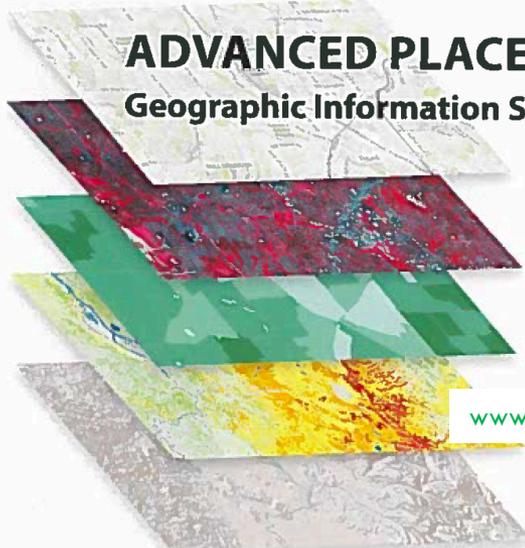


ADVANCED PLACEMENT GEOGRAPHIC INFORMATION SCIENCE & TECHNOLOGY (AP[®] GIS&T)

A PROPOSED NEW AP[®] COURSE
FOR U.S. HIGH SCHOOLS



ADVANCED PLACEMENT
Geographic Information Science & Technology

A Proposed
New AP Course
for High Schools

Learn more and
register your support

www.gistcourseproposal.org

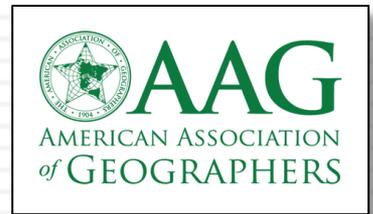
 **AAG**
AMERICAN ASSOCIATION
of GEOGRAPHERS

All references to AP[®] are to be referred to the Advanced Placement programs of the College Board.

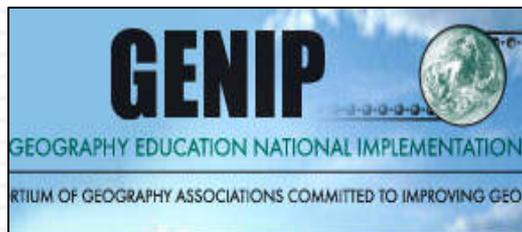


Rich Schultz, Ph.D., GISP, C.P.G.

Information

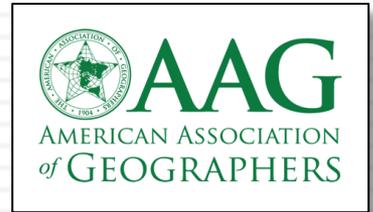


- With funding support from the Geography Education National Implementation Project (GENIP), the American Association of Geographers (AAG) developed a proposal in Fall 2015 for a new Advanced Placement course in Geographic Information Science & Technology (AP[®] GIS&T).



GENIP (Geography Education National Implementation Project) is a consortium of geography associations committed to improving the status and quality of geography education in the United States. It was organized in 1985 by the American Association of Geographers (AAG), American Geographical Society (AGS), National Council for Geographic Education (NCGE), and National Geographic Society (NGS).

Disclaimer and Future Plans



- This presentation represents the development of the **course proposal** for the College Board's AP[®] Program.
- The course proposal will be submitted to the College Board on June 15, 2017.
- The College Board will make a ruling on the decision to move forward on the development of the course in 2018.

This research was supported by a grant from the Geography Education National Implementation Project to inform development of a new Advanced Placement course proposal. Advanced Placement[®] is a trademark registered by the College Board, which is not affiliated with, and does not endorse, this presentation.

Outline for this Presentation



- ❑ Background Information
- ❑ The Proposed Course
- ❑ Proposal Committee Members and Advisory Board
- ❑ Methodology of the Proposal
- ❑ Course Description
- ❑ Assessment
- ❑ Professional Development
- ❑ Endorsing scientific and professional organizations

Background Information

- The proposed AP[®] GIS&T course is based on extensive original research and consultation with key geography organizations and stakeholders, including academic geographers, high school teachers, and public and private sector GIS professionals.
- It consists of:
 1. a course description,
 2. a recommended assessment,
 3. a plan for teacher professional development,
 4. a collection of representative college syllabi, and
 5. a list of endorsing scientific and professional organizations.

