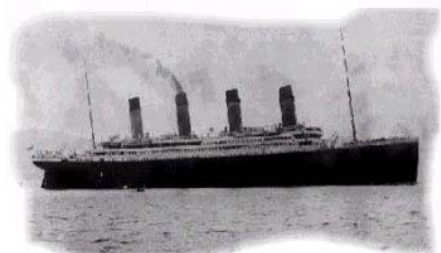


Exploring the Titanic

Lessons Using The Geographic Perspective

Instructor Guidelines



Lesson Description

Students use the geographic perspective and Geographic Information Systems (GIS) tools to learn about latitude and longitude, map projections, ocean currents, databases, maps, and images, through the analysis of the route, warnings, sinking, rescue, and discovery of the ocean liner *Titanic*. Students consider the human and physical aspects of the 1912 maiden voyage in the North Atlantic Ocean at a variety of scales, from global, to regional, to local. They use history and mathematics in a geographic context. Students analyze how the sinking of the *Titanic* affected future shipping routes, and, ultimately, its 1985 discovery. Students apply geography to interpret the past.

Educational Level

This lesson is targeted for the following range of students:

Middle School – Grades 5 – 8 -- Students Aged 10-13
High School – Grades 9 – 12 -- Students Aged 14-18
Community College and University

For the college and university setting, suggestions as to how to expand the lesson are included in these instructor guidelines.

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Lesson Summary

The lesson is arranged in 17 steps:

- Step 1. Start ArcView GIS
- Step 2. Begin geographic investigation using GIS Tools
- Step 3. Examine the Origin of the Titanic
- Step 4. Explore the Maiden Voyage of the Titanic
- Step 5. Creating the Route of the Titanic
- Step 6. Exploring Map Projections and the Titanic
- Step 7. Examining Ocean Currents
- Step 8. Exploring Icebergs
- Step 9. Further Investigation of Ocean Currents, Icebergs, and the Grand Banks
- Step 10. Planning An Alternative Route for The Titanic
- Step 11. Investigating the Blue Riband
- Step 12. Examining the Warnings
- Step 13. Investigating the Collision
- Step 14. Investigating the Sinking of the Titanic
- Step 15. Studying the Saved and the Lost.
- Step 16. Examining Shipping Routes Before and After the Titanic Disaster
- Step 17. Discovering the Titanic's Wreck

Materials Required For This Lesson

- Student Lesson Sheets to be photocopied for each student.
- Assessments.
- ArcView Geographic Information System (GIS) software by ESRI, Inc., Redlands, California, USA, version 3.2 or later.
- Data, included with this lesson.

Location of This Lesson

The data and all materials for this lesson can be found on the following 2 sites:

Environmental Systems Research Institute (ESRI)'s ArcLessons:

<http://www.esri.com/arclessons/>

USGS Rocky Mountain Mapping Center – Education:

<http://rockyweb.cr.usgs.gov/public/outreach/>

Quick Start-Up For This Lesson

1. Create a folder named Titanic (or name of your choice) on the computer.
2. Use Winzip or Unstuffit to unzip the .zip file into this Titanic folder.
3. Copy the schooltools.avx file into the c:\esri\av_gis30\arcview\ext32 folder.
4. Print the answer key and lesson, if desired.
5. Access ArcView GIS and open the project file "titanic.apr."

Computer Requirements For This Lesson

PC or Mac with at least 32 MB of RAM.
Storage space: 80 MB

Prerequisites For This Lesson

Students should have a basic understanding of the concept of latitude and longitude, map projections, and map scale before beginning this lesson. This lesson will reinforce these concept.

The lesson is designed in a step-by-step manner that guides the students through parts that require using the GIS software. Students do not need to be proficient in the software before beginning this lesson. However, spending two class periods with the students covering the basics of ArcView GIS may be helpful. Resources to aid in this introduction are the books *Getting to Know ArcView GIS* and *Mapping Our World: GIS Lessons for Educators*, both from ESRI press.

An introduction to ocean liners of the 19th and 20th Centuries, transatlantic crossings, and the *Titanic* before beginning this lesson is not required but would heighten the interest as the students begin this lesson.

