Integrated Cartography K-8 Scope and Sequence

Purpose

Through the lens of cartography students in grades Kindergarten through 5th grade will explore how knowledge about our world is constructed by participating in knowledge construction.

By the end of 5th grade students who have participated in the Integrated Cartography Curriculum will have developed skills that will allow them to:

- Consider and analyze the world around them
- Critically question information
- Participate in developing their own ways of knowing and representation
- Use maps to achieve a goal
- Design maps to achieve a goal
- Integrate skills and knowledge from multiple disciplines that span across the Wisconsin State Standards

How to use this document

This document is meant clearly define the horizontal and vertical alignment of the Integrated Cartography K-8 Scope and Sequence. In reality the Learning Outcome and subsequent Learning Objectives do not stand alone but are woven together and rely on one another.

Enduring Questions

This curriculum is grounded in six enduring cartographic questions:

1) What are ways that help us know about our world?
2) How can we represent our spaces and our world?
3) What are maps, and how do they help us know and represent our world?
4) What are the multiple ways maps are used?
5) What is the process map authors use when they design maps?
6) What kinds of decisions do authors of maps make when they design maps?

Learning Outcomes (These are referred to as standards in the WI documents)

Emerging from the six Enduring Questions are six Learning Outcomes that create the backbone of the scope and sequence. Within each Learning Outcome are aligned learning actions, or Learning Objectives (these are referred to as Learning Priorities in the WI documents), scaffolded by grade level.

Learning Outcome 1: Students will be able to gather data about a location using multiple means of observation, experiences, and sources.

Learning Objective	**Kindergarten/First**	**Second/Third**	**Fourth/Fifth**	**Sixth / Eighth**
A. Collect, Sort and Compile Data	K.1.1.a Describe the kinds of information our senses give us about the world. K.1.2.a List multiple attributes associated with an object (e.g., color, weight, shape, location etc.)	2.3.1.a Compile data from primary sources such as a book, a location, or place. 2.3.2.a Describe an object based on its location and one attribute. 2.3.3.a Compile and organize a dataset about a category of objects that includes the location of the objects and one attribute.	4.5.1.a Distinguish between quantitative (numerical) and categorical (descriptive and non-ranked) information. 4.5.2.a Compile a dataset about a location, including both categorical and quantitative data in the dataset 4.5.3.a Distinguish which data is geographic (location/coordinates) and which is attribute data (information about a location)	6.8.1.a Define metadata (who made it, what time range does the data cover, did the data come from another source, and if so, where*, etc.) and compile metadata about a given dataset 6.8.2.a Distinguish between qualitative data: nominal and ordinal measurements (order of measurement). 6.8.3.a Classify various qualitative datasets as nominal or ordinal measurements and explain the rationale for classification 6.8.4.a Compile metadata about a given dataset (i.e., Helpful information about the data)

B. Categorize Data	K.1.1.b Sort objects based on two attributes (size, color, location)	2.3.1.b Create categories based on data collected from a primary source such as a book or story, media, location or place.	4.5.1.b Generate categories based on dataset. 4.5.2.b Explain how categories were determined. 4.5.3.b Collapse (reclassify) categories of data to create broader categories.	6.8.1.b Determine whether types of data can be compared or not based on their level of measurement.
C. Evaluate Data	K.1.1.c Determine if a dataset can answer a given question. or achieve a goal.	2.3.1.c Evaluate different datasets to determine what questions they can answer or what goals they can help achieve.	4.5.1.c Evaluate different datasets to determine what questions they can answer or what goals they can help achieve. 4.5.2.c Discuss how collecting data can be helpful or harmful, including who could be impacted.	6.8.1.c Evaluate different datasets to determine what questions they can answer or what goals they can help achieve. 6.8.2.c Discuss how collecting data can be helpful or harmful, including who could be impacted. 6.8.3.c Propose alternative or ancillary data sources.

Learning Outcome 2: Identify multiple methods of representation for communicating about a space.

