquiry lessons are able to engage the brain with purpose. Other than engagement, geoinquiry offers many advantages for the brain including visual learning, assignment relevance, and all of the benefits that come from a cross-curricular lesson.

Visual learning is one of the main advantages that geoinquiry lessons offer to students and establishes why they should be incorporated into the classroom. Maps play a key role in the geoinquiry process. The geographic portion of the name — geoinquiry — alludes to the use of geographical positioning systems and the inquiry comes from the space between locations as a means of answering questions and exploring ideas. David Schunk's *Learning Theories: An Educational Perspective*, says visual learning helps

> to foster attention, learning, and retention. The collective findings from learning and brain research supports the benefits of graphics. Teachers who use graphics in their teaching and have students employ graphics, capitalize on visual information processing and are apt to improve learning. (67)

Maps could be considered one of the most well-known and well used graphics. Geoinquiry gives students the opportunity to develop questions and explore answers through a geospatial/visual lens with maps as tools. In her *Brain Matters: Translating Research into Classroom Practice* Patricia Wolfe states, "The human body is structured such that we take in more information visually than through all other senses" (182). Research emphasizes once again the significance of maps due to the increased volume of data that is perceived. Understanding that the brain functions in this manner can lead to the purposeful incorporation of geoinquiry as a way to provide visual stimuli for the students.

Geoinquiry offers students the ability to develop personal relevance in the content they are being asked to study. Anne Beitlers and Pedro Noguera's "Curricular Relevance: Students' Needs and Teachers' Practice" argues that the more students are engaged with the content the more motivated they become to be active participants in their learning. Beitlers and Noguera go on to say, "In addition to boosting motivation and engagement, relevant connections allow for deeper processing of information through the activation of prior knowledge, which positively influences performance" (Beitlers and Noguera). The brain is able to create memories that stick, leading to an increase of academic success, when students use what they already know in the context of something that is relevant to them. In addition, students are able to study the world around them, and in some cases get a chance to develop a sense of awareness that their current community might not be able to offer them. Personalizing their learning experience through the use of geoinquiry, students become engaged and therefore motivated to ask, explore, and analyze more. The brain needs to know that the information being received is significant to the learner and when it does the memories formed will encourage student success. Assessments, whether they be traditional or performance based, are a major component of educators measuring student

proficiency. Teachers promote positive academic outcomes when they support successful memory creation.

Finally, geoinquiry benefits the brain via cross-curricular instruction since the lessons are set up to explore more than one content area at a time, which leads to better memory retention. Eric Jensen in his *Teaching with the Brain in Mind* asks teachers to recognize that "strengthening multiple pathways gives your students a far better chance of retrieving a classroom memory" (131). As discussed in the previous chapter, memories are established when synaptic routes are formed and strengthened via repeated recall and novel use of memories. Geoinquiry is able to do just that by interconnecting previously formed memories from various content areas. It is not unlikely that three content areas are being supported through the process of geoinquiry when mathematical reasoning is considered. For example, students in English might be studying the classic novel *Of Mice and Men*. With the text taking place just after the Dust Bowl, students in their science class can study erosion patterns, while using a geoinquiry friendly platform, like Google My Maps to understand the geographic location. Students will be examining a science-based topic, with geography-based material, and demonstrating their understanding of the conflicts the characters face based on the historical information. Geography and geospatial inquiry is at the root of the practice, but ultimately it is the analysis of the data in addition to the content area of the topic being explored that forms lasting memories. The brain thrives on linking ideas to one another to reinforce neurological pathways, and adopting geoinquiry lessons into various content areas supports efficient memory retention and recall in students' brains.

The foundation of geoinquiry is the ability to activate the brain in a way that makes learning easier, engaging, and academically more beneficial to the students. Academic achievement through skill-based learning is accomplished when teachers create inviting lessons

that foster positive brain functioning. Using neuroeducation, instructors assist students to form concrete understandings, regardless of the content areas being featured, so that they are able to access more difficult content.

What platforms are available to practice geoinquiry?

To practice technology-based geoinquiry, two recommended programs — that are student and teacher friendly — include My Maps and ArcGIS. Both programs are free to users and can be found by searching their names on any web browser. As with any software, My Maps and ArcGIS each has its own advantages and disadvantages making their usage situational in the classroom depending on the lesson. Brief explanations as to what each program offers, the types of assignments that can be completed, and finally a brief account of advantages and disadvantages will result in an understanding that will lead to deciding which software meets the needs of the student for successful implementation in the classroom.

The first of the two programs is a part of the Google Suite family called My Maps. This program allows users to select layers, plot points, import spreadsheets, and customize views. One of the major benefits of My Maps is its seamless connection with the Google Suite system, which a large number of districts use as technology becomes more accessible. My Maps creates easy usage due to preventing an additional login and password as well as having any maps that the students create be automatically saved to Google Drive. To begin work on a new map students need to login to their Google Accounts and search “My Maps” in their browser to access this Google App. My Maps is a program that is similar to Google Docs or Google Sheets, where no additional downloading is needed to use the platform.

An example of a standards-based assignment is provided to illustrate what features and applications Google My Maps can offer, and Figure 5.2 is a representation of what this assignment might look like when completed. Minnesota English standard 9.4.9.9 asks students to

> Analyze how an author draws on and transforms source material in a specific work (e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare or how a Minnesota American Indian author uses oral tradition to create works of literature).” (MN K-12 Academic Standards)

Staying true to what students need to be engaged with the content, a teacher might ask students to read Minnesota based folktales and explain how these stories developed from an oral tradition. Engagement is developed from relevancy, and with these stories taking place in the same location where students are living and visiting, the lesson is able to foster personal connections. As students are reading fiction and non-fiction texts related to this standard, they could plot points within Minnesota to represent the location of the tribes as it is depicted in the literature. Students could complete research on current reservation and community sites within Minnesota and plot the present-day locations alongside those from the stories, which increases the complexity of the assignment. A geoinquiry-based lesson creates the opportunity for students to work towards the mastery of standard 9.4.9.9 while using a technology-based platform in a meaningful and applicable way.

The first step in getting started in the My Maps program is to select a base map. Base maps are underlying maps that provide a range of geographical features depending on what the map is going to be used for, and nine different maps are available in the My Maps application.

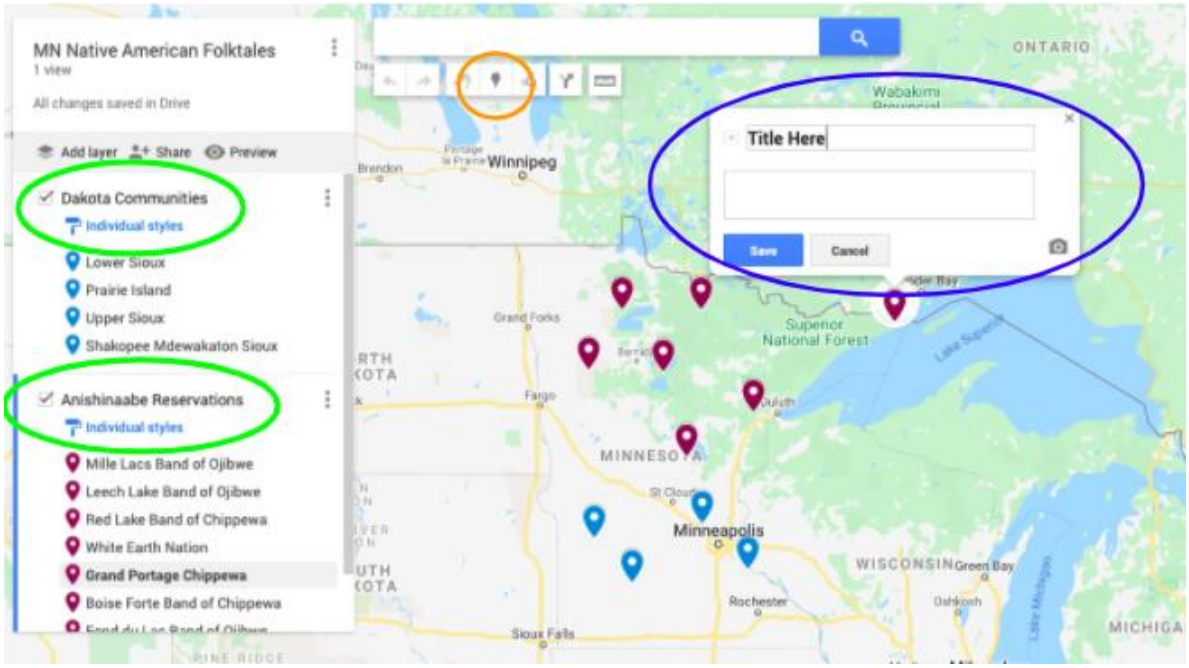

Figure 5.2. Default Setting When Creating a new My Map

For example, the default map pictured in Figure 5.2 would work well for plotting the points of the Native American tribes, where a terrain base map would be used for specific geographical locations. Several other functions allow for customization of the map, once a base map has been selected, through plotting points and incorporating map layers. The user is able to plot points on a map by clicking on the pin image, circled in orange in Figure 5.2, then clicking on the map where the marker should be placed. These points on the map could mark the location of one of the tribes or the place mentioned in the Native American stories. Figure 5.2 demonstrates the ability to color code the different pins to categorize them. For example, on the graphic the blue pins are the locations of nationally recognized Native American Communities, but the red pins are Native American Reservations. For this assignment, students could use the colors as a way to understand the organizational structure geographically within the state or even trace historically why these locations were chosen as plots of land. Different subject areas and

lessons can use markers on a map to represent significant locations and create opportunities for students to study geographic inquiry in a wide variety of contexts.

