

Using Geospatial Technologies in Instructional Design to Facilitate Meaningful Learning

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Introduction: Geospatial tools are multidisciplinary and are valued and in demand for scientific, math and social scientific research (Liben & Titus, 2012; Kawabata, Thapa, Oguchi & Tsou, 2010; Gewin, 2004). In the United States, GIS is used as a tool that enables students to study their communities through project-based approaches (Bednarz, 2004). The use of geospatial tools has been shown to be effective in teaching in a global context with varying education systems, limitations, opportunities and challenges (Kerski, Demirci & Milson, 2013).

The Gap: The main limitation for use of GIS in developing spatial understanding is when instructional conditions of teaching for understanding and transfer are not met (Bednarz, 2004). To bridge this, the course design focuses heavily on developing the student experience rather than a technical approach to learning a new skill.

Project Design: A course was designed in collaboration with GER²I at Purdue. The course is titled **Exploring the World with Geographic Information Systems (GIS)**

Description: In this course, students will be exposed to principles of geographic information systems and gain hands-on experiences in data collection. Learners will independently create GIS products such as static maps, desktop maps and online maps. Finally, they will showcase their own stories, embedding spatial data and audiovisual content and share experiences using story maps. The design of this course will employ both desktop and mobile technology when students walk through the campus to capture features of interest such as buildings, trees, fountains and their own ‘fun observations’. Mobile technology will be used not only for convenience of data collection but also to effectively communicate with and engage learners as suggested by Sung & Mayer (2013).

FOR FURTHER READING:

- Bednarz, S. W. (2004). Geographic information systems: A tool to support geography and environmental education?. *GeoJournal*, 60(2), 191-199. <https://doi.org/10.1023/b:gejo.0000033574.44345.c9>
- Driscoll, M. (2005). Chapter 11: Constructivism. *Psychology of learning for instruction* (3rd ed.). Boston: Pearson Allyn and Bacon.
- Kawabata, M., Thapa, R. B., Oguchi, T., & Tsou, M. H. (2010). Multidisciplinary cooperation in GIS education: A case study of US colleges and universities. *Journal of Geography in Higher Education*, 34(4), 493-509. <https://doi.org/10.1080/03098265.2010.486896>
- Kerski, J. J., Demirci, A., & Milson, A. J. (2013). The global landscape of GIS in secondary education. *Journal of Geography*, 112(6), 232-247. <https://doi.org/10.1080/00221341.2013.801506>
- Liben, L. S., & Titus, S. J. (2012). The importance of spatial thinking for geoscience education: Insights from the crossroads of geoscience and cognitive science. In *Earth and Mind II: A Synthesis of Research on Thinking and Learning in the Geosciences*. doi:10.1130/2012.2486(10)
- Sung, E., & Mayer, R. E. (2013). Online multimedia learning with mobile devices and desktop computers: An experimental test of Clark’s methods-not-media hypothesis. *Computers in Human Behavior*, 29(3), 639-647. <https://doi.org/10.1016/j.chb.2012.10.022>

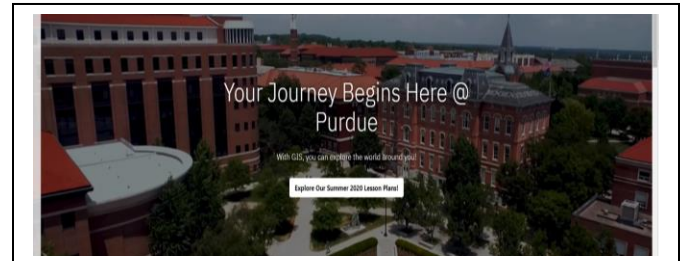
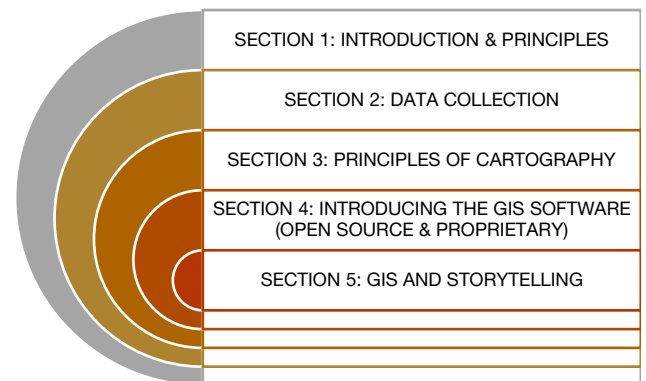


Figure 1. Course Website and Design



Learner Characteristics and Description

The learners for this course are grades 7-8 students who are gifted and intrinsically motivated students. The average age may range from 10 – 14 years of age. Various challenges are required to keep students motivated; at each stage, we will alter the lesson by increasing depth of lesson and presenting fun challenges to facilitate student motivation, reflection and self-regulation learning (Driscoll, 2005). As such, allowing gifted learners their freedom to explore and tackle new challenges is the main reason for employing constructivist type strategies.

Outputs

- The course module and website were created. Students can access this at <https://purduegis.wordpress.com/>
- Equipment was purchased and is ready for in-person training (to be offered in Summer 2021)
- The module and demonstration will be presented at the AECT 2020 Virtual Convention

Adapting to Change

The research output of this project will now take a qualitative approach to constructing unique narratives using story maps, in the light of recent challenges associated with the COVID-19 pandemic since it may not be possible to reach large groups in person. At present, the researcher is working on developing the course in an online format as distance learning is in demand.