Objectives

The student is able to:

1. Analyze a historical incident from a geographic perspective.
2. Create his or her own maps.
3. Understand map projections and the different ways they portray the earth.
4. Understand latitude and longitude.
5. Create his or her own routes based on coordinates.
6. Understand the effect of ocean currents on icebergs and shipping.
7. Understand how to analyze data at different map scales.
8. Solve real-world problems in geography, math, and history using GIS.

Advantages to Using GIS Tools and Methods in This Unit Over Printed Maps, Tables, and Books:

Using geographic information systems, students:

- 1) Analyze maps at an infinite variety of scales;
- 2) Create their *own* maps based on latitude and longitude coordinates and other instructions;
- 3) Analyze data tables that represent the attributes of mapped features;
- 4) Analyze an earth image that shows ice extents and the terrain of the ocean floor;
- 5) Quickly synthesize a large amount of data about the oceans, routes, climate, and other themes to make an informed decision.

Standards Used in This Lesson

National Geography Standards <http://genip.tamu.edu>

Geography standard	Titanic Lesson
1. How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective.	The student understands how to use geographic representations and tools to analyze and explain geographic issues, in particular, that surrounding the voyage of the Titanic.
4. The physical and human characteristics of places.	The student understands the changing human and physical characteristics of places where the Titanic sailed, and, more broadly, of the North Atlantic Ocean and bordering countries.
15. How physical systems affect human systems.	The student understands why and how ocean currents and icebergs affect transatlantic ship crossings.
17. How to apply geography to interpret the past.	The student uses the geographic perspective, GIS, databases, images, and maps to interpret the circumstances surrounding the Titanic.

National Social Studies Standards <http://ncss.org>

Social Studies standard	Titanic Lesson
2 Time, Continuity, and Change.	The student understands how to use geographic representations and tools to analyze and explain geographic problems.
3 People, Places, and Environments	The student understands the changing human and physical characteristics of places.

National Technology Standards <http://cnets.iste.org/>

Technology standard	Titanic Lesson
1 How to Gather, Synthesize, and Process Information	The student understands how to manage files, windows, databases, and other documents to synthesize information.

Estimated Time To Conduct This Lesson

This lesson is designed to be completed in three weeks of 1 hour class sessions, or one week with student home assignments. However, it can be expanded to a one month unit or contracted to fit restricted schedules. The lesson includes approximately 230 questions. Most are short answer, circle the correct answer, or fill-in-the-blank. Students are asked to print several maps and read several pages of text and tables.

The 17 steps listed above are not all the same length, but the end of each provides a good point at which to end the class period. For example, the first class could be asked to complete steps 1, 2, and 3. If one week is available for this lesson, then it may be better to let students complete the lessons at their own pace, rather than requiring every student to have finished a certain step before anyone can proceed further. Students will likely move through the lessons in a variety of speeds. Estimated time for each step, as well as the number of questions in each, is as follows:

Step	Approximate # of Questions	Est. Time to Complete
Introduction and Step 1	1	20 minutes
Step 2	0	10 minutes
Step 3	10	35 minutes
Step 4	20	35 minutes
Step 5	15	30 minutes
Step 6	20	50 minutes
Step 7	10	35 minutes
Step 8	20	55 minutes
Step 9	15	30 minutes
Step 10	15	30 minutes
Step 11	10	80 minutes
Step 12	15	40 minutes
Step 13	10	40 minutes
Step 14	20	55 minutes
Step 15	15	40 minutes
Step 16	15	40 minutes
Step 17	10	80 minutes
Essay	1	150 minutes

The unit can be shortened by omitting certain steps. Care should be taken in the omitting of steps to ensure that adequate background will exist such that the students can complete the next step. Possibilities for shortened units include:













Shortest Unit Practical without compromising the main points of the Lesson: 11 Steps. Omit Map Projections, Alternative Route, Blue Riband, Shipping Routes, and the Wreck. The lesson would include the following 11 steps:

- Step 1. Start ArcView GIS
- Step 2. Begin Geographic Investigation of the Titanic using GIS Tools
- Step 3. Examine the Origin of the Titanic
- Step 4. Explore the Maiden Voyage of the Titanic
- Step 5. Creating the Route of the Titanic
- Step 7. Examining Ocean Currents
- Step 8. Exploring Icebergs

- Step 9. Further Investigation of Ocean Currents, Icebergs, and the Grand Banks
- Step 12. Examining the Warnings
- Step 13. Investigating the Collision
- Step 14. Investigating the Sinking of the Titanic

Another alternative is to add back several of these omitted steps, making the unit between 11 and 17 steps in length.