Other than plotting a point to demonstrate a significant location, the user is also able to include a title, attach an image, and add text to each point describing the importance of the location. For the Native American lesson example, students can label the name of the story that mentions the specific geographical location, attach an image that covers the main idea, and write a brief summary to demonstrate their understanding of the story. Students have no problem voicing their opinions, especially their negative thoughts towards writing. Geoinquiry lessons, that incorporate literary texts, offer a way for students to practice their writing in a non threatening manner giving teachers a chance to assess without a fight. With the amount of information that can be included within each marker, students have the chance to establish understanding of the assignment and indicate the significance of what occurred at that point. The different points plotted on the map will be placed in order of creation under the first layer, marked with green circles in Figure 5.2.

A second feature of Google My Maps is the layers function. Layers are editable, stackable, pieces of data that result in a deeper or critical understanding of the content being displayed on the map. For instance, in Figure 5.2 the green circles demonstrate the two different layers that have been created, one of which shows the Native American Communities and the other the Native American Reservations. This assignment lent itself to having two layers because of the way that the Minnesota Native American population is organized. Layers can be turned on or off, resulting in numerous visual combinations in which to analyze the data; Figure 5.2 demonstrates what the data looks like with both layers on. Using the layers function in My Maps is a way to level the content depending on the student population working on the assignment.

Allowing students the choice in how they set up the information going onto the maps gives them the occasion to take charge of their own learning and develop conclusions based on the features that the map offers, where teacher-provided instructions or curated maps can remove a level of difficulty.

Displayed in Figure 5.3 is another example of what an assignment would look like using different features in Google My Maps; with complete assignment instructions provided in the Appendix. Students struggle with the basic plotline of the epic poem *The Odyssey* due to the myriad of characters and locations on top of language that is unfamiliar to them. Using geoinquiry as a tool can assist with student understanding when this assignment is introduced early into their reading of *The Odyssey*. For each stop along the journey students need to add a marker that includes an image of what occurred at that location as well as a text-based description of what happened in that spot, for reference, as they progress with their reading.

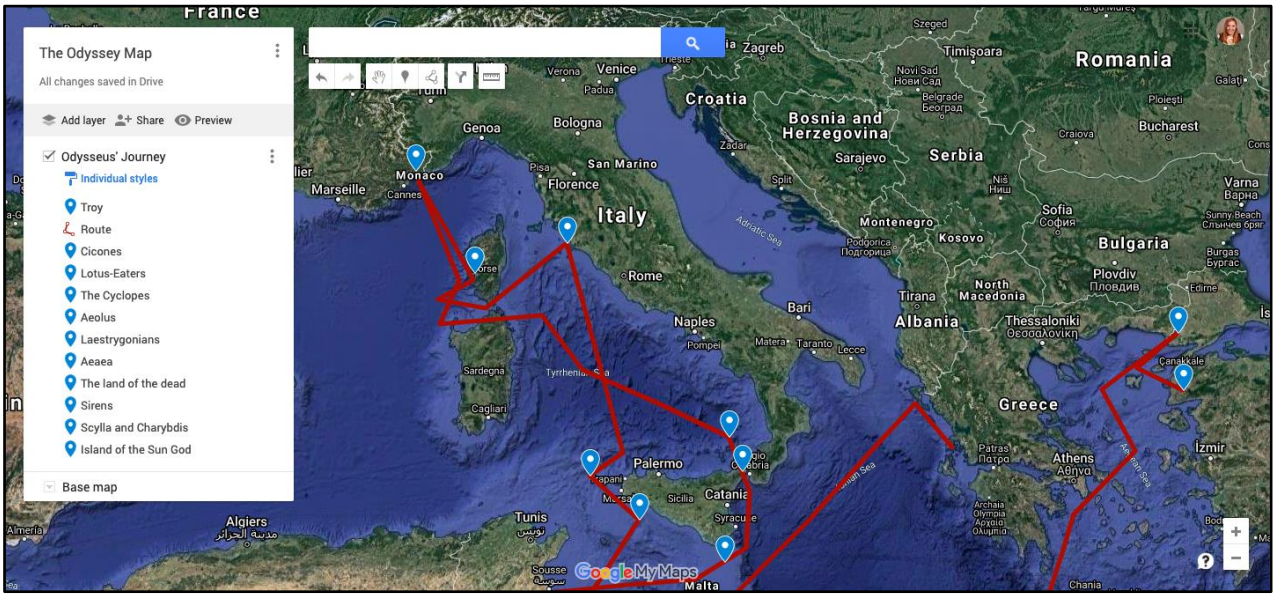

Figure 5.3. Image of Google My Maps Program

Using the My Maps program helps to clarify for students where in the world this fictional journey is taking place in addition to developing an understanding of what these characters are going through based on the data on the map. The red line in Figure 5.3 illustrates the successful completion of *The Odyssey* assignment where students connect each leg of the journey as the story progresses by adding in editable lines. Students will have developed this resource, which they can use as a one-stop summary of the text, to study when it comes time for the teacher to assess their understanding of Odysseus' journey. The features of My Maps allows students to make meaning where there was only confusion before. Educators can help students sharpen critical-thinking skills and clarify difficult content when they implement geoinquiry My Map lessons into their content areas.

A second program that offers geospatial analysis for secondary education students is a program called ArcGIS. Created by ESRI, Environmental Systems Research Institute, ArcGIS is the name that the company uses to refer to programs that use global information systems to create, edit, and analyze data via maps. ArcGIS offers more structured programs and lessons that teachers of all content areas can use rather than the Google program, in which teachers or the students must curate the map and data. The prepared lessons allow for geoinquiry to be incorporated with ease into classrooms by removing the guesswork and prep-time commitment for teachers. The two different programs that are housed in this software includes Story Maps, which is very similar to Google's My Maps, and GeoInquiries.

The purpose of Story Maps is to present geographic information in a smooth and organized fashion; it is a presentation tool rather than a platform for analysis like Google's My Maps. From placing markers that allow descriptions of the points, to adding pictures, and

tracking locations in order of creation, the intuitiveness of this program makes it ideal for student use just as My Maps is.

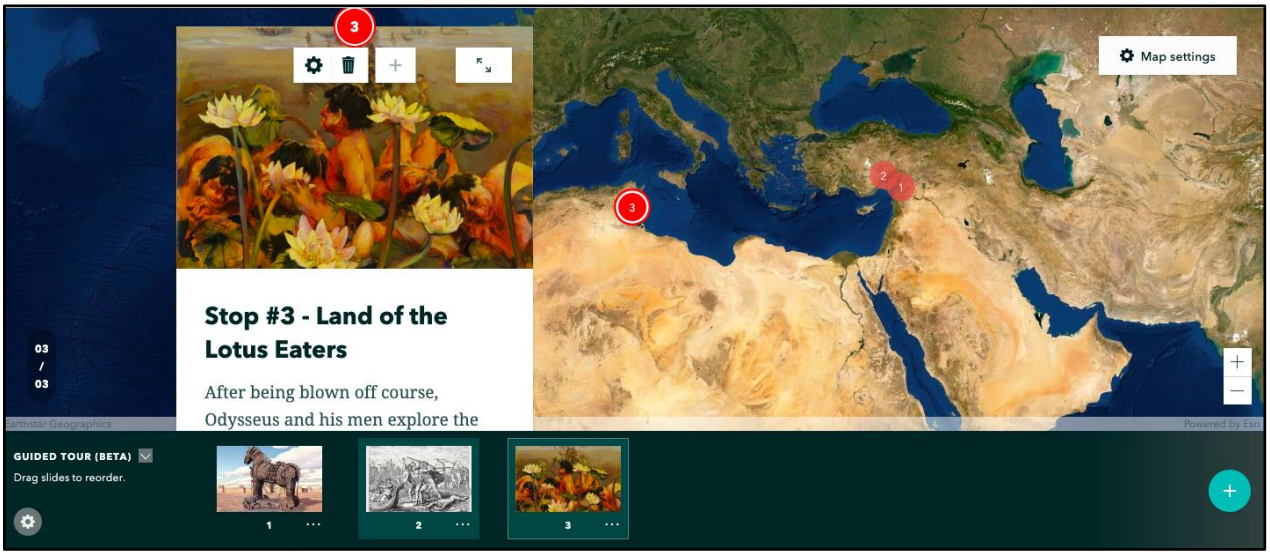

Figure 5.4. Image of ArcGIS Story Maps Platform

As pictured in Figure 5.4, Story Maps can be used to track journeys and as the title suggests, tell a story, which is where the similarities end. When comparing the two programs visually — especially taking into consideration that this image represents the same assignment, the journey of Odysseus from *The Odyssey* — Story Maps is more appealing. Story Maps is a visual program, in which the presentation of information becomes the focus rather than the data. The bar across the bottom in Figure 5.4 offers a different way for students to manipulate the information that helps them to not only see which material they have already provided, but when projected indicates the next portion of the story that will be shared. From an educator's perspective Google's My Maps is used as a formative assessment, practice for students to make sense of the content that they are working with, while Story Maps is the summative assessment, a project a student completes to demonstrate their understanding and mastery of the content. Unlike My Maps, Story Maps does not have the capacity to incorporate layers of data, but the

visual elements and ability to turn the map into a full screen presentation employs a different operation for this platform. Story Maps offer students a way to review and clarify content through demonstration of understanding by transforming small pieces of information into a collective image.

