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Hunting for Treasures Through Learning
Using Geocaching to Motivate Young Adolescent Learners

Katherine B. Brown, PhD\textsuperscript{1,2}, Abby J. Hughes, MEd\textsuperscript{2}, Isabelle G. Crowder, PhD\textsuperscript{2,3}, and Philip M. Brown, PhD\textsuperscript{2}\textsuperscript{[AQ: 2][AQ: 3]}

Abstract: As the National Middle School Association\textsuperscript{[AQ: 4]} wrote, “No other age level is of more enduring importance because the determinants of one’s behavior as an adult, self concept, learning interests and skills, and values largely are formed in this period of life.” During this influential time in the lives of gifted adolescents, it is important to expose students to a variety of experiences and educational topics. Geocaching, a high-tech scavenger hunt, is one rewarding strategy that supports the growth of gifted students’ emotional, social, and intellectual being through the wide variety of topics addressed, the problem-solving skills involved, and the collaboration required with peers. This manuscript examines the incorporation of geocaching into the middle school classroom as a means to motivate gifted young adolescent learners.

Keywords: instructional strategies, technology, problem solving

Owen despised social studies. In fact, he had since elementary school. It was his least favorite class. Learning about people he had never heard of made little sense to him. Reading about places he would never be able to visit bored him. Owen figured that middle school social studies would be the same as it had been since elementary school... boring.

When Owen walked into Ms. Tomkins’s social studies class Monday morning, he did not know that his opinion about social studies was about to change. Today, Ms. Tomkins was teaching about map skills. But instead of asking the class to take out their textbooks, she handed them a GPS device and a map of the Earth. Ms. Tomkins was determined to connect social studies to the active world around her students. Today, they would begin learning about the world through the lense of geocaching.

Introduction

Gifted students are often distinguished from their peers by their ability to learn content more quickly and link the new knowledge to previously mastered skills and knowledge, advanced performance in one or more areas, aptitude for dealing with complexity and abstraction, and deeper concentration on or commitment to multiple activities (Feldhusen, 1989; Rakow, 1989; Rogers, 2007). They also typically have high self-efficacy and can easily achieve at levels beyond their chronological peers (Moon, 2009). Based on these characteristics, students with high-ability need an educational environment that is appropriately challenging with quality, fast-paced instruction at a high conceptual level (Feldhusen, 1989; Moon, 2009). When reviewing the literature on gifted education, the following findings repeatedly emerge: Gifted students face great risk when schools fail to meet their unique educational needs. Gifted underachievement is of particular concern, and it is estimated that as many as 15% to 40% of gifted students are “at risk” of failure or performing below their full potential (Rayneri, Gerber, & Wiley, 2006). Educational environments are a primary influence on the extent to which gifted students will experience challenges and problems related to motivation and academic achievement. Often, our gifted students begin to lack motivation because they have no connection to the content being taught. Students wonder, “Why are we learning this information?” “How does this content relate to my life?” Sometimes, teachers do not make strong connections for students, and kids spend hours of their time...
memorizing facts that they will never actually need to recall after the end of chapter test. Teachers must find a way to connect the curriculum students are learning in the classroom to the students’ future development within the current world. Teachers must provide opportunities for students to develop skills that will help them become learners and workers in the 21st century.

Many gifted students spend countless hours communicating and working with technological devices. These students thrive in manipulating different sources of technology; however, too often they do not apply their technological abilities to tasks that may help them succeed as contributors to society. Our job as educators of the gifted is to take tools that students are already interested in using, teach students about new technological tools, and show students how they can use these tools to learn more about our world (National Association for Gifted Children [NAGC], 2010, 4.5.3). One way teachers can engage gifted students and address numerous NAGC Pre-K-Grade 12 Gifted Programming Standards (NAGC, 2010) is through geocaching.

What is Geocaching?

Geocaching is a high-tech treasure hunt. Through geocaching, people hide treasures within small containers, called caches, in a location that is documented by its coordinates. Others then use a compass, a GPS device, and clues to find the location of the cache. Once the cache is found, people usually collect a small treasure from the cache and leave another small treasure for others to find. Each cache also has a log book, which the treasure hunter signs and then places back in the cache, which he or she then puts back in the designated hiding spot. There are over a million caches hidden worldwide, including caches hidden in the ocean. Additional information about geocaching can be found at the website, www.geocaching.com.

