GPS Club

Jason Hubbard 5th Grade

Statement of Purpose

GPS CLUB

Now more than ever, a challenge for students is needed. We live in a rapidly evolving world of cell phones, iPods, and other digital technologies where children have taken the lead and actually utilize these tools to impose culture on everyone else. Think about it...the Net generation, that is, the 81 million children born between 1977 and 1997 can google, text, facebook, and twitter about anything and everything and get immediate results at their fingertips while previous generations are still trying to program their VCR's so that 12:00 will stop flashing. Furthermore, children born in this decade have never known a world without affordable and accessible handheld technology. If children are engaged in and bombarded by these technologies outside the classroom, then it is time for the schools to create curricula that utilize these devices to create meaningful learning experiences inside the classroom.

Curricula that are not interesting have the potential to consume precious learning time and sap the energy and motivation of students[1]. Students must be placed into environments where they are able to take control of their academic work and not simply placed in front of a lecturer. The latter can lead to sedentary and stagnant half-listeners who are simply not engaged at all. Using electronic media to heighten student-control in a subject will result in more intense engagement by the student.[2] Also, by going beyond the classroom walls, we greatly increase the probability that achievement will increase.[3] The Global Positioning System (GPS) is a marvelous example of the technology necessary to move students beyond the four walls of the classroom and into an environment that is challenging, integrative, and exploratory.

The GPS Club challenges young learners to come along on a geo-adventure as imaginary lines of longitude and latitude spring to life. Using high-tech GPS units and multi-million dollar satellites spinning the globe, students will explore our planet like never before. Capturing the spirit of the risingly popular adventure-sport Geocaching, the students will search for their knowledge as they learn about waypoints, hidden caches all over the world, mysterious puzzles, and even create their own educational cache that others can find.

Over the course of the club, the students will learn the basics of mapping, latitude and longitude, and how to use a GPS receiver. Then, the students will apply these basics three-dimensionally as they use the GPS units in our very own schoolyard to find hidden math problems, navigate to science experiments, and even locate hidden "treasure." The students will problem-solve, practice making good decisions, learn how to communicate and cooperate as a team. These are all skills, as well as using technology, that will aid in their journey of lifelong learning. Students will also learn how to mark and save their own geographical waypoints in order to send each other on student-constructed adventures. On rainy days, the students will use the Internet and work with programs that will increase their sense of spatial awareness and mapping and will help tie together what they have learned. GPS Club will offer a stimulating learning environment that will challenge students as well as motivate them with today's latest technology.

In the sub-unit within this instructional design, you will see the first few lesson plans within the GPS Club covered. The purpose is to dip the students' toes in the expansive waters of the global positioning system and introduce them to the novice skills needed in order to begin their geo-journey. In this lesson sequence, emphasis is placed on learning the buttons, functions, and features of a GPS receiver. For these purposes, the worksheets and instruction center around

a particular GPS unit that works well with students, in my opinion, but a teacher could easily make adaptations if using a different receiver. In addition to the basics of the receiver, activities also revolve around finding and saving waypoints, as these are necessary foundations for the duration of GPS Club. It will be assumed that the instructing teacher has a solid understanding of how to utilize handheld GPS and has obtained enough GPS receivers for their students to share in cooperative teams.

[1] Witte Mary, Ed. D. (2004). Engaging students in interdisciplinary curricula. Gifted Child Today, 27 (2), 52-53.

[2] FitzPatrick, S. (2001) Students' experiences of the implementation of an interactive learning system in their eighth grade mathematics classes. ERIC (ED470137).

[3] Lieberman, G. A., and L. L. Hoody. (1998). Closing the achievement gap: Using the environment as an integrating context for learning. San Diego, Calif.: State Education and Environment Roundtable.

Sub-Unit Learning Outcomes

GPS CLUB

This sub-unit marks the beginning point of GPS Club. It is a launching point to help learners understand the basics of GPS and high-tech scavenger hunting in order to prepare them for the much deeper waters that flow beyond these introductory lessons. Dive in!