ArcGIS offers a second option for educators and students, in which the focus is data analysis, called GeoInquiries. According to the ArcGIS website "GeoInquiries are 15-minute instructional activities that use interactive maps (geographic) to enhance your academic instruction of standards-based topics from grades 4-12" (ArcGIS). The free, scripted lessons are aligned with the common core standards and provide an easy way for teachers of all content areas to implement geoinquiries. Maps and layers of data are already compiled for the students, so the focus becomes what the information says about the content being presented rather than the process of creating. Students are asked to open a specific map and interact with the presented data based on guiding questions and established learning outcomes. These lessons can be short activities to introduce a new concept or they can be turned into full assignments where the conclusions drawn from the data are explained in short answers or even a presentation. An example of what these lessons look like is featured in Figure 5.5. The figure demonstrates the standards aligned with the lesson, establishing the understood need for teachers to connect every lesson and activity back to the standards in order to implement recognized best practices. Additional examples of these lessons that support engagement and retention of classic literature can be found in the Appendix.

Another benefit that the ArcGIS-created GeoInquiry lessons provide is that they are leveled. When navigating through the library of lessons, teachers will notice that lessons will be labeled with a one or a two in addition to expanding across 12 different content areas.

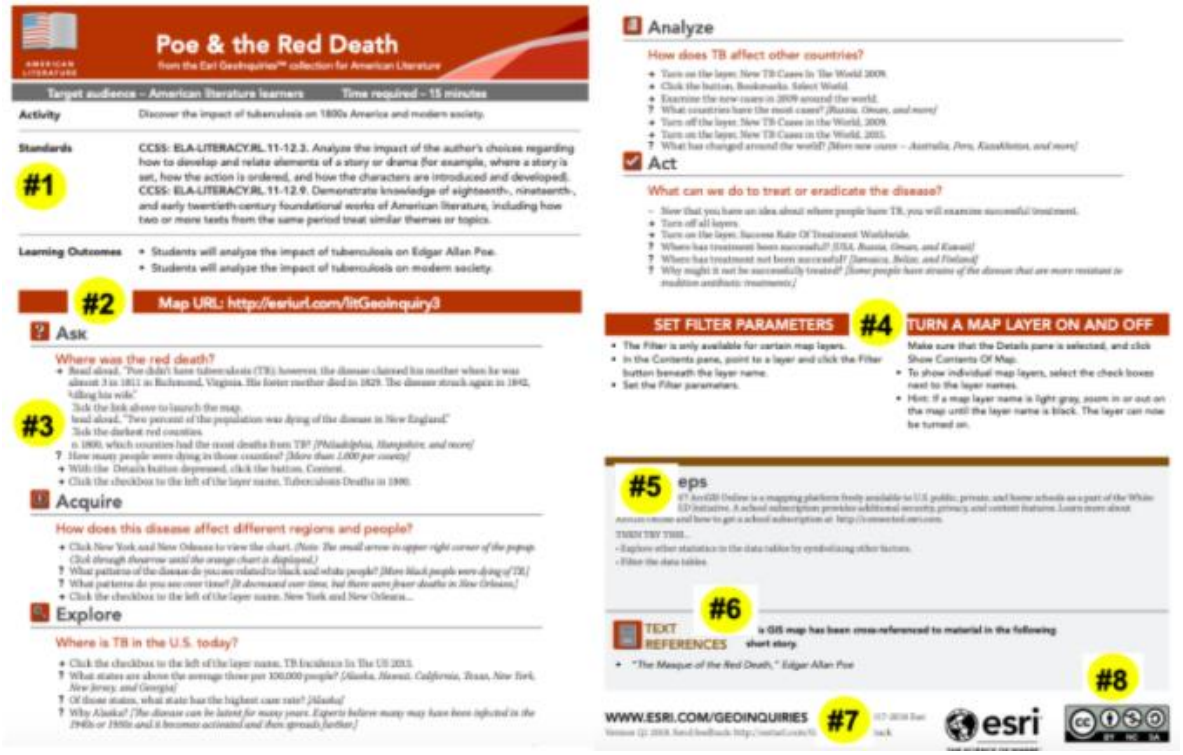

Figure 5.5. Anatomy of a GeoInquiry teacher PDF

#1	Standard Alignment	#5	Activity Extensions
#2	Active Link to Map	#6	Common Textbook Alignment
#3	Five Stage Inquiry Process	#7	Feedback URL
#4	Tech Tips	#8	Creative Commons Identifier

The intended audience for level-one lessons are middle- and high-school students with a focus on map analysis for beginners that includes access to basic tools on the website. Level two is for an elevated analysis, which requires access to distinct tools and content that needs to be downloaded, to give students a more rigorous experience with the content. Although the level-two maps are intended for senior-high audiences, teachers can modify the assignment so students of all grade levels are able to access the content being covered, which was initially structured in a more advanced form. The maps and layers of data, featured in the Geoinquiries lessons, were

made by professionals for educators and their students. The goal of geoinquiries is to expand and broaden students' understanding geographically but to also help them gain a deeper appreciation for what it takes to collect and organize information. ESRI and their ArcGIS lessons are ensuring a future workforce based on fostering positive student experiences with geoinquiry, leading to another generation of like-minded data-driven thinkers.

Google's My Maps and ArcGIS' two programs, Story Maps and GeoInquiries, are only two platforms of many that are considered to be geographical-information systems. The difference between the two discussed and all of the others not mentioned is how user friendly they are for staff and students to navigate. In order for technology-based programs to be incorporated into classrooms, there must be a need and a practical way for technology to solve the problem. Although school districts are directing more funds and attention towards the instruction and integration of technology, for smaller and rural schools' money for digital resources may not be an option. Geoinquiries is a pedagogical practice and can be completed with easily accessible materials like printed maps and data keys. Students using these traditional materials will not be able to manipulate the information presented to them as in a digital-based geoinquiry platform, but exposure and development of problem-solving as well as critical-thinking skills lends to the significance of geoinquiries.

What 21st-century skills are developed using this process?

To be successful in their post-secondary pathways as future participating members of society, students need to walk out of high school being proficient in 21st-century skills. The current workforce is competitive, and students will need to market themselves as well-trained and self-motivated workers in order to earn a job. Three universal 21st-century skills reinforced through geoinquiry lessons include problem solving, critical thinking, and digital competence.

With these skills at their disposal, students will have achieved a level of proficiency that will increase their career opportunities regardless of the field.

The first 21st-century skill students develop through the use of geoinquiry is problem solving, an independent skill that has strong ties to creativity. In today's world, issues need to be solved in an innovative manner whether they be economic, personal, or global. By using programs such as My Maps or ArcGIS, students have first-hand experience in trying to identify and solve problems that are real issues the world is facing today. For example, in his "Mask of the Red Death" Edgar Allen Poe intertwines fictional events with historical issues. During the time Poe was crafting this short story in 1842, tuberculosis was a deadly disease with no cure. Students today can find relevance from this classic piece of literature but also use it as a way to explore solutions to express the emotional impact the 2020 pandemic had on them — just as Poe did in his fictional tale. Additionally, students can use history and geography to unearth and explore previous solutions to pandemics while using modern-day technology to develop their own ideas on how to potentially resolve current issues. Problem solving requires a creative mind to discover solutions that have not already been pursued, and by having students practice in a controlled setting, with a topic that pertinent to them, the mission transforms from *me* to *we* with critical skills being polished along the way.

A second 21st-century skill is students' ability to think critically about the content they are studying, which leads to higher level thinking skills when they reflect on the information presented. Many of the geoinquiry assignments that students are asked to complete involve evaluating, measuring, and comparing material in order to pursue an idea or question — higher level thinking skills which take time to develop. Returning to the Poe example, the assignment being described is offered as a scripted Geoinquiry lesson provided by ArcGIS. The map

attached to the assignment offers multiple layers, each associated with different data representing tuberculosis cases, the inspiration behind Poe's "Mask of the Read Death." Figure 5.6 demonstrates one layer displaying various shades of red to show the number of tuberculosis deaths in 1800, the darker the color the more deaths, while another layer shows per capita active cases in 2015.