Different types of geocaches can be hidden and found. Micro-caches are very small caches usually the size of a film canister and are often more difficult to find. Multi-caches use a series of clues and coordinates to reveal the location of a final cache. These caches are typically in close proximity to one another. Geocachers may also create a travel bug, which is registered with an identification number and travels to different caches around the world.

Geocaching has been supported by educators throughout the past decade, and the educational application to geocaching has been coined by some as “educaching” (Dobyns, Dobyns, & Connell, 2007, p. 2). Educaching can allow students the opportunity to explore multiple subject areas in depth while traveling to different places within the world either physically or virtually. Through geocaching, students can explore historical sites, geographic regions, and animal habitats. Geocaching provides an opportunity for a deep understanding of geographic and mathematics skills and requires students to collaborate with one another as they work to create or find treasures in our world. The interdisciplinary opportunities for teachers and students to work across different subject areas are immense and should be investigated in teacher teams. According to Dobyns et al. (2007), “Educaching allows us to capture excitement and use it to facilitate high-end learning for all students in all curricular areas (p. 3).”

Why Incorporate Geocaching Into the Classroom?

Melvin truly admired his father’s service in the Navy, but he never could understand his father’s job aboard a naval submarine. Due to curriculum compacting in his math class, Melvin was able to explore the connection between GPS technology, mathematics, and naval submarines as part of an independent project. After using the GPS in his math class, Melvin’s teacher allowed him to bring the handheld GPS home to look for some caches near his neighborhood. Melvin asked his dad to join him on a geocaching adventure later in the afternoon. His dad was happy to spend some time outside with his son, but he had never experienced geocaching. This adventure allowed Melvin the opportunity to develop leadership skills by explaining and leading his dad on a geocaching adventure. Later in the evening at the dinner table, Melvin’s dad explained his work with GPS on the submarine, and due to Melvin’s interest and his independent project, his dad scheduled him for a tour of the submarine during the summer. This experience with geocaching inside and outside of the classroom helped Melvin experience the opportunity to lead his dad, as well as continue to learn about his father’s position within the Navy and the connection to the subjects he was exploring in school.

While there may be no singly adopted philosophy for educating young adolescents, individuals who work with this age group do seem to agree on one thing: the importance of this time to one’s future development (Alexander, 1968/2005; Hall, 1904/2005; Jackson & Davis, 2000; Lesko, 2001; Nakku, 2003; National Middle School Association, 1992, 2003, 2010; Ross & Wright, 1985). This is especially true of gifted adolescents, as educators design learning experiences that address their learning needs. According to Hébert (2012), “Advanced learners recognize their preferred approaches to learning, and they require meaningful and challenging school experiences that address their unique characteristics and needs” (p. 29). During this influential time in the lives of gifted adolescents, it is important to expose our students to a variety of experiences and educational topics to help them reach their full potential (NAGC, 2010). Geocaching is one rewarding educational strategy that addresses many of the NAGC Pre-K-Grade 12 Gifted Programming Standards (NAGC, 2010). Specifically, geocaching supports the growth of students’ emotional, social, and intellectual well-being through the wide variety of high-quality curriculum addressed (3.1.4), problem-solving skills involved (3.4.3), incorporation of technology (4.5.3), and collaboration required with peers (4.4.3; NAGC, 2010). Geocaching requires students to make decisions, learn abstract material, and test ideas in an authentic way (NAGC, 2010).
Due to the broad scope of geocaching opportunities, curious students will find ways to expand on basic geocaching experiences to explore a variety of related issues and topics. Geocaching is an excellent differentiation tool for teachers to utilize within their classroom (NAGC, 2010, 3.4.1). Each student within a classroom brings a unique set of skills, and by working in geocaching teams, students can discover their individual subject-specific skills such as calculating area or perimeter or designing the route of a multi-cache hunt. Geocaching also offers opportunities for independent exploration based on student interests, content abilities, and learning styles. During a hunt, students may also discover and develop their leadership or team-building skills, a target of high quality, gifted programming (NAGC, 2010, 4.3). To this end, it may be useful for the teacher to develop roles and norms for teamwork during each hunt. For example, one person may be the GPS reader while another may be responsible for collecting data during the hunt. In addition to the variety of issues that can be explored by individual students through geocaching, student groups who create their own geocaches will need to differentiate tasks based on interests and talents to develop the components of a successful geocache (NAGC, 2010, 4.4.3).