Learning Objective	**Kindergarten/First**	**Second/Third**	**Fourth/Fifth**	**Sixth / Eighth**

A. Define Representation	K.1.1.a Recognize how an object can be represented in multiple ways. K.1.2.a Recognize different types of representation of a place (written, pictorial, auditory, visual) K.1.3.a Name what an icon or image depicts	2.3.1.a Explain what a particular representation tells us about a place (image interpretation, sound interpretation, etc.) 2.3.2.a Predict attributes of an unfamiliar location based on a representation of that place.	4.5.1.a Explain what different representations tell us about a place. 4.5.2.a Predict attributes of an unfamiliar location based on a representation of that place. 4.5.3.a Sort icons from an icon library into icon sets based on similar design features (example: road signs, icon libraries like AIGA, ISO etc.)	6.8.1.a Explain what different representations tell us about a place. 6.8.2.a Predict attributes of an unfamiliar location based on a representation of that place, paying attention to the author and possible audience of the map. 6.8.3.a Apply map semiotics to map icons. Discuss a 'sign' as 'something which stands for something else' in various ways – conventional (by agreement, like 'H' for hospital), association (a relation, like a pickax for a mine) or iconic (mimesis, like a small mountain for a mountain).
B. Create a representation	K.1.1.b Select an icon to represent a familiar object. K.1.2.b Create a drawing of an object based on a description of the attributes of the object.	2.3.1.b Design an icon that represents a familiar place or location, or object in space and name the attribute that the icon represents. 2.3.2.b Using a map of a familiar place, add icons representing a familiar experience (e.g., place an icon of a nose in school locations that are	4.5.1.b Design an icon which reflects multiple attributes of an object or phenomenon (e.g., an icon of a tree that represents the type of tree using shape and the color of the tree using color). 4.5.2.b Create a map with icons conveying more than one type of information about a place, object or phenomenon. (e.g., use size to show number and color to show type). Describe the information conveyed by the icons and the information conveyed by the rest of the map.	6.8.1.b Starting with a complicated or highly pictorial icon, introduce the basics of icon design to create a generalized icon. Introduce basics of icon design: rely on silhouettes and simplified forms to lose visual complexity. 6.8.2.b Discuss what information might be lost as a result of simplifying an image or representation into an icon when following icon design guidelines. 6.8.3.b Curate an icon library for a purpose (e.g., a transportation map.)

		stinky to map the smells in the school). 2.3.3 b Create a drawing of a place and write about the specific features of the place that appear in the drawing. 2.3.4 b Represent the same dataset in different types of graphs	4.5.3.b Create and analyze multiple representations of the same place and compare similarities/ differences.	Explain the purpose of each symbol in the library. 6.8.4.b Using map semiotics, design conventional, associative, and iconic symbols for use on a map and explain how the design connects to what is being represented. 6.8.5.b Create and analyze multiple representations of the same place and compare similarities / differences, focusing on both the representation as a whole (i.e., the picture or map) and smaller portions (i.e., individual symbols, the legend, a data layer, et cetera.)
C. Evaluate Representation	K.1.1.c Determine which icon more closely resembles a real-life object (e.g., a school) or phenomenon (e.g. a thunderstorm) from a set of icons, drawings or pictures.	2.3.1.c Compare and contrast different icons representing the same location or phenomenon. Consider color, shape, association with real life object and / or other icons in the set. 2.3.2.c Compare and contrast different representations of the same place (photograph, written description, auditory	4.5.1.c Evaluate the usefulness of icons used on a map for specific representation goals 4.5.2.c Explain why some representations are more useful than others for certain goals.	6.8.1.c Evaluate an icon set. Identify icons that seem to be missing and propose additional icons for inclusion. 6.8.2.c Recognize the 'default' represented in an icon set (e.g., a black silhouette).

		etc).		

Learning Outcome 3: Students will be able to recognize common map types, cartographic conventions, and identify representations that could be considered maps.

