Encoding Geography Curricular Framework/Teacher Planning Tool

Process for Using the Curricular Framework:

Step 1: Consider **the students you teach**. What interests and aspirations do they have? What issues/challenges/relations in their community/world deserve curricular attention?

Step 2: Identify **a topic of study** you believe is worthwhile to teach and think about how/if geocomputation might help students engage with it in productive ways. Identify ways academics and/or working professionals use geocomputation in related ways and learn more! Review pgs. 3-4 for more information about the components of geocomputational thinking, computational thinking and geographic/spatial thinking. Write down your initial thinking about **how geocomputation could be powerful** for engaging students with knowledge associated with the topic. It might be helpful to identify the geographical/spatial considerations *and* the computational ones.

Step 3: Once you have determined that geocomputation could be useful, identify the aim you have for students particular to the topic and describe it. Through the aim, you are identifying *what* you want to teach. Then discuss why you think this is important knowledge for students to learn. Tie back to your responses in Step 1.

Step 4: Create an inquiry question that can drive the lesson segment.

Step 5: Identify a data set or other curricular source that allows students access to the knowledge (and thinking) you have identified. Ask for help as needed.

Step 6: Establish a plan for engaging students with the data utilizing geocomputational insights. Your plan should include:

- Opportunities to connect students' individual/community assets to the lessons
- Knowledge with which students will engage that you (the teacher) see as significant
- Data Analysis/ Geocomputational Thinking
- Pedagogical "moves"
- Assessment of students' learning

Step 7: Evaluate to what extent students' knowledge and ability to practice geocomputational thinking has developed through the enactment of lessons. Reflect on your goals from Step 3, make note of changes you would make in the future. How has your own understanding of geocomputational utility changed as a result of teaching the lesson?
Other considerations- Do we want to build in something that we want for dissemination with others? (student work, teacher reflection, etc.?)

Teacher Lesson Segment Planning Tool:

<table>
<tr><td>Unit of Study & Topic or Concept addressed in the learning segment:</td><td rowspan="7">COMPUTATIONAL THINKING TERMS

● Decomposition
● Pattern Recognition
● Pattern Abstraction
● Algorithm Design

CT TERMS ADAPTED FOR SOCIAL STUDIES
(Hammond)

● Data Definition
● Pattern Recognition and Generalization
● Abstraction
● Rule-making
● Automation
● Decomposition
● Outlier Analysis
or
● Data > Patterns > Rules (and Questions)

SPATIAL THINKING

● Frameworks:
○ Life Space;
○ Physical Space;
○ Intellectual Space
● Location
● Spatial distributions
● Regions
● Hierarchies
● Networks
● Spatial associations
● Surfaces</td></tr>
<tr><td>Student Considerations:
What student or issue-specific considerations will relate to the lesson? What local and/or global relevance can be identified?</td></tr>
<tr><td>Power of Geocomputation:
In what ways will geocomputation be useful for studying this topic? Link to any helpful insights from academic/professional sources.</td></tr>
<tr><td>Learning Aims and Purpose:
Describe the knowledge and skills students will acquire and why this is important for them to know.</td></tr>
<tr><td>Inquiry Question:
Identify the question that students will investigate or the process they will use to formulate their own question.</td></tr>
<tr><td>Type(s) of Data & Data Source:
Describe the significance of the data students will be analyzing and the source of the specific dataset.</td></tr>
<tr><td>Lesson Segment Details:
Describe what the teacher and students will do in this lesson segment. Organize your plan by day if helpful. Include opportunities to connect students' individual/community assets to the lessons and
specify the steps that students will take to analyze the data and respond to the inquiry question.</td></tr>
<tr><td>Outcome and Assessment:
Describe how students will convey their learning or take action based on the results of the inquiry.</td><td></td></tr>
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After enacting the lesson segment:

Evaluation/Reflection: Evaluate to what extent students' knowledge and ability to practice geocomputational thinking has developed through the enactment of lessons. Reflect on your goals and make note of changes you would make in the future. How has your own understanding of geocomputational utility changed as a result of teaching the lesson?

Guide to Geocomputational Thinking

COMPUTATIONAL THINKING

Decomposition	breaking into small steps or components
Pattern Recognition	noticing repeated patterns and relationships
Pattern Abstraction	filtering out – ignoring - the characteristics of patterns that we don't need in order to concentrate on those that we do
Algorithm Design	creating set of ordered finite steps to solve a problem

CT TERMS ADAPTED FOR SOCIAL STUDIES

Data definition	What is being included? What is being excluded?
Pattern recognition & generalization	What do I see? Does it apply elsewhere?
Abstraction	Can I remove detail to make it easier to see patterns or connections?
Rule-making	Does a pattern always apply? Can it predict what will happen in a new situation?
Automation	Can technology help me identify or confirm a pattern?
Decomposition	Can I break this question or dataset into smaller parts?
Outlier analysis	Which parts of the data do not follow the pattern? What can they tell us?

Simplification:

DATA →

- What are we looking at?
- In what way is this an abstraction?

PATTERNS →

- What is the pattern, if any? If there is a pattern, what are the outliers?
- If we decompose the problem, does the pattern change?

RULES

- Does this pattern generalize – that is, does it repeat under other circumstances?
- What factors seem to be important?

QUESTIONS (throughout)

- What else would you need to know to better understand the data, the patterns, and any rules observed above?
- Is there different data that you would like to consult?
- (etc.)

GEOGRAPHIC/SPATIAL THINKING

3 Spatial Contexts	
• Life Space	Relationship between self and objects; *thinking in space*
• Physical Space	Scientific understanding of phenomena; *thinking about space*
• Intellectual Space	Nature of space defined by a problem; *thinking with space*
First-Order Primitives	
Location	This includes a descriptor with identity, magnitude, location and time. An additional cognitive component might be familiarity. Occurrences are often called environmental cues, nodes, landmarks, or reference points.
Spatial distributions	Distributions have a pattern, a density, and an internal measure of spatial variance, heterogeneity or dispersion; occurrences in distributions also have characteristics such as proximity, similarity, order, and dominance.
Regions	Areas of space in which either single or multiple features occur with specified frequency (uniform regions) or over which a single feature dominates.
Hierarchies	Multiple levels or nested levels of phenomena including features.
Networks	Linked features having characteristics, connectivity, centrality, diameter, and density. Networks may also include physical links such as transportation systems, or non-visual systems.
Spatial associations	Associations include spatial autocorrelation, distance decay, and contiguities. Examples of these associations include interaction frequencies or geographic and areal associations. For example, the coincidence of features within specific areas (i.e., squirrels are normally near trees) is a spatial association.
Surfaces	There are generalizations of discrete phenomena, including densities of occurrence, flows over space and through time (as in the spatial diffusion of information or phenomena).