With its emphasis on authentic, exploratory learning experiences, geocaching is an ideal instructional strategy for gifted middle school students (5.1.3). The characteristics of gifted young adolescents clearly align with the process of geocaching. Using the energy, curiosity, and competitive nature of gifted adolescents, geocaching provides an educational arena for students to explore and discover.

**Geocaching in Multiple Disciplines**

Teachers in numerous content areas can find ways to incorporate geocaching into their classroom to meet the needs of gifted young adolescents. This section will discuss strategies for integrating geocaching into the areas of math, science, language arts, social studies, art, and physical education.

**Math and Science**

*A gifted artist, Lupita, often struggled in mathematics, and like many of her classmates, learned better when she had a visual example of a mathematical concept. Coach Dorsey had already taught Lupita about circles using formulas and diagrams. Lupita and several of her classmates still weren’t understanding the concepts of radius, diameter, circumference, and area of a circle.*

Then, Lupita and her classmates were taught about geocaching in one of their exploratory classes. As part of the instruction, they learned about accuracy with the GPS. Lupita’s exploratory teacher, Ms. Bivins, took the students out to the empty bus parking lot and broke the students into small groups to help them understand the accuracy of the GPS and how this would affect their treasure hunt. Ms. Bivins told students to pretend like they were standing with their GPS at the center of the circle, which gave an accuracy measurement of ±8 feet. She asked students how they could demonstrate where the cache might be hidden using string and chalk. It didn’t take students long to figure out that if they measured out 8 feet of string, they could have a person in the center of the circle hold one end of the 8-foot string and someone else hold the other end. That person would then walk with the string, drawing a line with chalk on the concrete. The end result was a circle, which would hold the cache hidden somewhere inside.

Lupita was surprised to learn later that the length of the 8-foot string was the radius and began to have a better understanding of the formulas that would help you find the area and circumference of a circle. Coach Dorsey was even more surprised when Lupita shared this experience with her math class the next day and aced the section on circles on her math exam. After seeing how she performed higher academically on these specific mathematical concepts due to an incorporation of her strengths and interests, Coach Dorsey decided to advocate for Lupita to participate in the mentor program at school. She was connected with a local artist who incorporates mathematical designs into her art. This experience helped Lupita to grow in her area of talent, and also supported her in areas in which she did not typically demonstrate strength.

Use of the GPS device requires advanced preparation to acquaint students with its many functions and uses; this allows teachers to incorporate state and national standards at an advanced level as they train students to use the GPS correctly. Teachers of mathematics and science have the opportunity to prepare many in-depth lessons related to the GPS because the device provides many mathematical and scientific problems. Initial lessons should include an orientation to the GPS device itself, discussions and demonstrations of how the GPS coordinates change with regard to latitude and longitude, and discussions of accuracy and how to determine the precision of a GPS. These lessons, along with an introduction to geocaching, provide the essential hooks that are needed to motivate gifted learners.

The GPS device presents challenges to students as they learn to calculate the pace in seconds to produce a change in the coordinates. Mathematics teachers can use this opportunity to discuss rate and ratio in a real-world context. Students also begin to notice patterns as the degrees and minutes remain the same or rarely change in a local area. Discussions about this concept and connecting students to the meaning of the lines and numbers on the globe bring earth science to life, especially when science teachers incorporate conversations about how the center of the earth is used to calculate these angles. During math class, angles begin to make sense to students who now see relevance to their own world. Imagine the look of excitement on students’ faces when a mathematics or science teacher discusses latitude and longitude in terms of angles and earth processes instead of pointing to a picture in a textbook. These discussions and experiences reaffirm to students that learning is engaging and exciting.