The Proposed Course

- ❑ AP[®] GIS&T is designed to introduce high school students to the fundamentals of geographic information science and applications of geospatial technologies for spatial analysis and interdisciplinary problem solving.
- ❑ Together with AP[®] Human Geography, AP[®] GIS&T offers an opportunity to engage students in outstanding geographic learning experiences and promote awareness of the many college and career opportunities available in the workforce.
- ❑ The AP[®] GIS&T course proposal has attracted broad support from prominent scientific and educational organizations, as well as major technology employers such as Google.

How Widespread Can This Get?

- ❑ AP[®] Human Geography Results from 2016:
 - ❑ 159,609 students from 4279 high schools took the exam
 - ❑ Breakdown by age:
 - ❑ 9th grade: 97,237 students (61%)
 - ❑ 10th grade: 26,744 students (17%)
 - ❑ 11th grade: 13,779 students (9%)
 - ❑ 12th grade: 16,579 students (10%)
 - ❑ Others: 5,270 students (3%)
 - ❑ The number of students taking the exam increased by 17% from 2015.
 - ❑ In 2017, approximately 180,000 students are expected to take the exam.



The Proposed Course (cont.)

- ❑ In making its recommendations for the course, the AAG made every effort to ensure that high schools will not have to purchase expensive specialized software to offer AP[®] GIS&T. ConnectED helps with this.
- ❑ Much of the content can be delivered with textbooks, videos, and other traditional instructional materials.
- ❑ For some individual and group learning activities and assessments, students will need access to computers connected to the Internet.
- ❑ A wide array of free and user-friendly software platforms, compatible with Macs and PCs, are available to support these activities and assessments.

The Proposed Course (cont.)

- ❑ For AP[®] GIS&T to become a reality, the AAG needed to collect attestations from **250** U.S. high schools that confirm they have the interest and capacity to offer the course.
- ❑ Similar assurances were needed from **100** colleges and universities that they would be willing to offer some form of credit to students who demonstrate proficiency on the AP[®] GIS&T exam.
- ❑ The AAG invites high school principals and academic department chairpersons to consider adding their institution to the list of AP[®] GIS&T supporters by completing the brief attestation form at <http://www.gistcourseproposal.org>

Preliminary Results



High schools, school districts, and academic departments are invited to complete an attestation for AP GIS&T using the following links. The deadline to submit an attestation is *June 15, 2017*.

- [High School Attestation Form](#) | [College/University Attestation Form](#)

College/University Attestations Received (as of May 30, 2017): **119** | [view list](#)

High School Attestations Received (as of May 30, 2017): **264** | [view list](#)

Have questions about this AP® course proposal? [Contact the AAG.](#)

Formal Proposal to be submitted to College Board in June 2017

Total High Schools Needed: 250

Total Colleges/Universities Needed: 100

Source: <http://gistcourseproposal.org> on June 2, 2017



AAG

AMERICAN ASSOCIATION
of GEOGRAPHERS

AP GIS&T Course: High School Attestation

For the proposed AP GIS&T course to be formally considered by The College Board, at least 250 high schools must complete this form. If the College Board approves course development, it will likely take 3-5 years before the AP GIS&T course is available to high schools.

* Required

Attestation Statement

By signing this form, I attest that my school has the capacity and desire to offer AP GIS&T, with a minimum of 25 students likely to be prepared and willing to enroll in AP GIS&T in the first year it is available.

High School Name *

High School State (location) *

State postal code (e.g. Missouri = MO)

Is this school public or private? *

- Public
 Private

<http://bit.ly/2qcTGdP>

Signatory Name *

Signatory's Position at the School/School District *

Signatory's Contact Email *

Proposal Committee Members

Serving on the AP[®] GIS&T Proposal Writing Committee:

- ❑ Ola Ahlqvist (The Ohio State University),
- ❑ Dorothy Cassetta (Carroll High School),
- ❑ Jacquie Housel (Sinclair Community College),
- ❑ Niem Tu Huynh (Concordia University),
- ❑ Jolene Keen (AAG),
- ❑ Candice Luebbering (AAG),
- ❑ Adriana Martinez (Southern Illinois University-Edwardsville),
- ❑ Alex Northrup (Foxcroft School),
- ❑ Rich Schultz (North Park University) and
- ❑ Michael Solem, Chair (AAG).