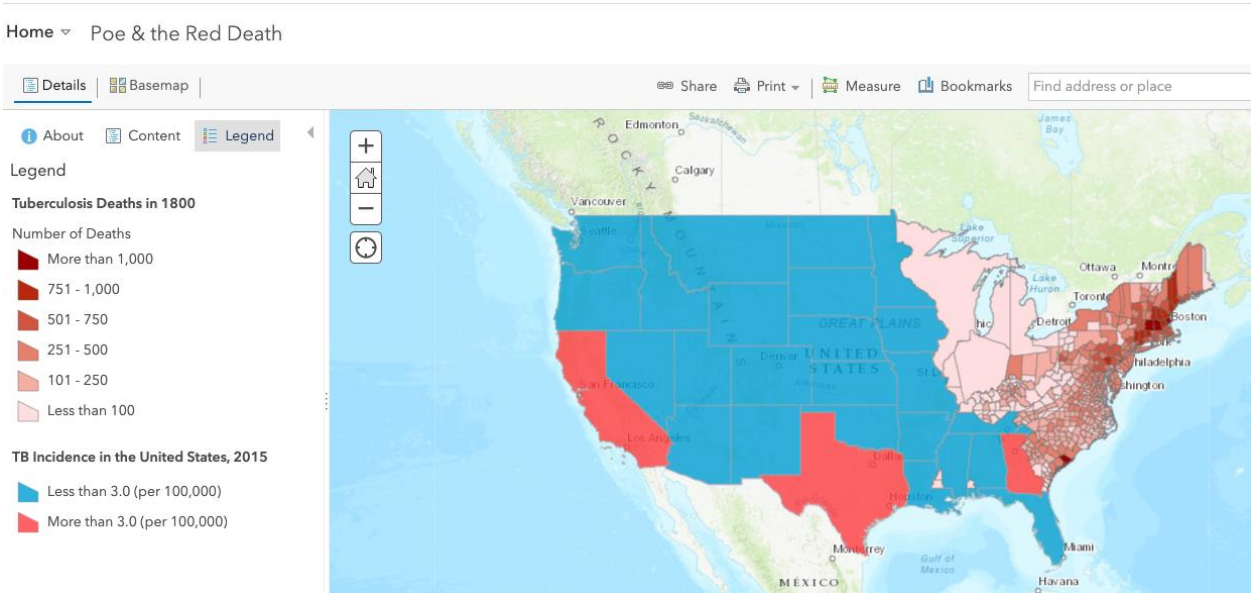

Figure 5.6. "Poe and the Red Death" ESRI Geoinquiries Lesson

What these layers present to students is the opportunity to compare, connect, and critically develop ideas about the content that they are working with. Students are able to gain a sense of appreciation and understanding of where the fear and confusion within the story is derived from by examining the facets of what is now considered to be a controlled illness. By developing a critical lens, students are able to reinforce their problem-solving skills while producing out-of-the-box ideas. Other than recognizing the significance of the information that they are working with, students have the chance to think critically about global relationships and the overall impact they have on history.

The final 21st-century skill that goes hand in hand with problem solving and critical thinking is becoming digitally competent. With 21st-century skills, students are encouraged to focus on the depth and the ways in which they think. Students need to develop an awareness of what technology-based tools to use in specific situations using problem-solving as well as critical-thinking skills to get there. When navigating geoinquiry programs, regardless of how intuitive those programs are, students are faced with a learning curve that needs to be overcome in order to seamlessly analyze and examine the data being presented. The upcoming graduating generations have been immersed in technology, whether good or bad, and these students have an understanding that makes their capabilities unique. Teens can use their phone for social media, but this does not make them digitally competent. The complexity of geoinquiry needs to be learned regardless of perceived mastery, assumptions surrounding teen technology competence is inaccurate. Learning how to manipulate data through technology allows students to develop an awareness, creating a learned skill that becomes a universal tool that allows for purpose and product to be exchanged with ease. Students are able to face the ever-evolving world of innovation with the capabilities to really create change through various digital platforms. Employers seek workers who have become digitally competent, making students' technology literacy profitable earlier than they most likely anticipate.

Educators are tasked with the duty to ensure that the students under their guidance are prepared for potential careers and are able to pursue higher education. Students have the obligation to be functioning members of society, which lessons in geoinquiries makes just a bit more manageable. Increasing student interest and motivation through relevance is one way to spur students on to action in the real world and become the problem solvers of tomorrow.

What content areas can use geoinquiry?

Geoinquiries is a universal process that can be implemented in any topic of study, creating the opportunity for instructors to collaborate through cross-curricular instruction. The locations and resounding conflicts described within the pages of literary texts invites an assortment of content areas to be used in conjunction with classic literature. Guidelines are established for students to graduate high school, and instructors who understand what courses they need to take can see why geoinquiries need to be incorporated into classrooms.

The Minnesota Department of Education states that students are required to complete 21.5 credits minimum to earn a high-school diploma. Credits start to accumulate once the student has reached the ninth grade

Table 5.1

Minnesota Graduation Credit Requirements

Credits Needed	Content Area	Course Examples
4 Credits	Language Arts	American Literature, composition, speech, creative writing,
3 Credits	Mathematics	Algebra, geometry, statistics and probability
3 Credits	Science	Biology, chemistry, physics
3 ½ Credits	Social Studies	U.S. history, geography, government and citizenship, world history and economics
1 Credit	Arts	Painting, drawing, ceramics, band, choir
7 Credits	Elective	Foreign Languages, shop courses, home economics, business, physical education

Source: "Minnesota Graduation Credit Requirements." *Minnesota Department of Education,* education.mn.gov/MDE/dse/gradreq/, 2019.

Every credit hour is the equivalent of one academic year worth of study, which in traditional public-school settings means students have four years to earn the various credits. Table 5.1

identifies the credit hours broken down by content areas, provided for by the Minnesota Department of Education. The table shows core classes — the areas of study at the root of a public education — including Language Arts, Mathematics, Science, and Social Studies. Based on the different required credits, students are asked to take a variety of classes, which cover a multitude of topics. Many of the topics featured in the far-right column are such that can be paired with a literature based geoinquiry lesson. For example, it is important to note that the only course students are required to take by the state of Minnesota all four years of their high-school education is English. This observation alone establishes the weight and significance that English has in regard for preparing students to be college and career ready. English classes are more than reading a book and talking about it as a class. Literature offers a way for students to connect their thinking beyond the boundaries of a course label with the recognition of how other classes seamlessly connect with the topics covered in literary texts.

The experts at ESRI take these comprehensive educational expectations into consideration and generate lesson plans, with interactive maps, to support educators in content areas, who may not be familiar with geoinquiry. ArcGIS Geoinquiry lessons are organized into topic specific collections, which makes navigating the site and locating a scripted lesson easy. Figure 5.7 demonstrates a few of the lesson plans that can be accessed for free that cover topics about health, science, physical education, world history, and many more. For example, the first image presented in Figure 5.7 is a lesson that asks students to analyze the global oil market. As indicated at the bottom of the Figure, one hour is allotted for the lesson, giving teachers an idea at quick glance as to how long that particular geoinquiry lesson might take. Educators clicking into the lesson further encounter a lesson chunked into smaller manageable pieces.