After initial lessons to prepare students to use the GPS receiver, teachers can take geocaching to many different levels...
depending on student interests and extensions to state or national standards. Like it did for Lupita, lessons teaching students to use the accuracy as the radius of a circle opens many a treasure hunters’ eyes. Seeing a circle made of yarn or string with a radius of 6 feet allows students to understand area and circumference at a deeper level than seeing a flat circle in a textbook. Teachers can also use coordinates to teach perimeter and area. Some students become preoccupied with the technical workings of the satellite system, and their interests relate to the earth in space as well as triangulation and mathematics involved in receiving an accurate satellite reading on earth. Other students become interested in waves emitted by the satellites and the speed of those waves. Providing students with differentiated research topics related to the GPS and satellites motivates students to research in order to connect what they read to what they do with the GPS receiver (NAGC, 2010, 3.3.3). Students connect more to their community and the outside world as they create their own caches and determine how to preserve nature and hide their cache from the outside eye. Researching the location of a cache provides students with field experience as they consider the flora, fauna, and safety of their surroundings and whether a cache could appropriately exist in that location.

GPS technology can also be combined with other software and devices to expand on the class discussions (NAGC, 2010, 4.5.3). For example, students can use Google Earth as a way to continue the coordinate discussion and expand into other subjects such as science through the study of biomes and climates. Also, the process of geocaching can help students with understanding the importance of data collection and journal writing. With regard to data collection, teachers can use geocaching to teach students to use computer programs such as Microsoft Excel to organize and graph data.

As students become more proficient with the GPS receiver, mathematics and science teachers can extend learning by incorporating mapping skills using topographic maps, scale drawings of a geocaching area, and ways scientists calculate coordinates without the aid of a GPS receiver. Graphs play a key role in helping students understand how GPS works. Students enjoy debating the pros and cons of GPS technology through Socratic seminars and discuss how advanced mapping programs and satellites are changing communication and the earth (NAGC, 2010, 3.4.1). Allowing students to delve into these topics encourages them to become more aware of their environment, their place on earth, and when they will use mathematics skills in the real world.

**Social Studies and English Language Arts**

After a frustrating day trying to get students to write narratives, Mr. Parker knew he needed something to inspire his students to write more creatively and find meaning for the characters they wrote about. That is when he decided to use geocaching and learning menus to get his students motivated and thinking in original ways. Mr. Parker began by creating a learning menu with assignment descriptions and support documents for each of the choices. All students would work on types of narrative writing with geocaching as a common theme. One choice allowed for students to write a historical narrative and create a virtual cache to link this narrative with a special location chosen by the student in the local historical district. Another choice allowed students to create a multi-cache with clues set in the form of a quest narrative. The final choice encouraged students to write a fantasy narrative using forced fit concepts while creating a travel bug. Steven and Shawna chose to work together to create a travel bug. As an exercise in creative flexibility, Mr. Parker had the pair choose one object from a box of toy animals, cars, and figurines. The students then wrote the beginning of their narrative story about their characters. One requirement was that each of the characters had to desire to travel the world or go to some special place. Students were also required to create the character’s background story and give him or her a reason to travel. They would then create the remainder of the story as the character experienced life as a real travel bug.

Steven and Shawna chose a car which they named Flames. In their narrative, Flames was in love with a gorgeous red mustang who didn’t love him back. This car believed that if he made it to a famous body shop in San Antonio, Texas, he could get a new paint job and the beautiful mustang would love him. Flames hoped that geocachers around the world would help him to get to San Antonio. After the rough draft of their narrative was written, Steven and Shawna typed their story and registered their travel bug, Flames, on geocaching.com. Mr. Parker placed Flames and other students’ travel bugs in caches around town to get them started on their adventures. Steven and Shawna had a blast keeping track of the cool places that Flames traveled on a map and continuously added to their narrative about Flames’ adventures in various cities such as Atlanta, Pittsburgh, Key West, Tallahassee, New Orleans, and finally, San Antonio. Students were able to share their narrative piece and the success of their travel bug in the local leisure magazine, encouraging parents to try geocaching with their children. Not only did Steven and Shawna learn about writing a narrative and geography, they also found a way to make their imaginative stories come to life.

