ACTIVE LEARNING STRATEGIES IN GEOSPATIAL SCIENCE

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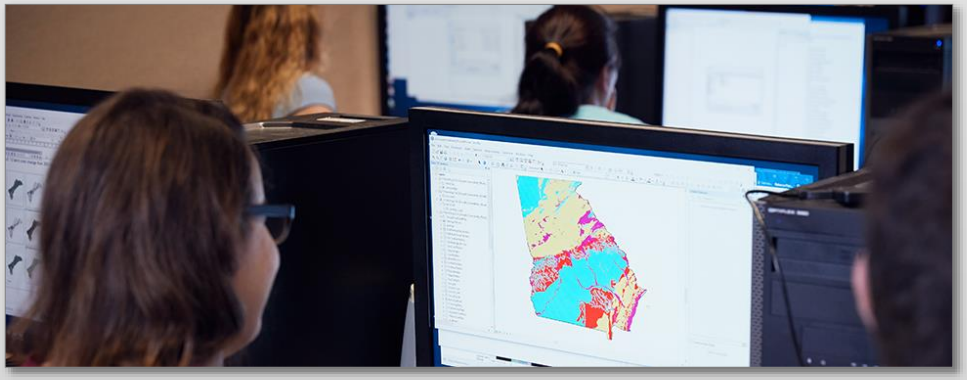
GEOGRAPHY/GIS CLASSROOMS

Value of spatial thinking

- Globalization
- Global issues require spatial solutions
  - biodiveristy, urban sprawl, energy, water, hazards, health
- Increasing use by the general public (GPS, GoogleMaps, IOT, mobile devices, etc.)



Introduction to GIS
UNG Institute for Environmental and Spatial Analysis

(Kerski)

GEOGRAPHY/GIS CLASSROOMS

Technology Rich

- GIS
- UAV (drones)
- GPS
- LiDAR
- sand/light tables
- augmented & virtual reality
- surveying total stations

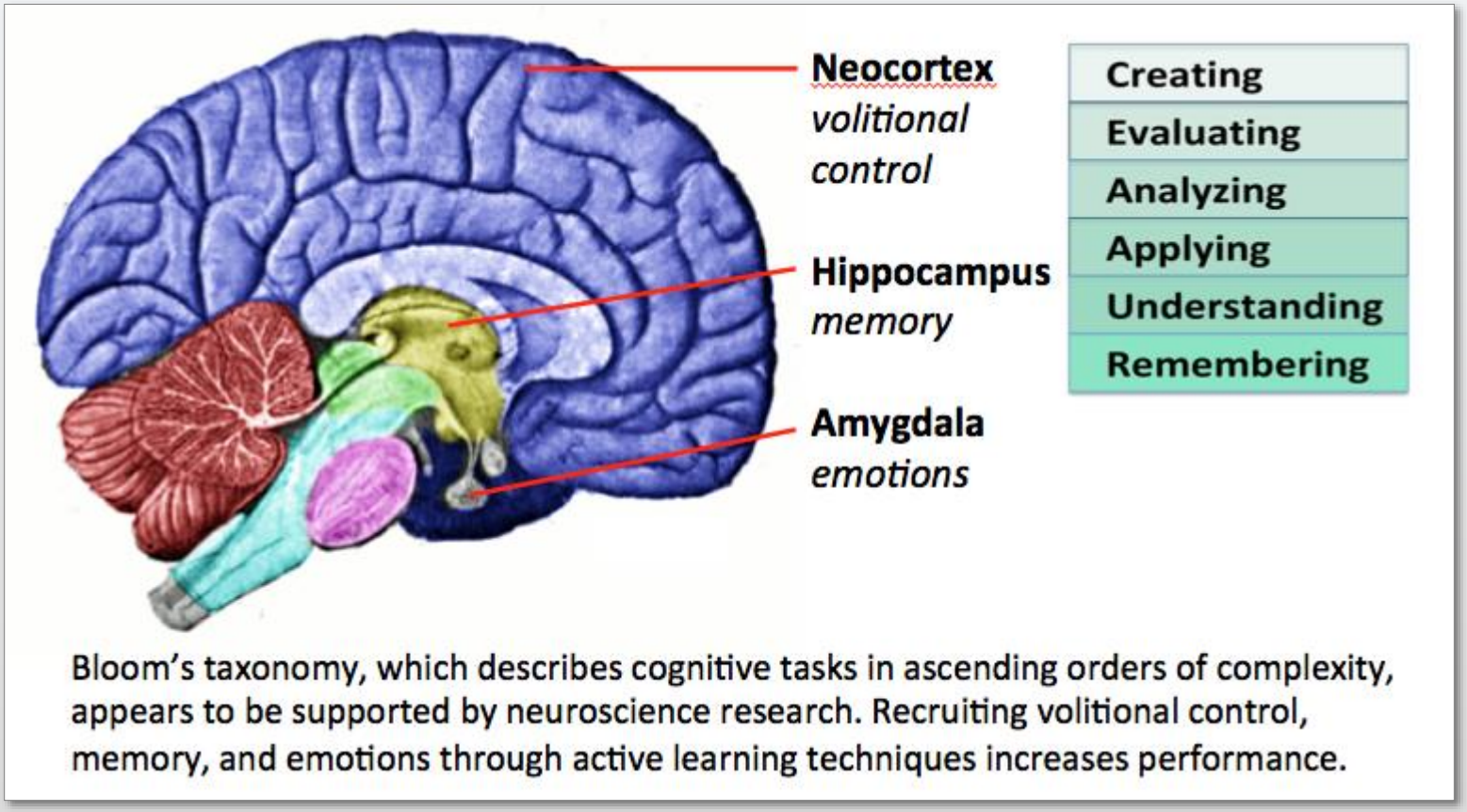
Introduction to Physical Geography, Fall 2018
Thermal Infrared UAV Image