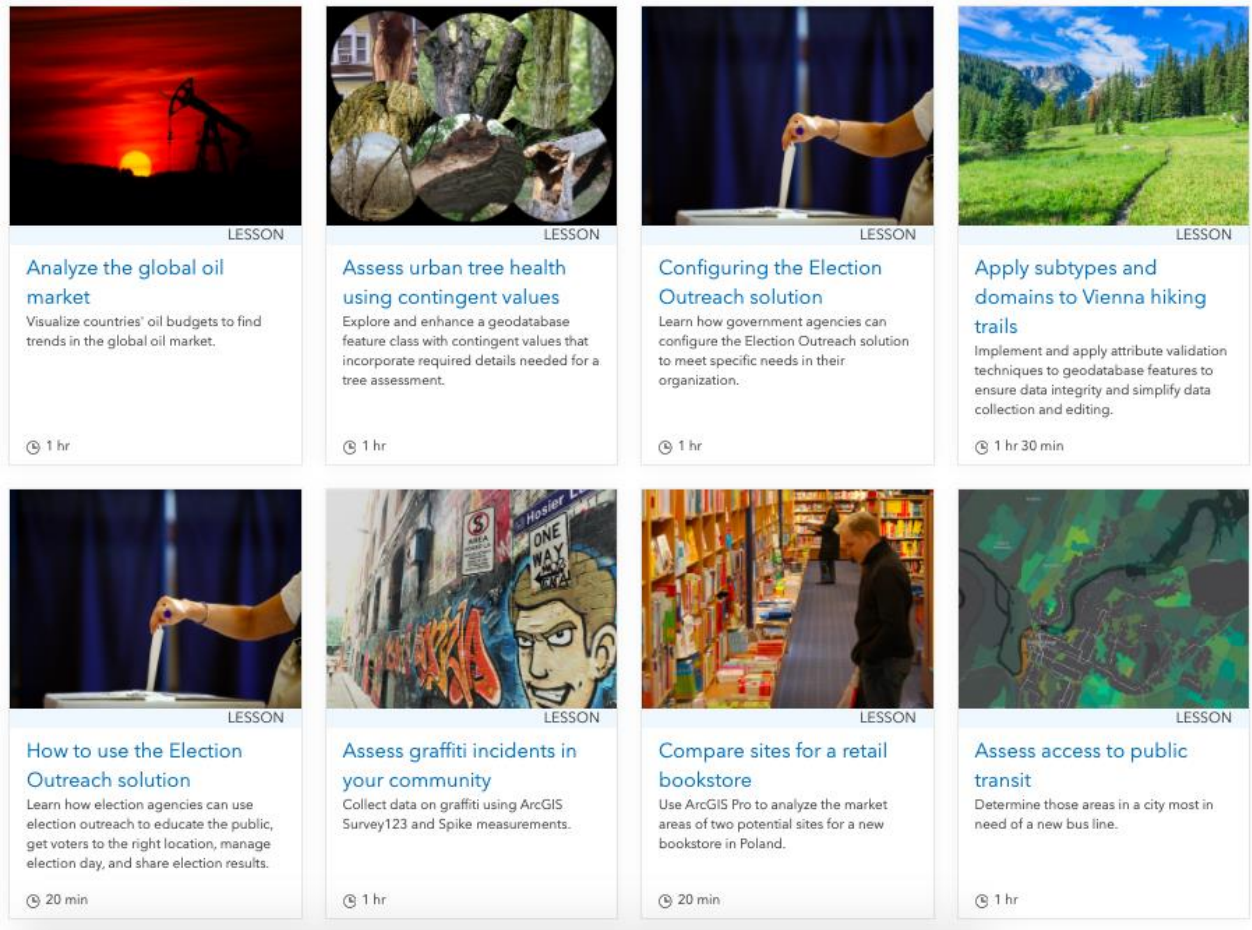

Figure 5.7. ArcGIS Lesson Gallery

Having a lesson organized in this manner is best practice for the formation of memories but also gives instructors the flexibility to deliver content at a pace that works for the students and the structure of the class.

Unlike what ArcGIS has to offer, Google My Maps is a blank slate, which can be used for any content area. An educator will need to implement creativity, out-of-the-box thinking, and prework in order to apply it to their subject area, but the versatility of the program truly allows any content teacher to use it as a resource. A map of any area in the world can be used to teach priority standards or skills students are expected to master. Using technology-based software can dispel the underlying hesitation and worry of teachers implementing geoinquiry for the first time.

Google My Maps and ArcGIS Geoinquiry lessons offer a reasonable way to create depth through inquiry, which gives teachers and students an opportunity to explore content in a different light.

Although the ultimate goal is to express how geoinquiries leads to the engagement and therefore academic achievement of students reading classic literature, the universal benefits of geoinquiry when used independent of literary texts cannot be overlooked. Maps give students a direct line to the world outside of their schooling and limited personal experiences, and if they can begin to grasp how big the world around them truly is, students will find success in an ever-changing society.

The purpose of this chapter was to introduce educators to the process of geoinquiry, benefits for the brain, platforms available for implementation, skills that are gained, and finally content areas that can use this educational practice. For teachers assigned the task of teaching classic works of literature, geoinquiry is an especially powerful tool. In his "On Literary Cartography: Narrative as a Spatially Symbolic Act" Robert Tally says that "as writers map their worlds, so readers or critics may engage with these narrative maps in order to orient [themselves] and make sense of things in a changing world." (Tally). Geoinquiry provides young readers of classic literature a chance to orient themselves in complex storylines via maps. The neuroeducational and academic benefits of the geoinquiry process emphasizes the need for teachers to provide such experiences in their classes. Beyond classic literature geoinquiry is a technique that can be applied to any kind of text whether it be fiction or nonfiction; the benefits of geoinquiry cannot be denied.

Chapter VI: Geoinquiry: Increasing Engagement and Retention in Classic Literature

Geoinquiry leads students to increased engagement and higher retention of content. Previous chapters have provided explanations and research-based best practices to lead up to the analysis as to how geoinquiries can assist students with reading classic literature. The literature mentioned in the following paragraphs has earned the title of "classic" based on the rigorous qualifications aligned with the social and moral values mentioned in chapter one. All of the components of geoinquiries, along with the benefits to students, provide a clear image as to how geoinquiries provide teachers with the means to engage their students while empowering them to retain information gathered through the experience of reading a classic text.

In what ways do maps make classic texts more accessible?

Teachers are known for their resourcefulness and creativity when it comes to delivering a lesson or covering a topic. English teachers as a part of their training to earn their license take courses on how to prepare lessons, select texts, and troubleshoot obstacles. Instructors have access to resources that provide an abundance of ways in which to make challenging texts approachable to the students reading them. What distinguishes geoinquiry from the other methods is the ability to activate the brain on a neurological level to provide engagement and therefore creation and retention of memories.

A final example of a detailed geoinquiry lesson will lead to clarity as to how maps make classic texts more accessible to students. The novel *Fahrenheit 451* by Ray Bradbury is featured on the recommended texts list referenced in chapter one. This futuristic novel can be difficult for students to connect with because of their inability to comprehend such a strict and overbearing society and the philosophical challenges of the characters. In order to make this high-school level book attainable to the teens who are being asked to read it, the text needs to be brought to their

reality. Figure 6.1 features a map layered with three pieces of data related to the book banning in schools as of 2020: books that were removed, books that were challenged but retained, and finally the population shaded by level of education in that county.

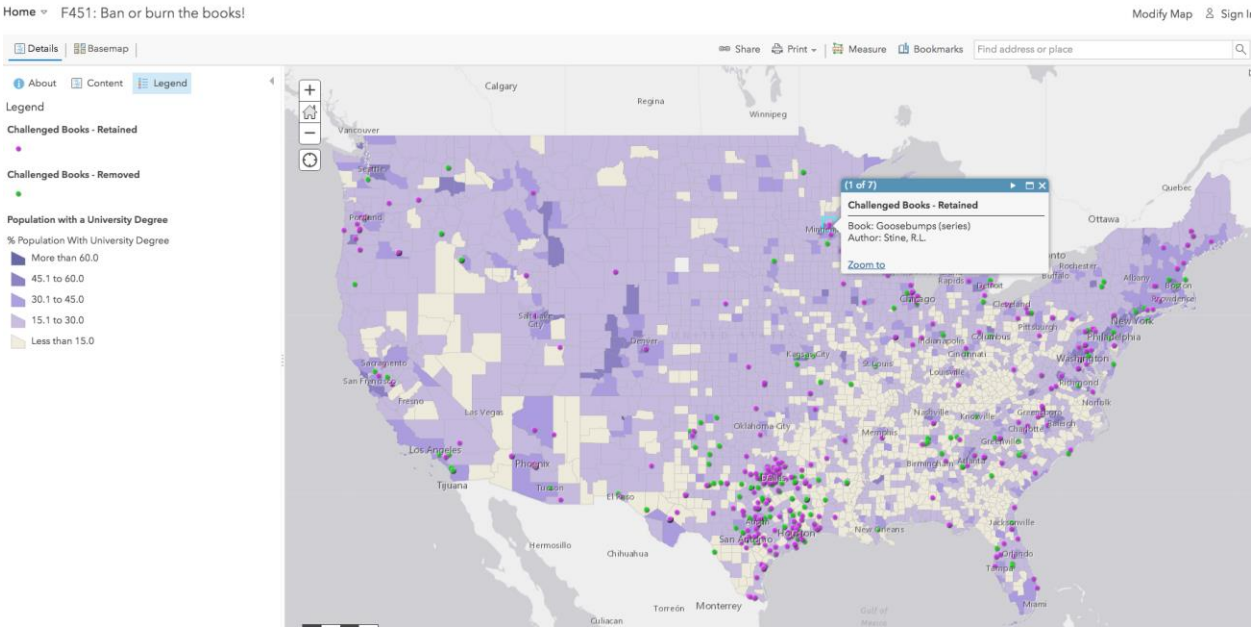

Figure 6.1. ArcGIS GeoInquiry Lesson - F451 Ban or Burn the Books Map

Imagine a teacher previewing *Fahrenheit 451* with an introduction to this map. Once students start to interact with the data, explore the places that they find to be personal, and start grasping the idea of censorship that is already occurring in their communities, the plot line and reactions of the characters become much less outlandish. In addition, geoinquiry lessons can lead students to critical and high-level thinking. The way the information is visually organized on the map gives students the chance to make independent deductions. When asked to consider where the greatest volume of banned book points lies, in connection to the geographical position and shaded area of the map, students are able to connect the level of education to the rate of book banning. It would be difficult to get students to draw these conclusions without the assistance of the map. Using geoinquiry allows students to see echoes of their world in the pages of a fictional

text, making the novel as a whole easier to understand. With this example the three issues students face reading classic literature — vocabulary, relevance, and learning — will once more demonstrate how geoinquiry is a comprehensive means of combating lack of student engagement and retention.

