Teaching GIS in English in a Chinese University

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The World Is Connected!
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- Practice
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- Discussion
“Cartography” Publications in WOS and CNKI

Capabilities for Broader and Richer Views
“Geographic Information” Publications in WOS and CNKI

Capabilities for Broader and Richer Views
Background

Beijing
- Capital city
- Headquarters of MNC
- International Organizations

Capital Normal University
- Flagship university: high quality students
- MOE International Student Center
- Department of GIS
  - Joint degree programme “1+2+1”, “2+2”
  - National Programme of Excellence

Higher Education in China
Methodology

• Internationalisation at Home (IaH)
  • Teaching language: optional
  • Contents speak louder

• Questions
  • To Chinese Students:
    • Is a course in English as effective as the one in Chinese?
    • Is a course in English help them improve academic English?
    • Is a course in English help student build a global perspective?
  • To International Students:
    • Is a course in English help students learn GIS in China

Purposeful integration of international and intercultural dimensions into the formal and informal curriculum for all students within domestic learning environments.
Methodology

• Pedagogies of Teaching Cartography & GIS
  • Science, Technology, and Art
  • Social applications
  • Academic research
  • Instructors’ expertise
  • Reference Books
  • Students’ Preference

Motivation: to move, perceive, and apply physical skills

Emotion: to feel, aesthetics value, appreciate, and care

Physical: to act, will, decide, and commit

Mental: to know, think, problem solve, and create

Cognitive

Psychomotor

Conative

Affective

T. Reeves, How do you know they are learning?: the importance of alignment in higher education, Int. J. Learning Technology, 2006, 2(4)
Methodology

CaGIS Courses

- Discrete to Coupled
- Academic to Real World
- Direct to Problem based
- One Direction to Multiple
- In Classroom to Realtime
- Teaching to Learning Oriented
- In Classroom to Realtime
- Instructor
- Student
- Technology
- Assessment
- Content
- Tasks
Practice

• *Principles and Methods Geographic Information System*
  • Mandatory course for students in GIS, Geography, Remote Sensing, Surveying
  • Prerequisite courses: Cartography, Survey Engineering, C programming (optional)
  • Basic arrangements: 16 weeks, 48 hours, 3 credits
  • Since 2015

Reference Books
Introduction
Cartography, computer aided mapping, Geography, IT, Society

Geospatial Representation
Geospatial abstraction and Modeling

Spatial Models
Object/Field, Vector and basic algorithms, Raster and basic algorithms, Mathematic models and transformation

Geovisualization
Symbolization, Generalization, Thematic maps, Map animations, Map storytelling, Infographics

Spatial Data Management
Spatial Database, multi-scale SDB, spatial relationship, query

Geospatial Analysis
Geostatistics, Computational geometry, Spatial clustering and correlation, Terrain analysis, Network analysis, Applications

Web GIS
HTML, JavaScript, OpenLayers

GIS Design
PPGIS, Society, Users, Demand, Analysis, Design, Outcome, Effectiveness

Academic reading, team project, assignments
Practice

- Example: a distance
• Example: demystification
Practice

- Example: a distance

1. **Assignment Information**

   **02 Simplifications and Sinuosity**

   **Instructions**

   Simplification and Sinuosity
   
   Vector data model is used to represent geographic feature in an object oriented manner. Basically a geographic feature can be abstracted as a point, or a polyline, or an area, or a combination of above three primary geometry entities.
   
   Details of geometries of geographic features vary depending on acquisition methods, data management context and application purposes. In the second lecture of GIS, we discussed two basic algorithms for linear feature simplification.
   
   Shape indicators can be employed to describe typical characteristics of geometries and reveal geographic patterns. Sinuosity is one of basic shape indicators, which can help to understand evolution of rivers and coastlines and surrounding geomorphological condition.
   
   Based on above two consideration, you are asked to conduct a hand-on data processing and document your results with the given datasets in WGS84:
   
   1. Datasets. You can get three data layers, including a polyline layer "rivers10m.zip" indicating linear rivers, a polyline layer "coastlines10m.zip" indicating coastlines, and a polygon layer "lakes10m.zip" indicating lakes' boundaries.
   2. River sinuosity calculation. Select at least 5 linear objects in "rivers10m.zip" longer than 200km, choose at least reasonable 5 threshold values for line simplification and calculate corresponding sinuosity. If necessary, you are suggested to edit and split the complex river features.
   3. Lakes sinuosity calculation. Select at least 5 lakes in "lakes10m.zip", reasonable 5 threshold values for polygon simplification and calculate corresponding sinuosity.
   4. Comparison of the series of sinuosity values you get during simplification.

   You are required to document your calculations process including: selected rivers and lakes and why you select them, threshold values of simplification results and why you choose these values, comparison of sinuosity changes before and after simplification and possible explanations.