Benefits of Technology

- student engagement
- deeper understanding of material
- inquiry-based learning

Surveying I
UNG IESA

(NEURO)SCIENCE-BASED PEDAGOGY



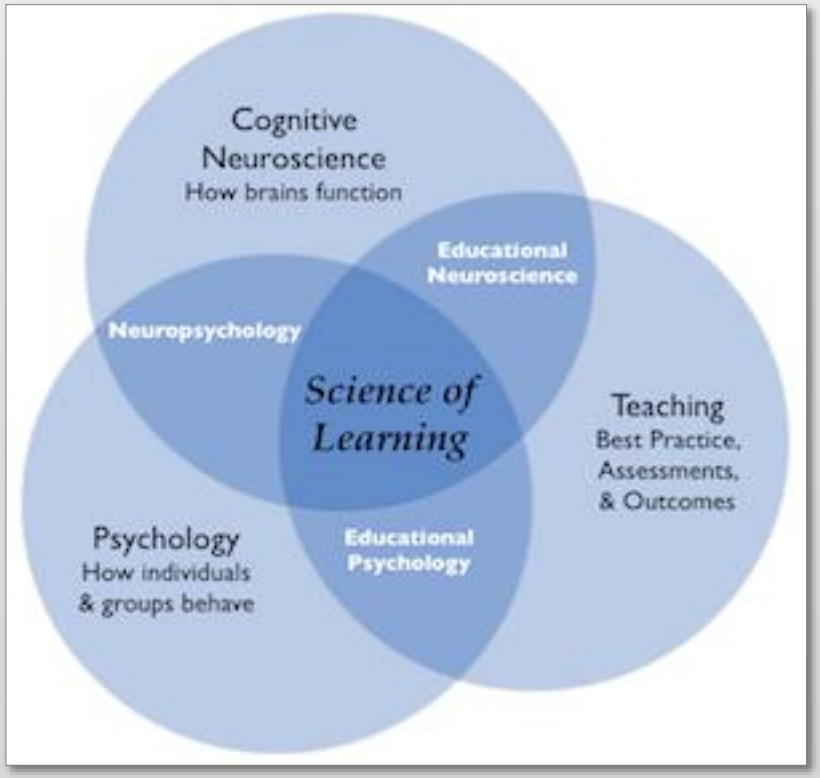
Bloom's taxonomy, which describes cognitive tasks in ascending orders of complexity, appears to be supported by neuroscience research. Recruiting volitional control, memory, and emotions through active learning techniques increases performance.

https://gsi.berkeley.edu/gsi-guide-contents/learning-theory-research/neuroscience/

PEDAGOGY

Science-Based Learning Strategies

- active experiential learning
- field-based inquiry
- metacognition
- retrieval practice
- story-telling