Primarily, one of the hurdles students often face reading a classic is the level of difficulty the language offers. The vocabulary becomes less of a barrier if there is context from the story to support what is happening. Language difficulty can be combated with various types of vocabulary instruction, but giving students the chance to put the story in their own words, as they come to understand the big picture, with the assistance from their teacher, makes the content more meaningful. *Fahrenheit 451* contains vocabulary that students may not be familiar with; however, by incorporating a geoinquiry lesson — which contains the same word usage in a similar context — teachers help students' brains move past the obstruction and engage with the text. If students do not follow the content being presented, they have no chance to see that there is a connection to themselves.

Now that students are able to understand what is occurring in the story, they have the opportunity to connect the novel to their own lives. Relevance is another hindrance that students face when asked to read classic literature. All geoinquiry assignments invite students to personally connect to the lesson because they can see their world on the map. Anne Beitlers and Pedro Noguera in their “Curricular Relevance: Students’ Needs and Teachers’ Practice” say, as school becomes more difficult, the need for curricular relevance increases. The authors go on to say that “relevance supports students academically by building bridges between what students know and new content. Curricular relevance also encourages active engagement and greater student buy-in” (Beitlers and Noguera). Once a student’s attention is lost, gaining it back

becomes an arduous task, making personal connections crucial for engaging students before moving too far into the text. Geoinquiry creates a way for students to buy in to classic literature through the clarity and relevance provided by the maps included in the lesson. Returning to the Ray Bradbury novel assignment, students are able to find their exact location on Figure 6.1, emphasizing that their community is not excluded from the problems raised within the novel.

Neuroeducation is the final way in which geoinquiries make classic literature more accessible for students. Learning is hard. Students' brains are being flooded with content, which the brain has little time to process and apply, in a setting that doesn't always encourage memory formation. Learners of all ages and their brains respond better to visual representations (Schunk 67). Once students understand the story, are able to connect it to their lives, and are provided with an image as to what is occurring on a geographical level, then they have reached a height at which their brain can absorb that much more content. Geoinquiry provides for the students a chance to understand and apply what is taking place in a complex text. *The Odyssey* is a classic Grecian text that has been translated from Ancient Greek to English, on top of being presented in a formal poetic structure, and it is no wonder students disengage and retain little of the information. When a teacher provides students the opportunity to chunk the content, in the case of *The Odyssey* stops along the journey, presenting the stops on a map provides visual representation for students to understand what is going on. Implementing chunking — what is originally thought of as best practice — transforms the lesson into the successful incorporation of neuroeducation.

The significance of geoinquiries, in the context of an English class, is made clear when looking at only the interpersonal connections it fosters for the students. The ArcGIS site states “Where stories happen matters. Geography isn’t merely a passive stage upon which things

happen. It shapes our stories. It often *explains* those stories" (Harrower). When given a chance to glimpse into their experiences, students have a chance to connect with classic stories and its characters based on where they are located. Geoinquiry gives them that connection.

How does geoinquiry lead to engagement and retention of content in classic literature?

Classic literature is recognized for standing the test of time as well as being quality writing with complex characters and enduring storylines. The role these stories play in the lives of teenagers has historically left much to be desired. Classics deserve to be remembered fondly for the part — regardless of how small — they play in shaping the way teens look at the world. Using neuroeducation to focus attention through deliberate planning, the instructor helps students' brains to process information via stimuli with a purposeful awareness derived from engagement. Along with the abundance of information students are asked to retain on a daily basis, the memories being formed in connection to classic literature will last longer because of the personal connections students are able to form with the characters and storyline. Geoinquiry provides engagement through novelty, technology, and relevance while teachers develop retention of subject matter in classic literature through content association, which strengthens recall leading to better performance on academic assessment tasks.

Attention can be triggered in a variety of different ways, one of which being novelty. Dave Schunk's *Learning Theories: An Educational Perspective* says "Novelty attracts attention; the brain tends to focus on inputs that are novel or different from what might be expected" (57). Knowing that the brain will focus on something that is unusual gives the advantage to the teacher. When it comes to maps paired with classic literature, the students' brains are attuned to what is going on due to the freshness of the content being presented. Using the classic novel *Fahrenheit 451* by Ray Bradbury, as an example, teachers pairing maps with a dystopian text

about burning books would be unexpected and peculiar. A sense of curiosity is fostered by capturing students' attention in both the content in the text as well as the map with the unique connection. In regard to *Fahrenheit 451,* asking students to analyze a curated map that tracks banned books across the United States as a way of piquing interest makes the novel element of geoinquiry an understandable way to boost engagement.

The use of digital technology can also be a way to ensure student attention during a lesson. In his 2018 "Novelty vs. Practicality: Technology in the Classroom" Andrew Julian says the importance of teachers recognizing and questioning whether the technology in the classroom they are asking their students to use is for a novel or practical purpose (Julian). As technology becomes more accessible, teachers are forced to adopt new devices and programs without proper training, leading to its misuse in the classroom. With respect to the technology used during an interactive geoinquiry experience: creating clarity and depth of understanding aligns with using technology for a purpose. The gains, when it comes to the students, have been well outlined; however, there are inevitable drawbacks. A small number of students, who just want to get on with the book already, find the use of technology —whether it be the device itself or a program they are being asked to navigate — cumbersome and wasteful. Teachers unfortunately become accustomed to not being able to reach every single student despite best efforts. Students thrive on immediate gratification, wanting to "finish" a book to its completion rather than reading it for its complexity. However, with a program like geoinquiries the depth is worth the slower pace. Teachers who devote precious class time to ensure students actually understand the content gives even the speedsters a reason to slow down: quality over quantity. Digital technology can be a way to garner the attention and therefore engagement of the students by developing an

understanding of the core elements of the text through the interactions of a map founded in geoinquiry.

The final way in which to engage students with classical literature, through the use of geoinquiry, is to bring relevance of what is taking place in the story to the lives of the students. Personal connection is the easiest way to develop a students' recall of certain memories. When a memory of an event is created in association with literature, the easier it is for the student to recall both synonymously. For example, the version of *The Odyssey* that is typically taught in high-school settings includes portions of the poem that cover the various stops Odysseus makes. At each pause in the journey the characters encounter monsters, mystical places, and conflicts. With over 12 stops it becomes difficult for students to remember the chronological order of the journey as well as what happens at each place. Since each disruption of the route also has an actual geographical location in Europe, geoinquiry allows for recall association, remembering what occurs based on the location on the map. Students are able to retain information from the literature and geoinquiry lesson on the neurological pathways created through the various engagement strategies mentioned. Not only will students be able to remember core themes and the general plotline of the text they are studying, but when the teacher maximizes the connections between various memories, students are able to recall them out of storage and use as needed.

Recall is crucial to education because it means that the information being processed was important enough to be moved into long-term memory storage. Recalling details demonstrates a deeper understanding of the text, which assisted in memory formation through content association. When a student pays attention, the information being presented is sent to the brain for processing. Students are able to build more neurological connections when they remember

the information, which they are able to draw on the previously established connections the next time they launch into a difficult text. In addition, highly developed recall pathways lead to higher academic achievement. Summative assessments encompass multiple goals, standards, and benchmarks that ask students to demonstrate what they understand; memories developed during a geoinquiry lesson will result in a better academic performance. Students develop a network of memories that will support the advancement of their 21st-century skills and success as global citizens by using the benefits offered by pairing literature and maps.

From what we know about geoinquiries and the brain it has become clear that classic literature does not have to be an intimidating hurdle that teachers and students face. A research-based approach explains why geoinquiries should be incorporated into the classroom as a means of delivering classic literature content effectively. A deeper understanding of classic literature gives students the space to develop not only a sense of respect for cultures different from their own but also empathy for the experiences of people from history. The skills gained by developing such an understanding, through analysis of cross-curricular content, is one that sets students up for success as open-minded individuals. Students can experience immediate academic-performance gratification when they see their grades improve as a result of deeply understanding the content. The more English teachers use geoinquiry to teach difficult classic texts, the more motivated they become to share the observed positive effects with their colleagues, ultimately leading to widespread use of a program that encourages student success.

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Appendices: Practical Resources Table of Contents

On a large scale the intent was to share some of the programs and resources available to educators if geoinquiry was not something they were aware of or knew how to incorporate into their content area. The following section features lesson plans, images, and links to assist in getting started, or in some cases review the options, that are available to teachers on their path of personal geoinquiry exploration.

Appendix A: Poe & the Red Death - Esri GeoInquiries™ collection for American Literature

- Link to printable scripted lesson - Click Here
- Lesson plan connects to Edgar Allen Poe's short story "The Mask of the Red Death"
- The story is loosely based on the tuberculosis epidemic and the assignment provides a geospatial insight as to where and how the illness spread.