☑ The students will identify the buttons and basic functions of the GPS receiver. (perception)

☑ The students will develop a sense of curiosity about the world around them. (set)

☑ The students will demonstrate how to find a waypoint using the GPS receiver. (guided response/mechanism)

☑ The students will demonstrate how to mark and save a waypoint using the GPS receiver. (guided response/mechanism)

☑ The students will record data learned in the field. (guided response/mechanism)

☑ The students will demonstrate a sense of teamwork, respect, and responsibility when utilizing the equipment. (guided response/mechanism)

☑ The students will identify problems/challenges and discuss solutions with their peers. (adaptation)

☑ The students will manipulate the collected data (such as a math problem) in order to practice a current grade-level skill or to further extend the GPS hunt. (complex overt response)

☑ The students will construct a geographical scavenger hunt for their peers using all the skills they have learned. (origination)

Pre-Assessment

GPS CLUB

Name_____ Date_____

1. Think about how you found your seat on the first day of GPS Club and the way latitude and longitude work. How are they alike? _____

_____

_____

2. What does GPS stand for and how does it work?_____

_____

_____

3. Describe how teamwork is an important feature of GPS Club:_____

_____

_____

4. In GPS Club, you will follow the 3 R's:

-Respect:_____

-Responsibility:_____

-Replacement:_____

On each line above, list one way you can show the 3 R's during GPS Club.

Are you an expert?

Next to each phrase, circle a number. Key: 1 2 3 4 5 (Beginner → Expert)

5. Reading a map	1	2	3	4	5
6. Using a compass rose	1	2	3	4	5
7. Using map scale	1	2	3	4	5
8. Using a GPS receiver in the car	1	2	3	4	5
9. Using a handheld GPS receiver	1	2	3	4	5
10. Finding a waypoint	1	2	3	4	5
11. Marking/saving a waypoint	1	2	3	4	5
12.Following an arrow to a destination	1	2	3	4	5

13. In order, list the steps you would need to do to create GPS scavenger for a friend:

_____

_____

_____

_____

_____

_____

_____

_____

Lesson 1: Join the Club!

GPS CLUB

I. Concept: Introduction to GPS Club, What is GPS?, and introduction to the GPS receiver

(Time: 1 hour)

Key Question: What is GPS?

II. Lesson Objectives:

☑ The students will develop a sense of curiosity about the world around them. (set)

☑ The students will identify the buttons and basic functions of the GPS receiver. (perception)

☑ The students will demonstrate a sense of teamwork, respect, and responsibility. (guided response/mechanism)

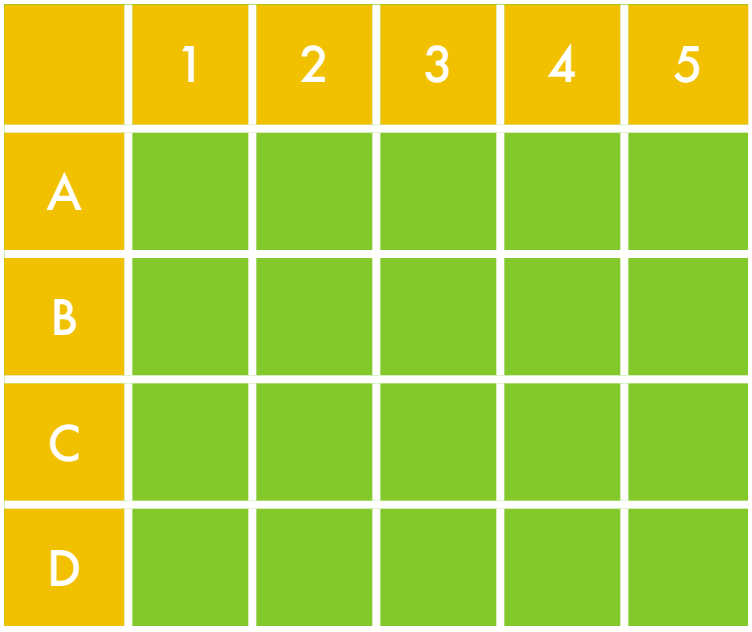
III. Procedures:

A. Introductory Activity (15 minutes)

1. As students arrive in room, pass out cards, each with a letter and a number (i.e. B5, C2, etc.). These are direction cards for where each student will sit down. Desks should be arranged accordingly prior to this activity in rows and

columns and a chart should be drawn on the board similar to the one shown below:

Please find your seat according to this chart and the card you have been given. Help each other accomplish this first task!



This warm-up activity will help prime longitude and latitude background knowledge and begin teamwork dialogue between the students. It will also mix student groupings so that new friendships and partnerships may more naturally occur. After students have found their seats, discuss briefly what was needed to find their **exact** positions within the classroom (i.e. two "coordinates" were needed).

B. Developmental Activity

1. Pre-Assessment (10-15 minutes)
    a. Pass out the pre-Assessment and instruct the students to complete it to the best of their ability.
2. What is GPS? (5 minutes)
    a. Briefly explain the Global Positioning System
        1) System of 27 satellites circling the globe sending latitude, longitude, and altitude data back to Earth
        2) Show video - http://videos.howstuffworks.com/howstuffworks/38-how-gps-works-video.htm
3. What is GPS Club?m (10 minutes)
    a. Discuss the objectives of the club.
    b. Discuss the 3 R's of Club:
        1) **Respect** - Students must respect teacher, each other, school property, etc.
        2) **Responsibility** - Students are responsible for their conduct, their equipment, recording their work, and making sure they are always where they need to be when working in the field.
        3) Replacement - Students must replace anything on the school grounds that they may have disturbed...in other words, they are to leave behind no sign of their presence. They are also to replace caches they find exactly as they found them.

C. Concluding Activity (15 minutes)

1. GPS Receiver Basics

a. Pass out the GPS Instructions sheet.

b. Review the basic buttons/functions with the students.

c. Turn the sheet over and tell the students that their first assignment during the next club meeting will be to "Find a Waypoint" as indicated on the back of the sheet.

IV. Assessment

A. Tell the students to review their GPS Instruction sheet tonight and bring it back with them for the next club. They are to review the basic buttons and be familiar with the steps for finding a waypoint.

B. After Club, review the student answers on the pre-assessment. Use their responses to shape your instruction for the duration of the Club. In other words, modify your vocabulary, pace, etc. in order to meet the diverse needs of your student population.

V. Materials

- Index cards for Introductory Activity
- Pre-Assessment (1 per student)
- Computer with Internet connection to display "How Stuff Works" video
- GPS Instructions Sheet (1 per student)

Lesson 2: The Great Golf Ball Hunt

GPS CLUB

I. Concept: The first high-tech scavenger hunt in which the students will put into practice what they have learned about GPS and GPS receivers (Time: 1 Hour, 5 minutes)

Read The Great Golf Ball Hunt Teacher Guide to prepare the school grounds prior to this lesson.

Key Question: How do you find a waypoint using a GPS receiver?

II. Lesson Objectives:

- ☑ The students will develop a sense of curiosity about the world around them. (set)
- ☑ The students will identify the buttons and basic functions of the GPS receiver. (perception)
- ☑ The students will record data learned in the field. (guided response/mechanism)
- ☑ The students will demonstrate how to find a waypoint using the GPS receiver. (guided response/mechanism)
- ☑ The students will demonstrate a sense of teamwork, respect, and responsibility when utilizing the equipment (guided response/mechanism)
- ☑ The students will manipulate the collected data (such as a math problem) in

order to practice a current grade-level skill or to further extend the GPS hunt. (complex overt response)

III. Procedures:

A. Introductory Activity (10 minutes)

1. Review basic buttons and functions of the GPS receiver. Ask some students to identify button name and other students to describe what function the buttons perform. Display on overhead, draw on board, or use on an interactive whiteboard the diagram below:

*Teacher Note:

If using an interactive whiteboard, display this picture with the key names "blocked out." This will allow students to come to the board as you ask key questions, and as they answer, the barriers can be removed to show the correct answers.