   **Due Date**
   October 27, 2021 11:59:00 PM CST

   **Points Possible**
   5
Practice

• Example: a distance
Practice Basic Definitions ➔ Models Design ➔ Core Algorithms ➔ Typical Applications ➔ Software Exercises ➔ Extending Scenarios
Practice

Spatial Network-extending

- Applications: not only for optimal routes and resource allocation.

The pictures illustrate the size of blocks and impacts on connectivity of a series of cities in China, Europe, and Japan. The last two images on the right show the lack of connectivity and the increase of average distances between intersections in recent urban developments in China.

<table>
<thead>
<tr>
<th>Intersections Per Km²</th>
<th>Turin</th>
<th>Barcelona</th>
<th>Paris</th>
<th>Guangzhou</th>
<th>Shanghai</th>
<th>North Beijing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>152</td>
<td>103</td>
<td>133</td>
<td>211</td>
<td>17</td>
<td>14</td>
</tr>
</tbody>
</table>

| Distance Between Intersections(m) | 80 | 120 | 150 | 45 | 280 | 400 |

L: Lane
M: Motorized
B: Bicycle
P: Pedestrian

<table>
<thead>
<tr>
<th>Traditional Chinese block 50m in between intersections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street length for 1 km²</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>M: 15km</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medium-grain small block 150m in between intersections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street length for 1 km²</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>M: 15km</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Fine-grain small block 150m in between intersections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street length for 1 km²</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>M: 15km</td>
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</tbody>
</table>
Practice

Spatial Network-extending

- Applications: not only for optimal routes and resource allocation.

Documenting culture trajectories and history centres.

The emergent processes driving cultural history are a product of complex interactions among large numbers of individuals, determined by difficult-to-quantify historical conditions. To characterize these processes, we have reconstructed aggregate intellectual mobility over two millennia through the birth and death locations of more than 150,000 notable individuals. The tools of network and complexity theory were then used to identify characteristic statistical patterns and determine the cultural and historical relevance of deviations. The resulting network of locations provides a macroscopic perspective of cultural history, which helps us to recount cultural narratives of Europe and North America using large-scale visualization and quantitative dynamical tools and to derive historical trends of cultural centers beyond the scope of specific events or narrow time intervals.
Practice

• Students are encouraged to spend 1500 seconds a day for reading
• Semester Survey

1. What were your expectations before joining Principles and Methods of GIS in English?
2. Do you think this course is challenging and why?
3. List your favorite topics:
4. List your confusing topics:
5. Apart from lectures and classroom programming, how much time have you spent on reading GIS materials and other GIS books the instructor sent you and suggested?__________(hours).
   The reasons that you could not put more time:
6. Your Suggestions on How to Improve the Quality of GIS Learning (e.g. more assignments, discussions etc.)
7. Your Plans to Develop Your GIS Knowledge in Future (e.g. reading, programming, or I simply don’t have any plan—let me know why!):
8. Others that I Want the Instructor Know
Please Briefly Answer the Following Questions.

1. Do you think this course is challenging and why? Yes, I have to keep up with the load of specific academic work, do a large amount of research, and do a lot of work in the class.

2. List your favorite topics.
   - Course Evaluation
   - Assessment of Learning

3. List your confusing topics.
   - Analysis of Learning
   - Algebra

4. Apart from lectures and classroom programming, how much time do you spend on reading GIS materials and other GI books? 1.5 hours on average.

5. In English lectures, how much more engaged are you into the GI topic? I have to keep up with the load of class work, do a lot of reading, do a lot of writing, do a lot of research, and do a lot of work in the class.

6. In English lectures, how much more engaged are you into the GI topic? I have to keep up with the load of class work, do a lot of reading, do a lot of writing, do a lot of research, and do a lot of work in the class.
Results

1. What were your expectations before joining *Principles and Methods of GIS* in English?
   Improve English, Challenging oneself, Preparation for international study
2. Do you think this course is challenging and why
   English, too many readings, no time
3. List your favorite topics
   Geovisualization, terrain analysis, interpolation
4. List your confusing topics
   Topological structure, Quadtree, Projection, Georeferencing, Programming, Spatial Index, Spatial Autocorrelation, Vectorization, Interpolation, A* (optimal path in raster)
5. Apart from lectures and classroom programming, how much time have you spent on reading:
   2 hours a week. Just no time.
6. Your suggestions on how to improve the quality of GIS learning (eg. more assignments, discussions etc)
**Discussion**

- **Objectives:** classical topics, to coupled topics as a whole
- **Content:** theories, methods and applications from latest articles
- **Instructor:** the role of support, time limitations, no enough interactive arrangement
- **Student:** inspired with applications, more concentrated and pushed by tasks
- **Implementation:** each topic and group of topics share research problems
- **Task:** real world tasks from research and applications of GIS in relevant disciplines
- **Technology:** predefined data and hunting for data
- **Assessment:** how much new interpretations and findings in open tasks overruns answer sheets
Thank you!

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