Appendix B: Depression, dust, & Steinbeck - Esri GeoInquiries™ collection for American Literature

- Link to printable scripted lesson - Click Here
- Lesson plan connects to John Steinbeck's *Of Mice and Men* and/or *Grapes of Wrath*
- Both of these texts take place during the time of the Dust Bowl and feature the lasting effects of the Great Depression.

Appendix C: F451: Ban or burn the books! - Esri GeoInquiries™ collection for American Literature

- Link to printable scripted lesson - Click Here
- Lesson plan connects to Ray Bradbury's *Fahrenheit 451*
- As a dystopian novel many students find difficulty connecting with a philosophical text. This assignment asks students to look closely at the restrictions that are taking place in their own communities and draw conclusions about the information represented on the map

Appendix D: My Maps 9th Grade English Assignment on *The Odyssey*

- Portions of *The Odyssey* are featured in many curriculum platforms. This assignment was created as a way to help provide clarity to students who were struggling with the plot.
- Figure C1: Map used for reference for *The Odyssey* My Maps Assignment

Appendix A: ESRI GeoInquiries Lesson in American Literature: Mask of the Red Death

Poe & the Red Death

from the Esri GeoInquiries™ collection for American Literature

Target audience – American literature learners **Time required – 15 minutes**

Activity	Discover the impact of tuberculosis on 1800s America and modern society.
Standards	**CCSS: ELA-LITERACY.RL.11-12.3.** Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (for example, where a story is set, how the action is ordered, and how the characters are introduced and developed). **CCSS: ELA-LITERACY.RL.11-12.9.** Demonstrate knowledge of eighteenth-, nineteenth-, and early twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.
Learning Outcomes	• Students will analyze the impact of tuberculosis on Edgar Allan Poe. • Students will analyze the impact of tuberculosis on modern society.

Map URL: http://esriurl.com/litGeoInquiry3

Ask

Where was the red death?

→ Read aloud, "Poe didn't have tuberculosis (TB); however, the disease claimed his mother when he was almost 3 in 1811 in Richmond, Virginia. His foster mother died in 1829. The disease struck again in 1842, killing his wife."
→ Click the link above to launch the map.
→ Read aloud, "Two percent of the population was dying of the disease in New England."
→ Click the darkest red counties.
? In 1800, which counties had the most deaths from TB? *[Philadelphia, Hampshire, and more]*
? How many people were dying in those counties? *[More than 1,000 per county]*
→ With the Details button depressed, click the button, Content.
→ Click the checkbox to the left of the layer name, Tuberculosis Deaths in 1800.

Acquire

How does this disease affect different regions and people?

→ Click New York and New Orleans to view the chart. *(Note: The small arrow in upper right corner of the popup. Click through thearrow until the orange chart is displayed.)*
? What patterns of the disease do you see related to black and white people? *[More black people were dying of TB.]*
? What patterns do you see over time? *[It decreased over time, but there were fewer deaths in New Orleans.]*
→ Click the checkbox to the left of the layer name, New York and New Orleans...

Explore

Where is TB in the U.S. today?

→ Click the checkbox to the left of the layer name, TB Incidence In The US 2015.
? What states are above the average three per 100,000 people? *[Alaska, Hawaii, California, Texas, New York, New Jersey, and Georgia]*
? Of those states, what state has the highest case rate? *[Alaska]*
? Why Alaska? *[The disease can be latent for many years. Experts believe many may have been infected in the 1940s or 1950s and it becomes activated and then spreads further.]*

Analyze

How does TB affect other countries?

→ Turn on the layer, New TB Cases In The World 2009.
→ Click the button, Bookmarks. Select World.
→ Examine the new cases in 2009 around the world.
? What countries have the most cases? *[Russia, Oman, and more]*
→ Turn off the layer, New TB Cases in the World, 2009.
→ Turn on the layer, New TB Cases in the World, 2015.
? What has changed around the world? *[More new cases — Australia, Peru, Kazakhstan, and more]*

Act

What can we do to treat or eradicate the disease?

– Now that you have an idea about where people have TB, you will examine successful treatment.
→ Turn off all layers.
→ Turn on the layer, Success Rate Of Treatment Worldwide.
? Where has treatment been successful? *[USA, Russia, Oman, and Kuwait]*
? Where has treatment not been successful? *[Jamaica, Belize, and Finland]*
? Why might it not be successfully treated? *[Some people have strains of the disease that are more resistant to tradition antibiotic treatments.]*

SET FILTER PARAMETERS

- The Filter is only available for certain map layers.
- In the Contents pane, point to a layer and click the Filter button beneath the layer name.
- Set the Filter parameters.

TURN A MAP LAYER ON AND OFF

- Make sure that the Details pane is selected, and click Show Contents Of Map.
- To show individual map layers, select the check boxes next to the layer names.
- Hint: If a map layer name is light gray, zoom in or out on the map until the layer name is black. The layer can now be turned on.

Next Steps

DID YOU KNOW? ArcGIS Online is a mapping platform freely available to U.S. public, private, and home schools as a part of the White House ConnectED Initiative. A school subscription provides additional security, privacy, and content features. Learn more about ArcGIS Online and how to get a school subscription at http://connected.esri.com.

THEN TRY THIS...

- Explore other statistics in the data tables by symbolizing other factors.
- Filter the data tables.

TEXT REFERENCES

This GIS map has been cross-referenced to material in the following short story.

- *"The Masque of the Red Death," Edgar Allan Poe*

Version Q1 2018. Send feedback: http://esriurl.com/GeoInquiryFeedback

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Appendix B: ESRI GeoInquiries Lesson in American Literature: The Dust Bowl

AMERICAN LITERATURE

Depression, dust, & Steinbeck

from the Esri GeoInquiries™ collection for American Literature

Target audience – American literature learners **Time required – 15 minutes**

Activity	Explore the economic, environmental, and cultural influences in Steinbeck's work.
English Standards	**CCSS: ELA-LITERACY.RL.11-12.3.** Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama. **CCSS: ELA-LITERACY.RL.11-12.9.** Demonstrate knowledge of eighteenth-, nineteenth-, and early twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.
Learning Outcomes	• Students will analyze the impact of the drought on characters. • Students will analyze the agricultural and economic influences in the literature.

Map URL: http://esriurl.com/litGeoInquiry10

Ask

Where did they come from?

→ Click the URL above to launch the map.
? How do we define refugees? *[Economic/environmental/political migrants]*
→ Examine the population change displayed on the map.
? How does the population change in Oklahoma and California between 1930 and 1940? *[People fled the Dust Bowl for jobs in California.]*

Acquire

Why did so many farmers leave their land?

→ Read aloud: "Houses were shut tight, and cloth wedged around doors and windows, but the dust came in so thinly that it could not be seen in the air, and it settled like pollen on the chairs and tables, on the dishes." – John Steinbeck, *The Grapes of Wrath*
→ With the Details button depressed, click the button, Content.
→ Click the checkbox to the left of the layer name, Population Change, to turn the layer off.
→ Turn on the layer, Farm Count Change By County.
→ Turn on the layer, Dust Outline.
? What role did farming play in the story? *[Farms dried up in the Dust Bowl and flourished in California.]*

Explore

How did people migrate?

→ Turn on the layer, Route 66.
→ Click the line to see the mileage for each state of Route 66.
? How far did the characters possibly travel? *[Answers vary based on the novel.]*
? How many miles did the Dust Bowl "refugees" travel/migrate? *[More than 1,200 miles]*
→ Look back at the data from population and farm count.

more ▶

Analyze

What waited for migrants in California?

→ Click the button, Bookmark. Select the bookmark, Of Mice And Men.
→ Turn on the layer, Of Mice And Men.
? Why were there so many ranches in the Salinas River Valley? *[The river provided water for crops and livestock. Large, thriving ranches meant jobs for strong men.]*
→ Select the bookmark, San Bernardino.
? What proof in the map data do we find that people like our characters migrated? *[Areas of Northern and Southern California have farm and population growth. Both areas would be accessible by common routes.]*

Act

What do modern climate migrants look like?

– Global sea level rise will make many populations migrants, even in the United States.
→ Press the button, Basemap. Select the Imagery basemap.
→ Select the bookmark, Isle Of Jean Charles.
? What is happening here? *[Water rising will overtake the area in time, like other areas.]*
? Where will these people move? *[Student speculations might include nearby higher-ground cities.]*

ZOOM TO A BOOKMARK

- Click the button, Bookmarks.
- Select a bookmark name to zoom to a map location and scale.

USE THE MEASURE TOOL

- Click Measure, select the Distance button, and from the drop-down list, choose a unit of measurement.
- On the map, click once to start the measurement, click
- again to change direction, and double-click to stop measuring.
- Hint: Position the area of interest on the map so that it is not obscured by the Measure window.

Next Steps

DID YOU KNOW? ArcGIS Online is a mapping platform freely available to public, private, and home schools. A school subscription provides additional security, privacy, and content features. Learn more about ArcGIS Online and how to get a school subscription at http://www.esri.com/schools.

THEN TRY THIS...

- Have refugee circumstances changed since the 1930s? Compare modern circumstances to those from the novels. Explore other Climate Migrants (http://esriurl.com/Geo227) or explore The Uprooted (http://esriurl.com/Geo228).
- With an ArcGIS Online organizational account for schools, use the Routing tool to determine modern migration or refugee routes.