2. Ask the students how to find a waypoint using the "Find" button on the GPS

receiver. Be sure that students have a good understanding of this before moving on to the developmental activity.

B. Developmental Activity - The Great Golf Ball Hunt

1. Before the Hunt (5 minutes)

a. Describe today's mission:

1) The students will work in cooperative teams using their GPS receivers to locate 9 golf balls on the school grounds. Upon finding them, they will log information on their field sheets. When the hunt is over, the students will use the numbers from each golf ball to help solve math problems.

b. Assemble the group into teams of four or less. Hand out student field sheets, pencils, clipboards, GPS receivers, and be sure they have their GPS Instruction sheets that were handed out during the first club meeting.

c. Take the students outside to a central meeting spot.

2. During the Hunt (40 minutes)

a. As this is the first time they have used the GPS receivers, utilize the next few minutes as a powerful mini-lesson.

1) Have the students turn on their receivers and wait while the receivers initialize satellites. During this time, explain the boundaries so that each team member knows where they are permitted to go. Remind the students of the 3 R's of Club. Explain that they need to be able to see the teacher at all times - this is part of being responsible! Encourage students to give everyone in the group a chance to use the GPS

receiver...trading off after each golf ball is found is a good rule of thumb! Instruct them to return to this central meeting spot when they have located all of the golf balls.

b. Once the receivers have warmed up, assign each team a different golf ball letter to begin searching for (this helps to stagger the hunt), and tell them to refer to their GPS Instruction sheet if they need help. Now, set the students free!

c. Allow enough time for them to explore and find all the hidden golf balls. Monitor to see that groups are utilizing the proper procedures to find waypoints and they they are following the 3 R's. If students come running to you for help, tell them to use the resources they've been given to figure out the answer to their questions first. Never rob a student of a golden learning opportunity by simply giving them the answers...

3. After the Hunt

a. Bring the students back to the classroom to turn in their equipment in an orderly fashion. Have them be seated with their field sheets.

b. Discuss any problems/issues they had during the hunt first. Allow anyone to offer suggestions or solutions to those problems. Now would be a great time, if you haven't already, to begin the included KWL chart. At this stage of Club, it would be simple to add information to all three areas of the chart , post somewhere visible, and continue to add information as knowledge is gained.

C. Concluding Activity (10 minutes)

1. Check to see that each student has the correct golf ball listed with it's corresponding number. Then, discuss the math problems and their answers, or, if you choose, assign the math problems to be completed for next Club.

IV. Assessment

A. The assessment for this lesson was the informal observation during the scavenger hunt. All students should be showing competence using the buttons and features of the receivers.

B. If you choose, the math problems may be collected at the next Club meeting for a short math assessment.

V. Materials

- The Great Golf Ball Hunt Teacher Guide
- 9 golf balls and a permanent marker
- Blackboard, overhead projector, or interactive whiteboard
- The Great Golf Ball Hunt Field Sheet (1 per student)
- GPS receivers (1 per group of 4 at least)
- Pencils
- Clipboards (or other writing surface)
- GPS Instructions Sheet (extra copies for students who may need one)
- KWL Chart (optional)

Lesson 3: "X" Marks the Spot!

GPS CLUB

I. Concept: Building upon their knowledge and skills thus far, the students will create a mini-scavenger hunt for their peers to seek (Time: 60-70 minutes)

Read the "X" Marks the Spot! Teacher Guide to prepare the school grounds prior to this lesson.