Some GIS Skills and Tools Included in This Lesson

-  Zoom in on a map
-  Identify attributes of a feature
-  Zoom to the previous extent
-  Zoom to the active theme
-  Add a theme to the view
-  Add a point at a specific latitude/longitude coordinate intersection
-  Draw a line
-  Edit the vertices of a line or polygon
-  Clear selected features
-  Create and print maps in a layout
-  Analyze data in tables.
-  Select and manipulate graphics and features.

Suggestions for The Instructor

First, ask the class to identify categories of what they think about when they hear the word “disaster.” What qualifies as a disaster? Have the students list the type of disasters that come to mind.

Next, divide these categories into natural disasters and human-caused disasters. Natural disasters that they name could include wildfires, forest fires, earthquakes, volcanoes, flash floods, river floods, floods caused by rainfall or monsoons, landslides, snow avalanches, tornadoes, blizzards, hurricanes, and so on. Human-caused disasters could include fires caused by humans, floods caused by breaks in dams, terrorism, wars, epidemics, famines, and so on.

Third, ask students to name specific examples of each disaster. These could include the 1995 Kobe Earthquake, the San Francisco earthquake and fire of 1906, the Yellowstone National Park fires of 1988, Hurricane Mitch in Central America, and so on.

Fourth, tell the class that this activity will involve examining one of the most famous disasters of all time—the sinking of the ocean liner *Titanic*. Ask the students if they think this falls into the category of natural disaster or human-caused disaster.

Fifth, ask students what they know about the *Titanic*. Have them write what they know about the locations, people, cause, and circumstances involved in the sinking, rescue, and discovery of the ship. Save these papers and hand them back to the students at the end of the lesson to assess what they have learned. Alternatively, ask a series of questions for the students to respond to in writing. Ask the same questions after the lesson is complete.

Sixth, ask the students if they have ever read any books or seen any movies on the *Titanic*. Through this lesson, compare what they are learning to what is portrayed in books and movies, and encourage the students to examine what is fact and what is fiction.

Seventh, encourage the students to reflect on one of the most intriguing aspect of the disaster—that some of it will forever remain shrouded in mystery. Ask them what is the most mysterious aspects of the voyage in their opinion. It is rare that a mystery can be investigated in the classroom—be sure to use this to enhance interest in learning.

Eighth, remember to remind students that, despite the interest and the fascinating facts and mysteries surrounding this event, that it remains a tragedy in which over a thousand people lost their lives in a horrific manner. How does this affect our study of it? How do emotions affect our study of any geographic or historical phenomenon? How *should* our emotions affect a study?

Ninth, ask students to consider the ethics of the discovery and the bringing to the surface of artifacts from the ship.

Before completing this lesson with students, you should complete it yourself. You need not complete every question, but you should become familiar with the ideas presented and the analysis that is required. Doing so will allow you to modify the lesson to suit the specific needs of your students.

After the lesson introduction, have the students work on the computer-based GIS component of the lesson. Ideally, each student should be at an individual computer, but the lesson can be modified to accommodate a variety of instructional settings.

Distribute the student investigation sheets to your students. Explain that in this lesson they will examine the construction, route, sinking, rescue, and discovery of the *Titanic*. They will examine ocean currents, map projections, warnings that the ship received, iceberg frequency and locations, and other data to help them understand each event.

The GIS activity will provide students with detailed instructions for their investigations. In addition to the instructions, the handout includes questions to help them focus on the main ideas and concepts. Some questions will have specific answers while others ask students for their opinions.

An Answer Key is included in the files provided with this lesson.