Learning Objective	**Kindergarten/First**	**Second/Third**	**Fourth/Fifth**	**Sixth - Eighth**
A. Articulate an understanding of what a map is.	K.1.1.a Discuss what students see in a map and what it could be used for. K.1.2.a Identify a map from a set of other images. K.1.3.a Recognize that not everyone can use a visual map.	2.3.1.a Compare and contrast a map to other types of representations (e.g., graph, photograph, picture, description, recording etc.) 2.3.2.a Compare and contrast examples of different map types (e.g., physical / political / thematic) and what they communicate.	4.5.1.a Write a definition of a map. 4.5.2.a Compare and contrast more complicated map types reference (physical / political); thematic (choropleth, proportional symbol, dot density).	6.8.1.a Write a definition of a map and defend your definition of a map with evidence. 6.8.2.a Compare and contrast thematic maps (choropleth, proportional symbol, dot density) through the concept of a data layer from which the map was derived (e.g., a population data layer). 6.8.3.a Recognize that maps and best practices in map design are visually dominated and that there is a deficiency of maps for people whose primary sense is not sight.

B. Identify common map features and conventions	K.1.1.b Recognize a map legend and discuss the information it conveys. K.1.2.b Discuss why some features of the map appear the way that they do (e.g., why is land green and water blue?) K.1.3.b. Recognize simple distinctions of scale (a city can be represented as a polygon or as a dot). Using a multiscale map (e.g., google maps), look at a familiar place at different scales (zoom levels).	2.3.1.b Identify common features of a map and their purpose (e.g., title, legend, compass rose, grid, scalebar, author, labels, symbols.) 2.3.2.b Articulate an understanding of basic cartographic conventions (blue for water, green for land; stars for capitals, dots for cities). 2.3.3.b Explain why cartographic conventions are helpful in map interpretation because conventions help the viewer know what to expect. 2.3.4.b Compare a globe to a flat map. How are they similar and how are they different?	4.5.1.b List and identify basic visual variables manipulated in maps (e.g., color, size, shape) to communicate information. 4.5.2.b Identify data layers on a map. 4.5.3.b Discuss how data layers use visual variables to display information (e.g., capital cities all have text that is the same color, and a point symbol that is the same color.) 4.5.4.b Discuss the visual hierarchy (what information is noticed first, second, third). 4.5.5.b Discuss why a 2d map of the 3d world must be projected. 4.5.6.b Discuss the distortions that occur when mapping a 3-dimensional location onto a 2-dimensional map (vs a globe). 4.5.7.b Identify when a	6.8.1.b List and identify additional visual variables manipulated in maps to communicate information (e.g., texture, pattern, opacity, orientation). 6.8.2.b Explain how each layer on a map is represented or symbolized using visual variables (i.e., cities have dots or stars, land is green, water is blue, roads are red, and so on) and propose an alternative symbolization, providing a 1-sentence justification for the alternate choice. 6.8.3.b Articulate an understanding of color models. Hue, Saturation, Value (HSV) vs CMYK. (Cyan, Magenta, Yellow, Black). Consider when to use each model and the color spaces enclosed within them. 6.8.4.b Discuss perceptual scaling and

			legend classifies numeric data and discuss why it is sometimes helpful to classify numeric data for display on a map versus mapping raw information (i.e., easier for a map reader to understand).	simultaneous contrast and explain why maps are designed to conform with perception. 6.8.5.b Recognize the two most common forms of color vision difference: protanopia and deuteranopia (red/green color deficiency) and tritanopia (blue/yellow color deficiency) and identify design solutions. 6.8.6.b List and identify typographical variables manipulated in maps to communicate information (e.g., casing (uppercase, lowercase), style, weight)
C. Analyze, synthesize and translate information on maps.	K.1.1.c Using a legend, count the number of similar objects represented on a simple map. K.1.2.c Identify natural features on a set of physical maps and discuss how the features appear (water vs. land; mountains vs. plains, ice vs. desert).	2.3.2.c Compare and contrast different maps of the same location. Describe how the maps look different and discuss how conventions are used. 2.3.3.c Interpret a more	4.5.1.c Create a legend and discuss the design decisions on the legend. (i.e.How does the legend help the viewer interpret the map?) 4.5.2.c Create maps of	6.8.1.c Evaluate the alignment of a map's visual hierarchy with the perceived goals or message of the map. 6.8.2.c Using histograms, evaluate different classification