Key Question: How do you save or mark a waypoint using a GPS receiver?

II. Lesson Objectives:

- ☑ The students will develop a sense of curiosity about the world around them. (set)
- ☑ The students will continue to identify and utilize the buttons and basic functions of the GPS receiver. (perception)
- ☑ The students will demonstrate how to find a waypoint using the GPS receiver. (guided response/mechanism)
- ☑ The students will demonstrate how to mark and save a waypoint using the GPS receiver. (guided response/mechanism)
- ☑ The students will demonstrate a sense of teamwork, respect, and responsibility

when utilizing the equipment (guided response/mechanism)

☑ The students will construct a geographical scavenger hunt for their peers using all the skills they have learned. (origination) *Note: this is not the final, large-scale hunt they will create as a culmination to GPS Club, but is a stepping stone toward that final project.

III. Procedures:

A. Introductory Activity - What makes a good hiding spot? (10 minutes)

1. Prior to this lesson, hid three small containers within the classroom: one in a ridiculously difficult spot to find, one in a sensible location, and one out in the open. Call upon volunteers to find your hidden containers. You may want to use the words "warmer" or "colder" to describe how close the students are to finding the containers. Discuss this role-playing activity and relate it to good hiding spots outside and their mission today: They will be working together in teams to secretly hide a small container on the school grounds for their peers to locate.

B. Developmental Activity - "X" Marks the Spot!

1. Before the Hunt (5-15 minutes)
   a. Refer the students once again to the back of the GPS Instructions sheet. Focus on the steps to mark/save a waypoint. Instruct the students that this is their main task today.
   b. Assemble the group into teams of four or less. Hand out student field sheets, containers, pencils, clipboards, GPS receivers, and be sure they have their

GPS Instruction sheets to refer to for help.

c. Have the each group formulate a question or activity that will be placed in their container (refer to the Teacher Guide for further information on this).

d. Take the students outside to the central meeting spot.

2. During the Hunt (30 minutes)

a. Have students turn on and initialize their GPS receivers. As they wait, remind students of the 3 R's again and the importance of following the Steps for Success instructions on their field sheets. Explain that once the students have completed all of these steps, they will report back to you at the central meeting spot for further instructions.

b. Once the receivers have warmed up, set the students off to complete their tasks.

c. Monitor the students as they choose hiding locations and mark their waypoints. As students finish, they will return to you to trade their receivers and the bottom portion of their field sheets with another group. Facilitate this process and send groups back out into the field with another group's receiver and sheet in order to now find the hidden container and perform the activity/answer the question located inside.

d. If time allows, have the students continue to trade receivers to find even more containers.

3. After the Hunt

a. Bring the students back to the classroom to turn in their equipment in an

orderly fashion and be seated.

C. Concluding Activity (15 minutes)

1. Group the students with the teams that switched receivers first. Have these group partnerships discuss any problems/issues they had in seeking the other team's container. Allow for a few minutes of discussion, then bring the whole class back together. Add to the KWL chart (optional).
2. Discuss the answers to the hidden questions/activities hidden in the containers.

IV. Assessment

A. It will be apparent in the interactions between the groups whether or not a specific team of students understands how to mark or save a waypoint. Informal observation of these skills will serve as a good assessment tool during the hunt. Clarify the procedure during the concluding activity.