Items to look for while the students are working on this activity:

- Are the students thinking about their responses to the questions, using what they know both within and external to the GIS-based functions? Help them to remember that many answers are not found by clicking a button on the computer, but in thinking about the question!
- Are the students using a variety of tools and analysis within the GIS, including examining tables and maps?
- Are they answering the questions as they work through the procedures? **Encourage students to pause frequently and think!**
- Are they experiencing any difficulty managing the display of information within the GIS as they turn themes on and off?
- There were, as of winter 2002, two lessons on the ArcLessons site on map projections that provide a good supplement to the map projections part of this lesson.

Conclusion

Refer back to your initial discussion about disasters. Ask the students:

- What have the students learned about the human and physical aspects of the Titanic disaster?
- What have the students learned about ocean currents, ice on the North Atlantic, seasons, and the Grand Banks?
- What have the students learned about map projections and their influence on the five aspects of portraying the earth in two dimensions?
- What have the students gained in their proficiency with GIS and with manipulating spatial data on the computer?

And perhaps most importantly, ask the students:

- What new questions has this lesson raised? About:
 - (The *Titanic*—sailing, warnings, rescue, and discovery).
 - Geography
 - GIS
 - Icebergs and ocean currents
 - Map Projections
 - Ocean Currents

Ask students to identify issues that played a role in the circumstances; for example:

- Ocean currents.
- Seasons.
- The dependence on sea travel versus air travel in 1912 and during the present day.
- Absolute location (latitude and longitude) and relative location (Grand Banks, Labrador Current, and so on).
- Warnings the ship received and which ones were ignored.
- The “Mystery Ship” that may have been very close to the Titanic.
- The Blue Riband and nationalism.

Ask students what the geographic perspective adds to their understanding of an issue in time and space such as the Titanic.

Assessment

The emphasis should be on whether the students are learning the concepts, rather than whether they clicked the mouse on exactly the desired point. Therefore, many of the questions where the students are asked to compute distances should be assessed with a leeway of 10% on either side. For example, if the answer given in the answer key is 1000 km, it should be considered correct if the student answered between 900 and 1100 km. The assessment for a GIS class, rather than a geography or history class, however, should be more rigorous.

Essay

Students (In Step 17j on the last page of the lesson) are asked to write an essay on the Titanic disaster from a spatial, or geographic, perspective. They are asked to consider all of the skills they have learned and issues that they have been examining. They are asked to illustrate their paper with maps that they have created from their GIS-based investigation.

Assessments are included for:

Middle School: *Highlights skills appropriate to grades 5 through 8 (Ages 10 through 13).*

High School: *Highlights skills appropriate to grades 9 through 12 (Ages 14 through 18)*

Encourage high school and university students to go one step further—produce maps that have not been specifically asked for within the lesson, but may help build the case for their points in the paper.

Project Views

Three views have been constructed under titanic.apr:

Titanic Investigation, Part 1
Titanic investigation, Part 2
Sinking, Rescue, Wreck, and Discovery

Data

Description of the data included for the Titanic lesson:

- adeckplan.jpg: image of the A-deck of the Titanic
- afterpoints.jpg:
- anchorsymbol.jpg: image of the anchor symbol
- boatdeck.jpg: image of the boat deck
- canada_prov.avl, canada_prov.dbf, canada_prov.sbn, Canada_prov.sbx, Canada_prov.shp, Canada_prov.shx: Canadian provinces theme used in View “Titanic investigation Part I “
- carpathia.jpg: image of the Carpathia
- cdeckplan.jpg: image of C-deck of the Titanic
- cities (.avl, .dbf, .sbn,.sbx, .shp,.shx): point theme representation of major cities across the world, theme used in the Views “Titanic investigation Part I & 2”