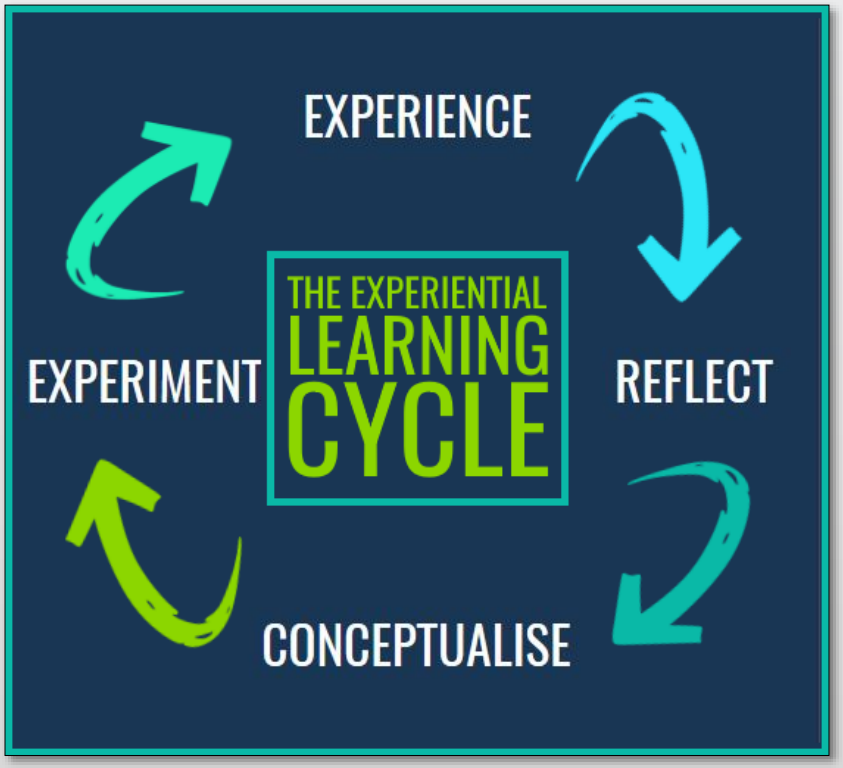


Eyler, 2018

http://sites.bu.edu/neuro-ed

ACTIVE EXPERIENTIAL LEARNING

- Learning through experience
- Learning through ***reflection*** on doing



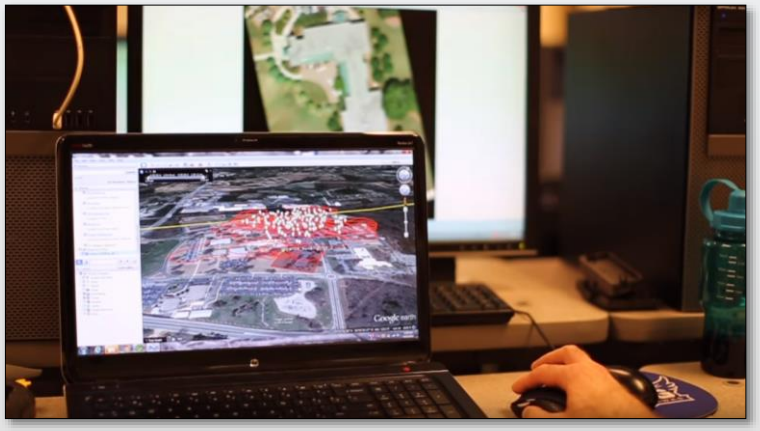
https://www.growthengineering.co.uk/what-is-experiential-learning/

ACTIVE EXPERIENTIAL LEARNING

APPLICATION: Geographic Information Science

Geography Courses

- explore spatial data…
  - interconnectedness
  - identify patterns/trends
  - embrace complex systems



GIS Courses

- encourage exploration/active experiences
- scaffolding
  - avoid reliance on “cook-book” procedures
  - iteratively remove detail, encourage students to explore

FIELD-BASED LEARNING

Experience Inquiry

Hypothesis-Testing & Experimentation

- science as iterative process
- location awareness
- spatial critical thinking

Challenge and achievement of real-world scientific investigation

- embrace the unexpected
- experience **failure**!

https://serc.carleton.edu/research_on_learning/synthesis/field_resources.html

FIELD-BASED LEARNING

APPLICATIONS: GPS, Surveying

- Experimentation
- Location awareness
- Service-based learning

GPS Data Collection

Surveying I, UNG IESA

METACOGNITION

Metacognition: thinking about thinking

- awareness of own learning process
- monitor/assess learning strategies and effectiveness (self-regulation, self-monitoring, self-assessment)
- consciously manage motivation/attitude toward learning

https://serc.carleton.edu/NAGTWorkshops/metacognition/introduction.html

METACOGNITION

APPLICATIONS: Sand/Light Tables, Citizen Science

- brainstorm educational applications
- creatively discuss *how* to tools can promote learning

Fundamentals of Remote Sensing
Spring 2019

Fundamentals of Remote Sensing
Spring 2019

RETRIEVAL PRACTICE

Retrieval practice: strategy in which calling information to mind enhances long-term learning.