B. You may want to use the hidden questions as an assessment piece.

V. Materials

- "X" Marks the Spot! Teacher Guide
- Small containers
- "X" Marks the Spot! field sheet (1 per team)
- GPS receivers (1 per group of 4 at least)
- Pencils
- Clipboards (or other writing surface)

- GPS Instructions Sheet (extra copies for students who may need one)
- KWL Chart (optional)

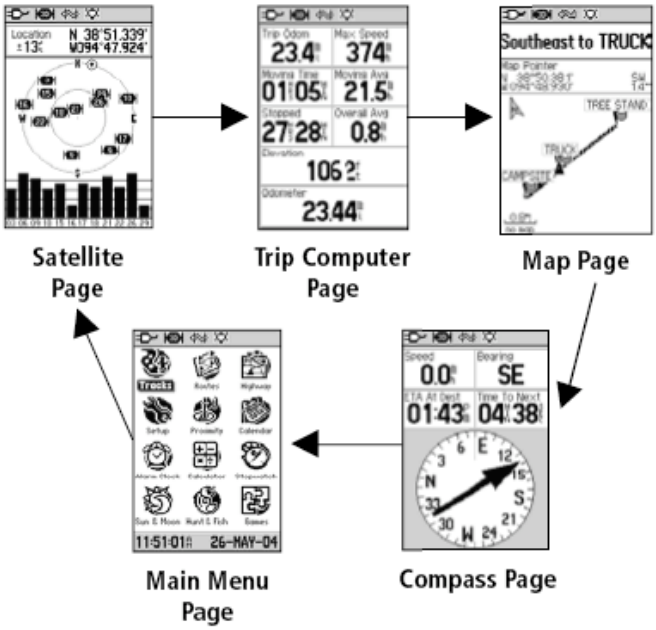
GPS Club

K	W	L
What I already know	What I need to find out	What I learned

GPS Instructions

The Garmin GPS 60

Displays



PAGE **Use the PAGE button to cycle through the different display screens.**

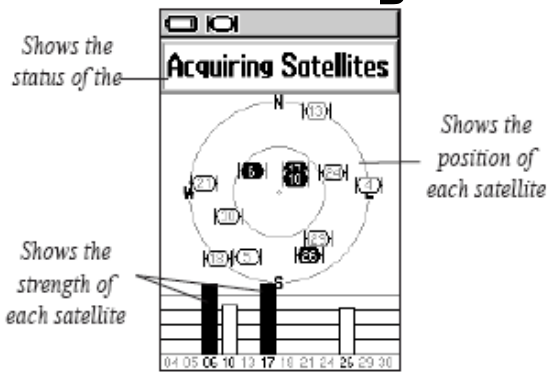
Important Keys

POWER Key—Press and hold to turn unit on/off. Press and release to adjust backlighting and contrast.

FIND Key—Press and release at any time to view the Find Page. Press and hold for Man Overboard.

ROCKER Key—Press left, right, up, or down to move through lists, highlight fields, on-screen buttons, and icons, enter data, or move the map panning arrow.

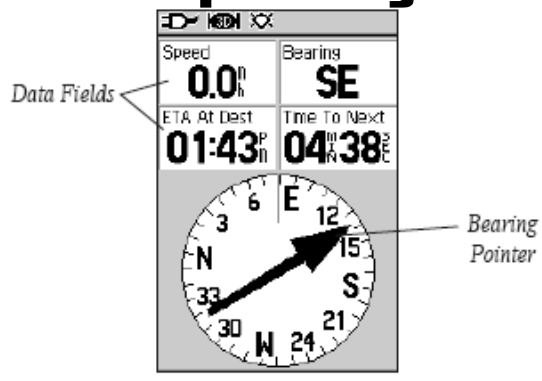
The Satellite Page



The Satellite Page

The dark bars show the satellites you are locked onto. You need at least 3 before you can get going.

The Compass Page



The Compass Page

Walk in the direction the arrow is pointing in order to move toward your destination.
***You MUST be walking for the pointer to work!**

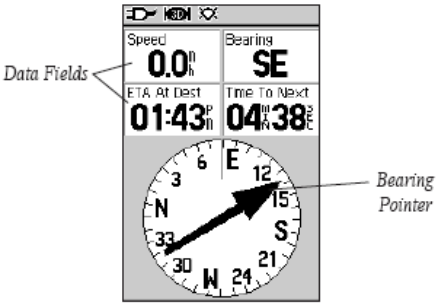
Finding a Waypoint

1. Press the FIND key.

2. Select WAYPOINTS by pressing the ENTR key.

3. Use the ROCKER key to move up and down until you have highlighted the location you want. Now press the ENTR key.

4. Press ENTR one more time to GOTO that location. Now get stepping and go find it! Go in the direction of the large arrow. The GPS will tell you when you are close...then use your eyes to find the container!