- continent (.avl, .dbf, .prj, .sbn, .sbx, .shp, .shp.xml, .shx): continents theme
- countries (.avl, .dbf, .sbn, .sbx, .shp, .shx): theme displaying countries around the world used in all views
- ddeckplan.jpg: image of the D-deck of the Titanic
- edeckplan.jpg: image of the E-deck of the Titanic
- fdeckplan.jpg: image of the F-deck of the Titanic
- glacier(.dbf, .shp, .shx): point theme showing location of glaciers
- Greenland glaciers (.avl, .dbf, .shp, .shx): point theme showing location of Greenland glaciers, used in View "Titanic investigation Part II"
- Grimsearch (.avl, .dbf, .shp, .shx): polygon theme that establishes the search area surrounding the Titanic, used in view "Rescue and Discovery"
- Iceberg.jpg: image of an iceberg displayed in written lesson
- Iceberg_crossec.bmp: cross-section of an iceberg displayed in written lesson
- Iceberg extent (.avl, .dbf, .shp, .shx): theme represents the main areas of ice on the North Atlantic. Used in View "Titanic investigation Part II"
- Icebergs (.avl, .dbf, .shp, .shx): theme indicates the known examples of extreme iceberg drift from 1890 to 1966, used in View "Titanic investigation Part II"
- Icebergmap.gif: map of icebergs
- Iceflow (.avl, .dbf, .shp, .shx): theme represents the patch of sea ice the Titanic hit, used in View "Rescue and Discovery"
- Jjkdeadlineroute.shp: theme included as an example for the deadline route created by students
- Jjknewroute.shp: them included as an example for the new route created by students
- Jjktitanic.shp: theme included as an example for the route created by students
- Lifeboats (.avl, .dbf, .shp, .shx): theme represents the point at which the Carpathia picked up the lifeboats, used in view Rescue and Discovery
- Oceancurrents (.avl, .dbf, .shp, .shx): theme that is used to examine the effect ocean currents had on the Titanic, used in view Titanic investigation Part II
- Oceancurrents.bmp: bitmap of oceancurrents around the world
- Oceannames (.dbf, .shp, .shx): theme containing names of the oceans, used in view Titanic investigation Part I
- Oceans (.avl, .dbf, sbn, .sbx, .shp, .shx): theme displaying oceans throughout the world, used in all views
- Rescueroutes (.avl, .dbf, .shp, .shx): theme showing the routes taken by ships sailing toward the Titanic, used in View "Rescue and Discovery"
- Rescuescreenshot.jpg: screenshot/image of circular rescue area for rescue ships, used in View, "Rescue and Discovery"
- Rescueships (.avl, .dbf, .shp, .shx): theme represents ships in relatively close vicinity to the Titanic disaster, used in view Rescue and Discovery
- Routes (.avl, .dbf, .shp, .shx): theme represents Great Circle shipping routes before and after the Titanic disaster, used in view Titanic Investigation Part II
- schooltools.avx: Arcview extension used for plotting latitude and longitude points
- schooltools_afterlong.jpg – screen shot showing view after lat-long points added.
- Schooltools_lat.jpg – screen shot showing latitude with schooltools extension.
- Schooltools_long.jpg – screen shot showing longitude with schooltools extension.
- Schooltools_screenshot.jpg – screen shot showing schooltools pulldown menu.
- Screenshot:: screenshot of Titanic route, iceberg graphics, Titanic graphics, etc.
- Shipside.jpg: image of the side of the Titanic
- Titanic.apr: Titanic ArcView project

- Titanic.zip: Titanic folder in a zipped file (WINZIP)
- Titanic_berg.jpg: image of the iceberg
- Titanic_berg2.jpg: image of the iceberg
- Titanic_image: image of the ship
- Titanic_launch: image of the ship launching from Belfast
- Titanic_lesson.doc: Titanic lesson for teachers; MSWord document
- Titanic_lesson_answer_key.doc: Titanic lesson with inserted answers; MSWord document
- Titanic_lesson_rubrics.doc: standards for the lesson; MSWord document
- Titanic_pic.jpg: image of the Titanic (side view)
- Titanic_teacher_materials.doc: teacher guidelines for teaching the lesson; Word document
- Usa_states (.avl, .dbf, .sbn, .sbx, .shp, .shx): theme displaying the United States
- W_lakes (.avl, .dbf, .sbn, .sbx, .shp, .shx): theme displaying the major lakes throughout the world.
- Warnings (.avl, .dbf, shp, .shx): theme displays the ice warnings that other ships reported to the Titanic, used in View "Rescue and Discovery"
- Whitestarlogo.gif: logo for the White Star shipping line
- Wholeearth: image theme of ocean floor, used in View "Rescue and Discovery"
- Wreck_pieces (.dbf, .shp, .shx): theme created by students during lesson but included for added example and direction
- Wreck_site (.avl, .dbf, .shp, .shx): theme displaying the wreck site of the Titanic, used in View "Rescue and Discovery"