		complex legend to describe what information can be collected from a given map, including identifying if information is classed or unclassed. 2.3.4.c Create a legend for a map to convey specific information about a location. 2.3.5.c Collect data from a map and translate into a different product such as a barchart, story, or descriptive paragraph.	a familiar location at different scales, including a scale estimation (inches, feet, miles) and legend. 4.5.3.c Evaluate graduated symbol maps with different classification methods to understand why some classification methods may be misleading.	techniques applied to the same choropleth map dataset, paying attention to equal interval (range of numbers determines the class breaks, which are always the same, as a result, you could have some classes with 0 members) and quantile classification (equal members in each class, but the class breaks are not the same) schemes. 6.8.3.c Recognize generalization on maps, paying attention to selection (choosing what things to include) and simplification (reducing detail). 6.8.4.c Discuss numerical rounding on map legends and on scalebars. Why are 'counting numbers' (e.g., numbers ending in 0 or 5) often used? (see 6.8.2.c) 6.8.5.c Critique a map legend, suggesting how the legend could be improved to be more

				effective at explaining the map. 6.8.6.c Analyze a map's use of ancillary information (helpful but not strictly necessary information to include on a map, such as accompanying text or other infographics), to contextualize and explain the mapped phenomena. What additional information would help the viewer understand what they are seeing? What words might be unfamiliar to the audience?

Learning Outcome 4: Students will use maps and other data sources to navigate and investigate a given location.

Learning Objective	**Kindergarten/First**	**Second/Third**	**Fourth/Fifth**	**Sixth-Eighth**
A. Read maps.	K.1.1.a Orient a map or diagram to a viewpoint of a familiar location or place (e.g. a floor plan of a school). K.1.2.a Recognize that	2.3.1.a Recognize that locations have names; note some names can provide information about a location while some do not.	4.5.1.a Discuss why maps tend to be oriented in the same way (north is up, emphasis on global north) and consider different ways maps could be oriented.	6.8.1.a Compare traditional and or historical maps made by peoples and cultures around the world (e.g., the Islamic world, Medieval Europe, Asia and Pacific

	locations have names.	2.3.2.a Describe how map scale can affect map use. 2.3.3.a Use a grid to find cities and locations on a map.	4.5.2.a Use a ruler to measure distance on a map 4.5.3.a Identify areas on a map that are distorted on Mercator projections (e.g., Antarctica; inflated size of global north) compared to compromise projections. (Example tool to help: Tissot's indicatrix, which shows areas of distortion by stretching out a circle, called distortion ellipses: https://map-projections.net/tissot.php) 4.5.4.a Choose from maps of the same place at different scales to solve a specific problem. 4.5.5.a Using simple measures of latitude and longitude, use the grid to find cities and locations on a simple map	Islands, Africa, and so on). 6.8.2.a Estimate distance on a gridded map using the Pythagorean theorem to determine the distance between two points on a map. 6.8.3.a Explain the concept of Great Circle Distance and antipodes using a globe.
B. Use maps.	K.1.1.b Mark the location of an object on a simple map of a familiar place. K.1.2.b Follow a map of a familiar place to find a specific location or object.	2.3.1.b Mark a location on a map based on given criteria. 2.3.2.b Draw a route on a map, then describe the route using directional terminology and landmarks.	4.5.1.b Collect information from different types of maps to answer questions. 4.5.2.b Use a map to tell a personal story or describe a journey.	6.8.1.b. Compare the advantages and disadvantages of different types of maps to complete a given task (e.g., plan a vacation, decide where to move).

				6.8.2.b. Use multiple maps to describe change in a location or region over time. (e.g., historical movement of populations-human and otherwise, current movement of populations-human and otherwise, landforms, weather patterns).