Connecting students to other parts of the world and getting them excited about writing is natural when students use travel bugs as a part of geocaching. A travel bug has a special ID tag that allows for easy tracking as it moves from cache to cache. Travel bugs can be large or small items, and students may wish to set goals for the item as it makes its way around the world. Using this version of geocaching allows teachers to help students create a story and description of the travel bug’s life and goals, track the progress of the travel bug on a map, and write about the travel bug’s adventures. Students are motivated to check on the status of their travel bug and read the interesting log entries after each visit. Every new location opens the students’ eyes to places outside of their own hometown. Finding connections to these locations allows students to make sense of the world around them and engages learners in discovering new and interesting places. Many students never imagined social studies and English language arts could truly take them to new places.
Geocaching can be incorporated into language arts and social studies in other ways. Social studies teachers put tools for learning map skills right into learners’ hands when they relate latitude, longitude, and the history of navigation. When students are able to write about these experiences or research navigation and the invention of the GPS, they become immersed in the history and development of such a system. Students can focus on the global implications of having satellites in space that give specific locations, society’s dependence on GPS technology, or plans for the future of GPS technology and what it means for the world (NAGC, 2010, 3.4.1). While on a field trip, geocaching can promote interdisciplinary learning, especially if the cache involves a historic site or an area of particular importance to a community. Showing students how to use the GPS puts technologically savvy students at ease with learning new concepts.

When students begin to learn about geocaching, they encounter a whole new culture and language (NAGC, 2010, 4.4.1). Students must learn new terminology related to the GPS and cache hunting, which draws parallels to immigrants entering a new country. Students must practice vocabulary and learn abbreviations specific to geocaching to participate in this event. Language arts lessons focus on acquainting students to the new terms and how they might be used on the Geocaching website. Creating a cache that yields a clue and description requires strong writing and editing skills as geocachers from all over the world read these cache descriptions and truly use the clues to guide them in their hunt. Students learn about different people as their cache is found, as cachers write a log entry after each hunt using terms and abbreviations from the geocaching world.

Incorporating geocaching in the social studies or language arts classroom provides a deep exploration of geography. Students who struggle to remember latitude and longitude, cardinal directions, and basic map skills connect their learning to technology, something that most students relate to in their own lives. Providing students with a local map and allowing them to use a GPS to create a cache or go geocaching opens the outside world to students. Lessons related to map reading, scale, and cardinal directions are vital to student understanding of the GPS and often meet multiple state and national standards. Technology is part of every student’s life, and teaching geography, history, and language arts with a GPS engages all types of student learners, especially gifted learners.

**Differentiating Geocaching for Gifted Students**

While geocaching can be implemented with all students regardless of a gifted identification, this strategy is appropriate for gifted students due to the high quality of curriculum explored as discussed above. Students develop numerous process skills as they learn content standards, all while focusing on more meaningful conceptual understandings. Concepts are explored such as location or change, and students examine how their own community fits into a larger worldview perspective (NAGC, 2010, 3.4.1). Also, students delve into communication with a focus on purposeful writing for a real audience (NAGC, 2010, 4.5.2). They explore technology and evaluate how technological advancements affect society (NAGC, 2010, 4.5.3). Whether teachers are implementing geocaching with a mixed-ability classroom or homogeneously grouped gifted class, geocaching is a strategy that lends itself to differentiation. This is important, as even a class of homogeneously grouped gifted learners will have varying interests and individualized academic needs that require differentiation (NAGC, 2010, 3.3.1). Teachers can utilize many differentiation strategies when implementing geocaching with gifted learners.

One differentiation strategy that strengthens geocaching is flexible grouping. Teachers may use flexible grouping strategies to ensure that students are in a role that challenges them academically or interests them by appealing to their unique learning style (NAGC, 2010, 4.1.2). Teachers may decide to group students by academic ability or group students with opportunities to serve in differentiated roles based on learning styles (Tomlinson, 2003). For example, in a traditional cache hunt, students with interpersonal strength may choose to serve as the group leader, while students with verbal/linguistic strengths may wish to analyze the description of the cache to find hidden clues as to its location. Teachers may also choose to group students based on their interests, allowing student groups product or process choices based on the type of geocaching option they would like to explore including the search for a traditional cache, starting a travel bug, or creating their own cache.