Extensions and Resources

This lesson is designed to teach geography and history *using* GIS. However, it can be used in a class that teaches *about* GIS at the high school or college level. For this setting, add GIS functions such as intersecting, clipping, querying, advanced lesson editing, and tabular functions.

For further investigation, examine data on the following sites:

USGS:

<http://www.usgs.gov>

<http://rockyweb.cr.usgs.gov/public/outreach/>

<http://www.usgs.gov/education/>

GIS:

<http://www.gis.com>

<http://www.spatialnews.com>

GIS In Education:

<http://www.esri.com/k-12>

<http://rockyweb.cr.usgs.gov/public/outreach>

<http://kangis.org>

Titanic:

In the author's opinion, the ultimate online guide to the Titanic:

<http://www.webtitanic.net>

Encyclopedia Titanica:

<http://www.encyclopedia-titanica.org/index.shtml>

Titanic Reference Map, MapLink, Inc.

This is an excellent map. See www.maplink.com.

Lord, Walter. *A Night to Remember*. Book.

Butler, Daniel Allen. 1998. *Unsinkable—The Full Story of RMS Titanic*. Stackpole Books.

Ocean Liners:

Great Ocean Liners:

<http://www.greatoceanliners.net>

Vintage Liners:

<http://www.vintageliners.fsnet.co.uk/>

Ocean Liners:

<http://www.schuminweb.com/ocean-liners/main-page.htm>

In the author's opinion, the most extensive guide available to the Blue Riband:

<http://www.blueriband.com>

Postcards of Ocean Liners:

<http://www.greatships.net>

Ocean Liners:

www.oceanliners.com

<http://www.geocities.com/yosemite/rapids/4233/>

Ocean Liner Society:

<http://www3.mistral.co.uk/latrobe/olshome.htm>

Cairis, Nicholas T. 1979. *Passenger Liners of the World Since 1893*. New York: Bonanza Books. ISBN 0-517288753.

Newell, Gordon. 1962. *Ocean Liners of the 20th Century*. Seattle, Washington: Superior Publishing Company.

Shipwrecks:

<http://www.cimorelli.com/safe/shipwrecks.htm>

Icebergs:

International Ice Patrol:

<http://www.uscg.mil/lantarea/iip/home.html>

<http://users.skynet.be/deneyer>

<http://nsidc.org>

Map Projections:

See lessons on Latitude, Longitude, Map Projections, and Great Circles on

<http://www.esri.com/arclessons>

Geographer's Craft:

http://www.colorado.edu/geography/gcraft/notes/mapproj/mapproj_f.html

- Muehrcke, Phillip C. and Juliana O. Muehrcke. 1998. *Map Use: Reading-Analysis-Interpretation*, 4th ed. Madison, WI: JP Publications.
- Snyder, John P. 1987. *Map projections: A working manual*. USGS Professional Paper 1395. Washington, DC: United States Government Printing Office.

Acknowledgements

It is hoped that this lesson provides an interesting and challenging unit that will enhance what students know and are able to do at many different levels, contexts, and curricular areas.

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The author gratefully acknowledges the permission of the following for images and data for this lesson:

Karl Metelko, webtitanic.net Editor

Hans Deketele, blueriband.com editor.

Yves Beaufays - Iceberg Image: Copyright Marc Deneyer –
<http://users.skynet.be/deneyer>

MapLink, Inc., Titanic Reference Map

While the information in this lesson is accurate to the best of the author's knowledge, there is conflicting information in books and web resources on the Titanic. The information should be, as all information, subject to critical examination.

The author would like to hear comments on your use of this lesson in your curriculum, and any suggestions for improvement. Email: jjkerski@usgs.gov

*** End of Instructor Guidelines ***