External Advisory Board

- ❑ Chris Bunin (Albemarle High School),
- ❑ Joshua S. Campbell (Sand Hill Geographic),
- ❑ David DiBiase (Esri),
- ❑ Allison Hunt (University of Louisville / Jefferson County Public Schools),
- ❑ Bob Kolvoord (James Madison University),
- ❑ Ming-Hsiang Tsou (San Diego State University),
- ❑ John Van Hoesen (Green Mountain College),
- ❑ Beth Walton (University of South Florida), and
- ❑ May Yuan (University of Texas – Dallas)

Methodology of Proposal

- ❑ According to The College Board's guidelines, the AP[®] GIS&T course description should represent "*the standard, commonly offered college course upon which the proposed AP[®] course will be modeled.*"
- ❑ This statement must also include a description of the *subsequent* course typically offered in the field.
- ❑ The AP[®] GIS&T writing committee's methodology included analyzing a sample of syllabi for introductory courses anchoring 2-year and 4-year undergraduate GIS majors and certificate programs.
- ❑ This analysis was built on The GeoTech Center's model course, "*Introduction to Geospatial Technology*", which itself is a synthesis of content presently taught in undergraduate geospatial technology course offerings.

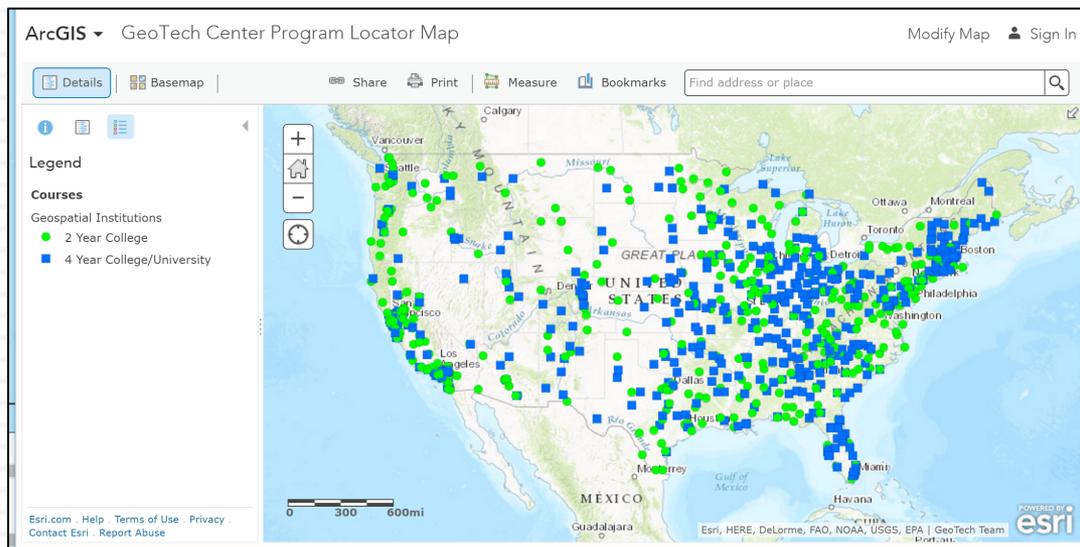


National Geospatial Technology
Center of Excellence

Empowering Colleges:
EXPANDING THE GEOSPATIAL WORKFORCE

Methodology

- 451 higher education institutions with GIS programs identified
 - Sources:
 - AAG Directory of Online Geography Courses,
 - AAG Program Guide 2015-2016,
 - National GeoTech Center 2015 Certificate Programs Map