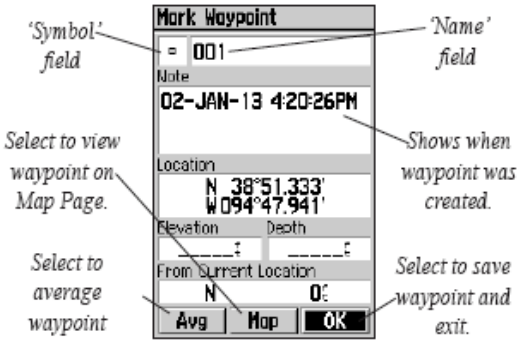


REMEMBER: You must keep moving for the compass pointer to work!

Marking a Waypoint

1. To make your own location, press the MARK key at the exact spot.

2. Notice the GPS gives this location a 3 digit name. To change the name of the waypoint, use the ROCKER key to highlight it and press ENTR. Use the ROCKER key and ENTR to give it a new name.



The Mark Waypoint Page

3. When you are finished naming it, highlight OK, then press ENTR. Back at the Mark Waypoint Page, highlight OK, then press ENTR to save your location.

Always try and figure it out first with your team, then ask the teacher if you are still stuck!

THE GREAT GOLF BALL HUNT

TEACHER GUIDE

Use a permanent marker to label 9 white golf balls. Each ball will have a capital letter on one side and a number on its other side. Label as follows:

A, 37
B, 45
C, 51
D, 59
E, 64
F, 72
G, 78
H, 84
I, 93

Now, hide the golf balls in select locations around the schoolyard. If at all possible, hide the golf balls as close to the time of the hunt as you can...otherwise, passers by may be curious and snatch up your golf balls, leaving disenchanted GPS Club students! Choose hiding spots that are not too difficult, yet not too easy to find and ones that are safe for the students. As you hide each golf ball, mark (save) its waypoint on a GPS receiver. To make it easier, save the waypoint as the letter of the golf ball you are hiding.

When you have hidden them all and saved their waypoints, enter all of the saved waypoints into every GPS receiver the students will use during the actual hunt. Make a copy of the Great Golf Ball Hunt field sheet for every student. Be sure to have a copy of the answer key to this activity with you on the day of the hunt. Have fun!

THE GREAT GOLF BALL HUNT

Answer Key

37	45	51
A	B	C
Location:_____	Location:_____	Location:_____
59	64	72
D	E	F
Location:_____	Location:_____	Location:_____
78	84	93
G	H	I
Location:_____	Location:_____	Location:_____

GOLF BALL MATH!

Answer Key

133

Problem #1

What is the sum of Golf balls A, B, and C?

5,376

Problem #2

What is the product of golf ball E and ball H?

64

Problem #3

Which golf ball is a square number?

22

Problem #4

What do you get when you subtract Golf Ball A from Golf Ball D?

1,2,3,4,6,8,9,12,
18,24,36,72

Problem #5

Can you list all of the factors of Golf Ball F? Careful...there are 12 of them!

125

Problem #6

Add Golf Ball G plus Golf Ball H, then subtract Golf Ball A. This is how many miles per hour Tiger Woods swings his golf club!

THE GREAT GOLF BALL HUNT

GROUP NAMES:_____

When you find a golf ball with your GPS, write the number from the ball in the space below. Then briefly describe the location you found it (ex. low tree notch). **Replace the golf ball exactly the way you found it!** Find them all!