Learning Outcome 5: Interpret a map as an artifact of a map author's motive and perspectives

Learning Objective	**Kindergarten/First**	**Second/Third**	**Fourth/Fifth**	**Sixth / Eighth**
A. Recognize maps have authors	K.1.1.a Recognize that maps have creators, referred to as authors. K.1.2.a Compare what an author of a book does, what an illustrator of a book does, and what an author of a map might do.	2.3.1.a Create a hypothesis about the purpose of the map. 2.3.2.a Analyze who the audience of a map might be. 2.3.3.a Introduce persuasive maps. Discuss how authors can use maps to influence users.	4.5.1.a Identify who the author of a map is. 4.5.2.a Create a hypothesis about the purpose of a map and how that may demonstrate authorial priorities. 4.5.3.a Explain why multiple maps may be necessary for a given location. 4.5.4.a Discuss how maps can be helpful and harmful, including who could be impacted by map creation.	6.8.1.a Discuss who influences authorial priorities (i.e. who has power). 6.8.2.a Examine the ethics of map making through a historically critical lens. (e.g., Redlining, Colonialism and country borders, or relocation of citizens of First Nations from their ancestral homes.)

B. Recognize and identify map authors' decision points.	K.1.1.b Discuss why a map cannot show everything. K.1.2.b Discuss map design decision making. (e.g. make a map as a class, discuss map design decision-making. Ask students to choose colors, icons, place names.) K.1.3.b Create a map of a familiar location. Compare and contrast maps with a peer noting what is similar and what is different.	2.3.1.b Identify what a map author selected to include and identify omissions. 2.3.2.b Discuss the type of decisions a map author makes, including colors, icons, shapes, objects included, etc. 2.3.3.b Imagine how a map might need to be changed based on the needs of an audience. (What needs to be different for map users who can't read? Colorblind map users?) 2.3.4.b List three foundational decisions a map's author must make: 1) The purpose of the map; 2) The data, and which to include and omit; 3) The design of the map.	4.5.1.b Examine multilingual and/or historical maps; consider how names change or vary among people groups. 4.5.2.b Hypothesize the purpose(s) of a map by examining the data used on the map and the design of the map, including possible reasons the author chose to include some features and not others.	6.8.1.b Extrapolate how the design of the map informs the audience's perspective by examining the data used to make the map, the selected features, and the intended purpose of the map. 6.8.2.b Discuss counter mapping to contest official or dominant maps.
C. Make intentional authorial decisions in the creation of maps	K.1.1.c Explain what your map shows and why the map looks like it does (connection between map appearance and representation). Articulate why you chose to show some features and not others.	2.3.1.c Explain what your map shows and connect map appearance to your design decisions. Articulate why you chose to show some features and not others. 2.3.2.c Name at least three decision points made when	4.5.1.c Building on all prior activities, create a map that shows your personal experience of a familiar place (i.e., your hometown.) Explain your design decisions - what locations you selected and why you represented them the way you did.	6.8.1.c Building on all prior activities, create a map that explores the history or features of a familiar place or a place you would like to visit, paying attention to place names and features or locations emphasized on the map. Explain your design

		making your map (ex. data, feature selection, color choice.) Explain why you made the choice you made and identify a different choice you could have made and why you did not make that choice.	Compare your map of your hometown to an "official" map and identify differences. 4.5.2.c Building on all prior activities, draft a map of a familiar location. Solicit formative feedback on your map, and then revise the map. Record the changes between the two versions of the map, and why you made the changes. Were there any changes you chose not to make? Why?	decisions - what locations you selected and why you represented them or named them the way you did. Compare your map to an "official" map and identify differences. 6.8.2.c Building on all prior activities, draft a map for a peer or familiar person based on their favorite activities or locations important to them, making sure to understand what features are most important for the map to emphasize. Record attribute information and design preferences. 6.8.3.c Solicit formative feedback from your peer or familiar person and revise the map draft. Record the changes between the two versions of the map. Were there any changes you chose not to make? Why?