Course Description

- ❑ The course description represents the standard, commonly offered college course upon which the proposed AP[®] GIS&T course will be modeled.
- ❑ It is based on a content analysis of [30 syllabi for introductory GIS&T courses](#). This sample was randomly drawn from a database of 451 postsecondary institutions that offer undergraduate Geography and GIS degrees and certificate programs.
- ❑ The Geographic Information Science and Technology Body of Knowledge (GIS&T BoK) was used to classify and code the knowledge, skills, learning objectives, and course catalog descriptions in the sample of course syllabi.
- ❑ This analysis identified 16 topical units that are generally representative of the content of introductory GIS&T courses.
- ❑ These topics fall under six GIS&T knowledge areas:
 - 1) Analytical Methods,
 - 2) Conceptual Foundations,
 - 3) Cartography and Visualization,
 - 4) Data Modeling,
 - 5) Geospatial Data, and
 - 6) GIS&T and Society.

Recommended Course Topics for AP GIS&T

I. Analytical Methods

- A. Basic Analytical Operations
- B. Basic Analytical Methods

II. Conceptual Foundations

- A. Domains of Geographic Information
- B. Elements of Geographic Information

III. Cartography and Visualization

- A. Data Considerations
- B. Principles of Map Design
- C. Map Use and Evaluation

IV. Data Modeling

- A. Database Management Systems
- B. Tessellation Data Models
- C. Vector and Object Data Models

V. Geospatial Data

- A. Georeferencing Systems
- B. Map Projections
- C. Data Quality
- D. Satellite and Shipboard Remote Sensing
- E. Metadata, Standards, and Infrastructures

VI. GIS&T and Society

- A. Ethical aspects of geospatial information and technology

Course Description (Cont.)

□ **Course Prerequisites**

- Introductory undergraduate AP[®] GIS&T courses do not typically have prerequisites. Nearly 75% of the syllabi analyzed for this proposal do not specify a prerequisite. At institutions where a prerequisite course is recommended, it is usually a course in basic mathematics.

□ **Sequent Courses**

- Students who continue coursework in GIS&T build upon the foundational knowledge of the introductory course. This happens in two ways: 1) The sequent course typically introduces more advanced topics within the six knowledge areas that appear in the proposed AP[®] GIS&T syllabus. 2) The sequent course often delves into the other four knowledge areas identified in the GIS&T Body of Knowledge publication.

□ **Course Classification**

- AP[®] GIS&T should be classified as a STEM offering in the AP[®] program (potentially as an addition to the current Math and Computer Science AP[®] offerings).
- Additional details on course description here: <http://bit.ly/2rN7M6P>

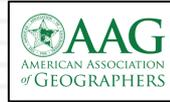
Assessment

- ❑ The AP[®] GIS&T course proposal includes a description of how knowledge, skills, and abilities are assessed in GIS&T at the college level, including assessment formats and evidence of learning.
- ❑ The recommended assessment for AP[®] GIS&T is a hybrid assessment model that includes a summative assessment in the form of an exam (multiple-choice and free response) and a final digital GIS project.
- ❑ The final digital GIS project should include written and visual elements to support the inquiry-based approach to learning favored in GIS&T and other STEM disciplines.
- ❑ This recommended assessment is based on three considerations:
 - ❑ 1) a review of assessment methods currently used in introductory undergraduate GIS&T courses;
 - ❑ 2) a review of assessment types and methods commonly used in AP[®] courses; and
 - ❑ 3) the evolving movement to make STEM-based learning more inquiry-oriented, as confirmed by the latest academic literature.
- ❑ Additional details about assessment are here: <http://bit.ly/2sxcFxf>

Professional Development

- ❑ The majority of high school GIS&T courses are offered exclusively under the Career and Technical Education curriculum.
- ❑ As such, these courses are primarily focused on software training and technical skills development.
- ❑ A few states offer a sequence of GIS&T courses that include more advanced and analytical content.
- ❑ AP[®] GIS&T will complement these existing courses by introducing high school students to:
 - ❑ fundamentals of information science,
 - ❑ spatial data,
 - ❑ spatial database development and management,
 - ❑ spatial reasoning,
 - ❑ cartographic design, and
 - ❑ other topics commonly taught at the introductory college level.