A

Location:_____

_____

_____

B

Location:_____

_____

_____

C

Location:_____

_____

_____

D

Location:_____

_____

_____

E

Location:_____

_____

_____

F

Location:_____

_____

_____

G

Location:_____

_____

_____

H

Location:_____

_____

_____

I

Location:_____

_____

_____

GOLF BALL MATH!

Now that you have found every hidden ball, work with your group to solve a few golf ball problems! Substitute the number from each ball you found in the problems.

Problem #1

What is the sum of Golf balls A, B, and C?

Problem #2

What is the product of golf ball E and ball H?

Problem #3

Which golf ball is a square number?

Problem #4

What do you get when you subtract Golf Ball A from Golf Ball D?

Problem #5

Can you list all of the factors of Golf Ball F? Careful...there are 12 of them!

Problem #6

Add Golf Ball G plus Golf Ball H, then subtract Golf Ball A. This is how many miles per hour Tiger Woods swings his golf club!

"X" MARKS THE SPOT!

TEACHER GUIDE

The purpose of this lesson is to train the students to hide one small container and mark its waypoint. You will need to have a small container for each group. Film canisters work great and can be usually had for free at local photo labs. Small plastic food containers or mint canisters work well too. You will also want to place something educational inside each container or have the students do this. I propose the latter...allowing the students to come up with a good content question or activity for their peers, as long as it is directed by you, can allow for a more student-centered activity. Use the following ideas as possibilities for container "stuffers" or create your own to meet your students' needs:

-a multi-step math problem

-a puzzling science inquiry

-a writing prompt..

-a vocabulary word that needs defined

-a timeline event that needs to be placed in order

-a story element - the students could create these funny/spooky/serious writing ideas, then combine all the ones they find during the hunt into one creative writing piece

You do not need to hide anything in the schoolyard...that is the work of the students today! Be sure to make a copy of the field sheet for each group. You may also want to "clear" the memory on each GPS receiver prior to the lesson. This may help cause less confusion when students are marking or finding waypoints, because unnecessary waypoints will not show up on the screen.

"X" MARKS THE SPOT!

GROUP NAMES:_____

Steps for Success:

1. Find a good hiding spot! Remember to choose a good spot that is not too easy, but not too difficult.

2. Mark the waypoint in your GPS receiver. Remember to use your GPS Instruction sheet for help.

3. Record your receiver number, the number you saved your waypoint as, and where it is located in the box to the right. →

4. Now complete the box below, tear it off and give it and your receiver to your teacher at the meeting spot. ↓

Our Receiver #_____

Our Waypoint #_____

Where is it located?_____

_____

_____

_____

_____

CAN YOU FIND IT?

Group Names_____

Receiver #_____ Waypoint #_____

Pre-Assessment

GPS CLUB

Name_____ Date_____

1. Think about how you found your seat on the first day of GPS Club and the way latitude and longitude work. How are they alike? _____

_____

_____

2. What does GPS stand for and how does it work?_____

_____

_____

3. Describe how teamwork is an important feature of GPS Club:_____

_____

_____

4. In GPS Club, you will follow the 3 R's:

-Respect:_____

-Responsibility:_____

-Replacement:_____

On each line above, list one way you can show the 3 R's during GPS Club.

Are you an expert?

Next to each phrase, circle a number. Key: 1 2 3 4 5 (Beginner → Expert)

5. Reading a map	1	2	3	4	5
6. Using a compass rose	1	2	3	4	5
7. Using map scale	1	2	3	4	5
8. Using a GPS receiver in the car	1	2	3	4	5
9. Using a handheld GPS receiver	1	2	3	4	5
10. Finding a waypoint	1	2	3	4	5
11. Marking/saving a waypoint	1	2	3	4	5
12.Following an arrow to a destination	1	2	3	4	5

13. In order, list the steps you would need to do to create GPS scavenger for a friend:

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