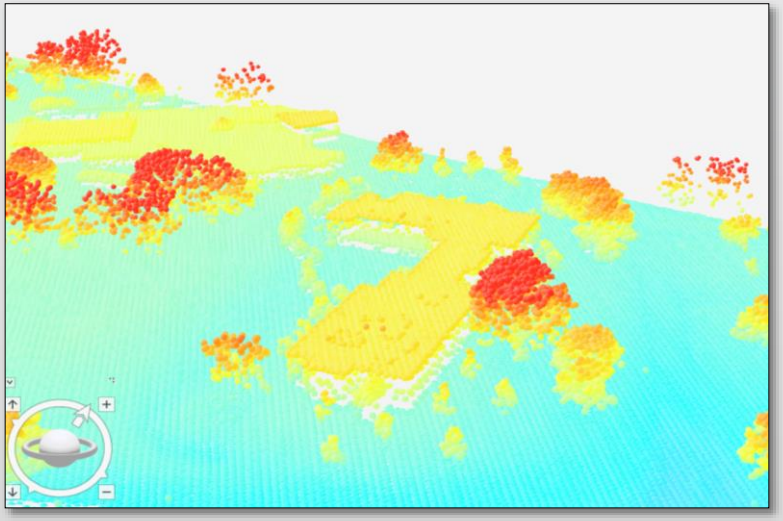
How to implement

- staggered review of concept within varying contexts
- low stakes and no-stakes assessment

RETRIEVAL PRACTICE

APPLICATION: REMOTE SENSING

- recall and reframe principles of electromagnetic radiation



UNG Science Building LiDAR Point Cloud

Remote Sensing of Environment
Fall 2018

STORYTELLING

- humans learn through narrative
- memory is linked to emotion

https://www.forbes.com/sites/steveolenski/2015/11/30/4-benefits-of-using-storytelling-in-marketing/#27152b574616
https://www.nytimes.com/2012/03/18/opinion/sunday/the-neuroscience-of-your-brain-on-fiction.html

STORYTELLING

APPLICATION: Unmanned Aerial Vehicles

- teach history of technological innovation *using narrative*
- discuss applications *as stories*

Civil engineering applications of UAV
Dr. J.B. Sharma

Student flies DJI Phantom 4 as part of a class assignment

https://www.youtube.com/watch?v=1PKsTUinh6c

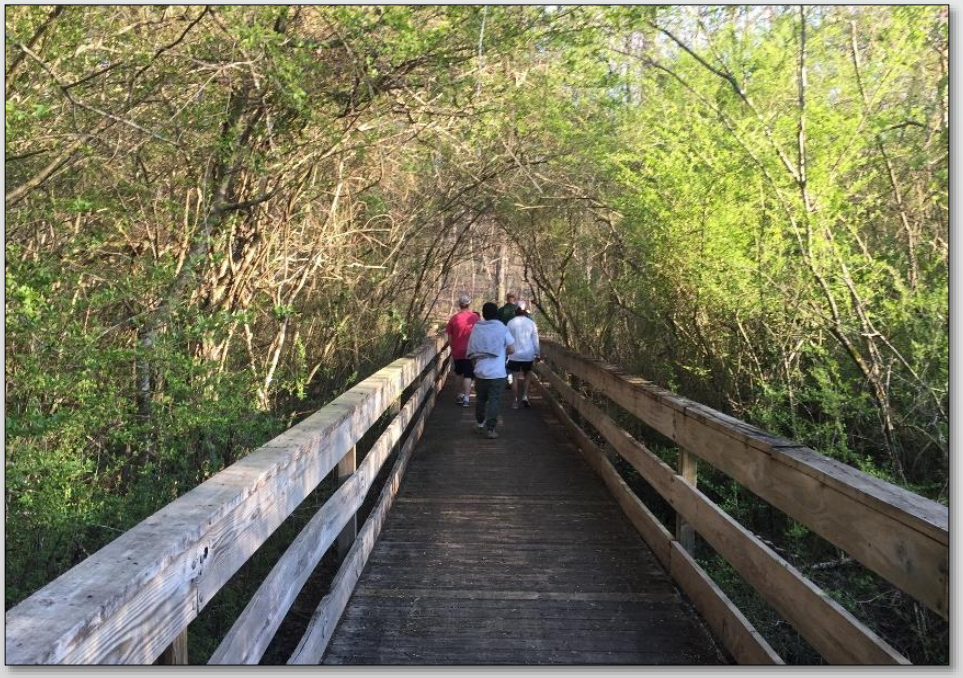
SUMMARY


field-based inquiry
active experiential learning
Best Practices
metacognition
retrieval practice
storytelling

CONCLUSIONS

Geography/GIS classrooms and geospatial technologies provide opportunities for experiential active learning.

Teaching strategies which incorporate field-based inquiry, storytelling, retrieval practice, and metacognition can further enrichen classroom experiences and promote long-term learning.



Introduction to GIS Spring 2019
GPS Trail Data Collection

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