Endorsing scientific and professional organizations



- American Association of Geographers (GENIP member)
- American Geographical Society (GENIP member)
- American Geosciences Institute
- American Society of Photogrammetry and Remote Sensing
- Cartography and Geographic Information Society
- Coalition of Geospatial Organizations
- Environmental Defense Fund
- Esri
- Geographic and Land Information Society
- GeoTech Center
- GIS Certification Institute
- Google
- International Association of Assessing Officers
- Management Association for Private Photogrammetric Surveyors
- National Council of Geographic Education (GENIP member)
- National Geographic Society (GENIP member)
- National Society of Professional Surveyors
- National States Geographic Information Council
- National Wildlife Federation
- North American Cartographic Information Society
- Open Source Geospatial Foundation
- Uber
- United States Geospatial Intelligence Foundation
- University Consortium for Geographic Information Science
- Urban and Regional Information Systems Association
- WiLDCOAST

(Endorsing Organizations as of August 3, 2016)



Professional Development (cont.)

- ❑ Prospective AP[®] GIS&T teachers will therefore require additional specialized professional development that provides, at a minimum, the following knowledge and skills:
 - ❑ **Knowledge:** Teachers will need to know fundamental principles and concepts of geographic information science (as outlined in the AP[®] GIS&T course description). Teachers will need to have an understanding of:
 - ❑ what constitutes spatial data,
 - ❑ how spatial data are collected,
 - ❑ sources of error affecting the accuracy and utility of spatial data,
 - ❑ performing an analysis using GIS,
 - ❑ the principles of analytical methods,
 - ❑ data modeling, and
 - ❑ geo-visualization.

Professional Development (cont.)

- ❑ Prospective AP[®] GIS&T teachers will therefore require additional specialized professional development that provides, at a minimum, the following knowledge and skills:
 - ❑ **Skills:** Teachers will need to master a variety of geospatial skills to teach AP[®] GIS&T. For example, teachers should be comfortable:
 - ❑ employing and demonstrating various GIS graphical user interfaces (GUI), particularly those associated with their GIS software platform of choice,
 - ❑ creating, querying, and managing databases (e.g., data entry, editing, and conversion),
 - ❑ working with general mapmaking and cartographic skills,
 - ❑ using map elements and projections, and
 - ❑ using a GIS to analyze data, including, but not limited to, carrying out vector analysis (e.g. overlays) and raster manipulation (e.g. raster calculations).

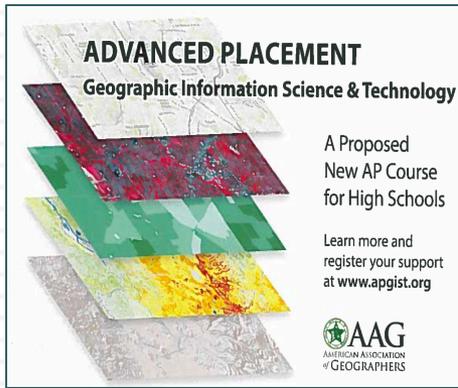
Professional Development (cont.)

- ❑ A GIS&T Summer AP[®] Institute, with a training agenda framed around 30 hours of training over a consecutive number of days (5-8 days), has been proposed and should provide the necessary amount of professional development for teaching AP[®] GIS&T.
- ❑ Additional details about professional development plans are here: **<http://bit.ly/2rNo2EZ>**

Summary

- ❑ Formal proposal to be submitted on June 15, 2017.
- ❑ The College Board will decide on the future course of action and if the course is to be developed during 2018.
- ❑ Additional details about the proposal details and process: **<http://gistcourseproposal.org>**

Please pick up a handout



- *Background on the initiative:* <http://bit.ly/2b05ZA1>
- *Executive Summary:* <http://bit.ly/2smLJkg>
- *Justification:* <http://bit.ly/2qK2Wae>
- *Course Description:* <http://bit.ly/2rNuhsm>
- *Assessment:* <http://bit.ly/2s1XmzZ>
- *Professional Development:* <http://bit.ly/2rNo2EZ>
- *Endorsing Organizations:* <http://bit.ly/2smERn9>
- *Representative Syllabi:* <http://bit.ly/2qcJAtp>