Geocaching also allows for differentiation by ensuring that students are assigned respectful tasks that differentiate content, process, and product, so that all students are actively engaged in appropriate, meaningful tasks (NAGC, 2010, 3.1.4). One way this can be done is through tiered assignments where students receive the same opening lesson, but work in small groups during the work session at differentiated academic levels on tiered geocaching assignments. In geocaching, caches are ranked based on their difficulty. On a school geocaching excursion, teachers may choose to group students by ability and have students work to find various levels of caches. If students are creating their own caches, teachers may differentiate the requirements for students by requiring the advanced tiers to create multi-caches with interdisciplinary clues. As teachers begin to incorporate geocaching in their identified subject area, tiered lessons to scaffold and challenge students will become apparent and necessary.

Teachers may also utilize independent study as an extension opportunity for high-ability students (NAGC, 2010, 5.1.4). During a geocaching unit, numerous skills are developed and content discussed related to authentic people, places, and experiences. Because of this, many gifted students will develop interests related to these topics and wish to pursue them further. In this case, curriculum compacting (Reis, Burns, & Renzulli, 1992) would be useful. Teachers may choose to compact content in which the student has already demonstrated mastery to allow for time to pursue the independent study. Students may
wish to create their own cache, delve into the mechanics of satellites, or analyze how scientists use and manipulate GPS data. Other students may choose to focus on service learning components of geocaching by organizing a local “Cache in Trash Out” event or connecting with local historical organizations. The independent study should be negotiated with the teacher and clear expectations put in place. By allowing students to explore the content further through independent explorations, teachers can continue to “provide opportunities for self-exploration, development and pursuit of interests” (NAGC, 2010, p. 6).

To effectively differentiate, continual assessment is necessary to uncover areas in which students need support and ensure that students are developing mastery of state and national standards. Journaling with teacher feedback can help students connect the process skills they are learning with the content standards that need to be mastered. In addition, when allowing groups to implement varied products, the use of checklists and rubrics support students in self-guided learning. Teachers should identify specific questions in students’ content area tests that directly or indirectly relate to skills learned through geocaching to further assess the success of the unit. To truly measure the growth of each student through geocaching, pre- and post-tests with questions from multiple content areas are appropriate. This might include problems about circles or composite shapes in mathematics, or questions about local history or geography in social studies. Written response questions that ask students to solve a real-world problem related to geocaching provide valuable information about the lessons learned.

Closing

Owen no longer despised social studies. He became interested not only in skills related to geocaching, but civil war history as well. After his class learned about geocaching, his group decided to create a multi-cache at a historical cemetery located a block from the school (with permission from the cemetery). To create the clues for each of the caches, Owen and his friends researched the time period in which several of the individuals passed away. They found a few people in the cemetery who had fought and died in the civil war. Owen and his friends became intrigued with these individuals and a once abstract concept they read about in a textbook became very real. In writing clues for their cache, the boys researched the experiences these men and their families went through during civil war times. Not only did they learn about map skills and technology, but also, without realizing it, they learned to appreciate history and see the real-world connections to their own lives.

As evidenced throughout this article, Geocaching is an excellent tool to use to motivate young adolescents to learn. Numerous NAGC Pre-K-Grade 12 Gifted Programming Standards (NAGC, 2010) are addressed through geocaching, including the use of “enrichment options to extend and deepen learning opportunities within and outside of the school setting” (p. 7), the use of “current technologies” (p. 7), and providing “environments for developing many forms of leadership and leadership skills” (p. 6). Often, topics and issues originally presented through geocaching become so intriguing to students that they continue to explore these issues long after the lessons in geocaching. Because of the expansive and inclusive nature of geocaching, students everywhere can become motivated to learn and explore difficult concepts through this amazing tool. Gifted young adolescents will thrive with the opportunity to expand their world through geocaching.

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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**Bios**

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