TEXT REFERENCES

This GIS map has been cross-referenced to material in sections of chapters from these American novels.

- *The Grapes of Wrath*, John Steinbeck
- *Out of the Dust*, Karen Hesse
- *Of Mice and Men*, John Steinbeck

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Appendix C: F451: Ban or burn the books! - Esri GeoInquiries™ collection for American Literature

AMERICAN LITERATURE

F451: Ban or burn the books!

from the Esri GeoInquiries™ collection for American Literature

Target audience – American literature learners **Time required – 15 minutes**

Activity	Explore banned books, population density, religion, and global literacy related to *Fahrenheit 451* by Ray Bradbury.
Standards	**CCSS.ELA-LITERACY.RL.11-12.3**. Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (for example, where a story is set, how the action is ordered, and how the characters are introduced and developed). **CCSS.ELA-LITERACY.RL.11-12.9**. Demonstrate knowledge of eighteenth-, nineteenth-, and early twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.
Learning Outcomes	• Students will analyze the patterns of reported book challenges. • Students will analyze how book challenges and *Fahrenheit 451* are related to religion, education, and literacy.

Map URL: http://esriurl.com/litGeoInquiry14

Ask

Where are the challenges to remove books?

→ Read aloud, "According to the American Library Association, 'A challenge is an attempt to remove or restrict use of a book from a library, public circulation, or a teaching curriculum, based on objections by an individual or group. Censorship is a review of books, movies, or other forms of expression to prohibit publication, viewing, or distribution.'"
→ Click the link above to launch the map.
→ Examine the distribution of the book challenges and the population density.
→ Describe the pattern of the challenges—clustered, linear, random? *[Answers vary but may include clustered in the northeast and Texas. It looks random in other places.]*
→ Zoom in to view large clusters of Challenged Books.
? How is population density related to the number of challenges? *[Clustered near large cities]*

Acquire

What books were banned?

→ With the Details button depressed, click the button, (Show) Contents.
→ Uncheck the two layers, All Challenged Books and Population Density.
→ Turn on the layers, Challenged Books Retained and Challenged Books Removed.
→ Explore the distribution of retained and removed books by turning the layers off and on.
? Is there a pattern to the challenged books that are removed versus those that are retained? *[Answers vary but may include a similar distribution. Far more books are retained than removed. More are removed in Texas.]*

Explore

How does religion influence challenged books?

– People challenge books for many reasons, but religion is a strong influence on challenged materials.
→ Turn on the layer, Religious Adherence For Evangelicals.
? What is the relationship between evangelicals and the number of challenges? *[Strong connection in the South]*

Analyze

How does education influence challenged books?

→ Turn off the layer, Religious Adherence For Evangelicals.
→ Turn on the layer, Population With A University Degree.
? Do areas where citizens are well-educated see fewer challenges? *[Not necessarily; however, this hypothesis is supported in Colorado, where there is a high education population and fewer challenges.]*
? Does religion or education have the stronger influence over the number of challenges? *[Religion seems to be a stronger influence.]*

Act

How important is reading?

– Read aloud, "In *Fahrenheit 451*, reading had become a crime. Democracy, freedom, and many other individual rights exist in countries where literacy and education are supported.. "
→ Turn off all active layers and turn on the Global Literacy layer. Zoom out to see the world map.
? What are the patterns of global literacy? *[Wealthier and more educated countries]*
? What countries have high literacy rates? *[Countries in Europe, North America, and Japan]*
? What continent has the lowest literacy rates? *[Africa]*
? Do countries with higher literacy rates have a responsibility to support education in countries with lower literacy rates? *[Answers will vary. Open discussion for class.]*

SET FILTER PARAMETERS

- The Filter is only available for certain map layers.
- In the Contents pane, point to a layer and click the Filter button beneath the layer name.
- Set the Filter parameters.

LEGENDS, LAYERS, AND SYMBOLS

- To the left of the map, click Details and then click the Show Contents Of Map button. The Contents pane allows you to turn on and off layer visibility.
- Press the Legend button. The Legend pane allows you to identify symbols.
- On the map, click symbols for more information that will appear in a pop-up box.

Next Steps

DID YOU KNOW? ArcGIS Online is a mapping platform freely available to public, private, and home schools. A school subscription provides additional security, privacy, and content features. Learn more about ArcGIS Online and how to get a school subscription at http://www.esri.com/schools.

THEN TRY THIS...

- Explore the distribution and relationships between other religions and book challenges by symbolizing the existing layers.
- Filter the data layers to explore other relationships.

TEXT REFERENCES

This GIS map has been cross-referenced to material in the following novel.

- *Fahrenheit 451 by Ray Bradbury*

Appendix D: My Maps 9th Grade English Assignment on *The Odyssey*

Goal: Using the My Maps Google site create a map that outlines the main parts of Odysseus' journey from part I of *The Odyssey*. This will provide you with an opportunity to visualize his journey as well as apply what you have learned about each location with brief summaries.
Points to include in the Map:

Troy	Polyphemus's Cave	Circe's Island	Scylla	Laestrygones	Lotus Eaters
Ciccone 's	King Aeolus' Island	Land of the Dead	Charybdis	Sirens	Ithaca

Additional Requirements:

- Each stop needs:
  - A title
  - A 2-3 sentence summary of what happened at that stop
  - An image (Use google image search when you click on the camera)

Directions:

- Google "My Maps"
- Click on create New Map
- Title it: "The Odyssey Map"
- For layer 1 title it "Part I"
- I would suggest "Simple Atlas" for the base map but that is up to you
- Zoom in to the area over Europe & Asia (Map below for reference)
- Click on the upside-down tear drop and click on the map where you want it placed
- Add the title, summary, and picture
- Repeat the process until you have all twelve markers on your map

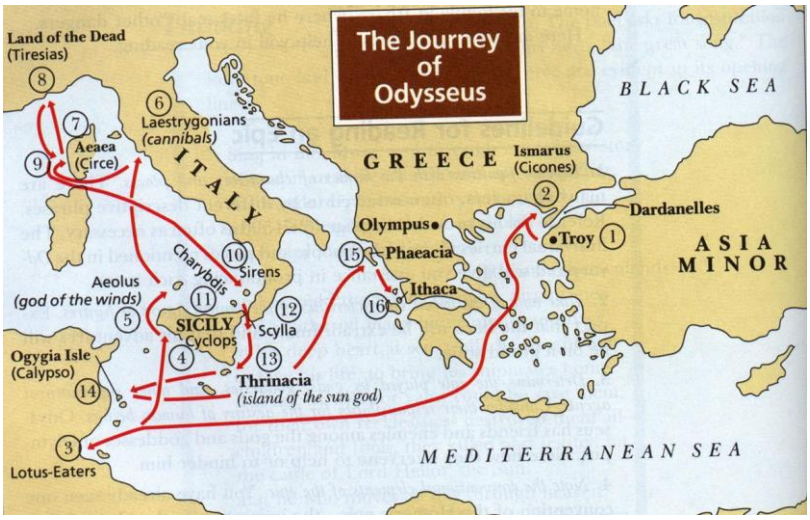

Figure C1: Map used for reference for *The Odyssey* My Maps Assignment

Glossary of Terms

Affective Engagement - The amount of attention a student is able to give to their classes based on how secure they feel in all aspects of their life.

ArcGIS - An education-based company that provides resources and platforms for teachers to implement geoinquiry into their classrooms.

Classic Literature - Texts that have stood the test of time with themes, characters, and storylines in which the audience is able to identify with or gain a greater understanding of.

Content Association - Correlating two different topics based on the neurological pathways formed during the memory creation process.

Cross-Curricular Instruction - The "crossing" or combination of two different content areas in order to provide a lesson that leads to a deeper knowledge or understanding based on the ideas presented. The content areas lend themselves to being combined based on subject or standard.

Engagement - The direct attention given to a stimulus that causes the individual to connect in some way to the content being presented.

Geoinquiry - Posing a question, that will lead to a deeper understanding of a concept or subject, that can be answered through the use and analysis of maps and their layered data.

Geospatial Technology - The tools that are available and used as a means of analyzing data on a map based on location. Global position systems found in most cell phones are an example of this.

Literary Cartography - The reference and use of real or fictional maps in literature.

Literature - A piece of fictional text that has assigned value based on the structure and content.

Metacognition - The awareness of one's own thinking process, used in terms of student

engagement when told that something needs to be learned.

My Maps - A Google platform that allows users to plot and connect points, provide details and images for each point, and create multiple layers of information.

Neuroeducation - The use of brain science to inform educational practices to better meet the academic and emotional needs of students.

Retention - The ability for a student to acquire, sustain, and apply knowledge gained in the classroom to practical real-world situations.

Self-Efficacy - One's confidence in themselves that they are able to control what it takes to be successful in a task or goal.

Silo Effect - A negative way of describing the logistical way in which teachers are organized and separated based on the content area that is delivered to the students.