The following is an approximation of the national technology standards infused with GIS learning objectives (in bold, gray italics). Categories came directly from ISTE National Educational Technology Standards for Students: (BOC) Basic Operations and Concepts; (SEHI) Social, Ethical, and Human Issues; (TPT) Technology Productivity Tools; (TCT) Technology Communications Tools; (TRT) Technology Research Tools; and (TPSD) Technology Problem-Solving and Decision-Making Tools. They are subject to change.

(PreK-2)

BOC

Use input devices (mouse, keyboard)

Use output devices (monitor, printer)

Successfully operate technology equipment

Learn using multiple medias/technologies ***(introduce spatial applications in Web-based media)***

Communicate using appropriate terminology ***(introduce GIS terms: zoom, pan, etc.)***

Use multimedia learning support tools

Introduction to the concept of layers in reality, in photos, on maps, etc.

SEHI

Work cooperatively with others using technology

Demonstrate positive social/ethical behavior with technology

Use technology tools responsibly

TPT

Create developmentally appropriate multimedia products ***(Web-based interactive map with age appropriate symbols)***

Use technology resources for problem solving, communication, illustration of thoughts, ideas, and stories ***(Web-based games/interactive learning)***

Describe when it is appropriate to use maps for problem solving, communications, illustration of thoughts, ideas, and stories

Determine objects based on their symbols

TCT

Use reality, maps, photos, and other media to differentiate between human-made and physical characteristics

TRT

Gather information and communicate with telecommunications technology

Introduction to the concept of layers in reality, in photos, on maps, etc.

(3-5)

BOC

Use common input and output devices efficiently and effectively

Discuss common uses of technology in daily life *(including geospatial technologies)*

Operate Web-based activities using GIS functions: zoom, pan, ordering and turning on/off attribute layers, etc.)

Link data tables to graphics layers

SEHI

Discuss advantages/disadvantages to uses of technology in daily life

Discuss basic issues related to responsible use of technology and information and describe personal consequences and inappropriate use

Discuss issues related to inclusion/exclusion of attribute layers including attribute hierarchy

TPT

Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum *(interactive lessons with MapMachine and/or Xpeditions)*

Use technology tools for individual/collaborative activities *(activities for collaborating on choices for symbol, color, size, inclusion of attributes, etc.)*

TCT

Communicate using technology tools and produce a product for an audience *(use learned tools to complete a Web-based activity/application)*

Use telecommunications to access remote information *(could be the beginning of a community partnership that lasts throughout the education experience with eventual capstone project)*

Communicate with others in support of direct and independent learning, and pursue personal interests

Participate in collaborative problem-solving activities in order to develop solutions or products for an audience *(partner with teachers from other subjects to solve curriculum appropriate problems using geospatial technology - could use lessons developed specifically for that purpose)*

TRT

Use technology resources (calculators, data collectors, software) for problem-solving, self-directed learning, and extended learning *(spatial measurement, guided queries)*

Select appropriate technology resources to solve particular problems

TPSD

Determine when technology is useful *(determine when is it appropriate to use geospatial technology)*

Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information

Evaluate issues concerning the use of charts, graphs, spatially displayed information and describe how different formats change the ways people interpret phenomena

(6-8)

BOC

Apply strategies to identity/solve routine software/hardware problems*(data problems, projection, attributes of attribute layers)*

Demonstrate an understanding of hardware/software/connectivity/application concepts

Determine geographic scale

Determine appropriate figure/ground relationship

Demonstrate appropriate use of GIS tools (measurement, absolute location, buffer, query, etc.)

SEHI

Current changes in information technologies and how they influence work/society

Legal/ethical behaviors and consequences of misuse *(subjectivity, purpose and audience, and statistical deception)*

Accuracy, relevance, comprehensiveness, bias, and appropriateness of electronic information sources*(including the effects of altering visual displays of data)*

TPT

Content-specific tools, software, simulations to support learning/research *(GIS activities in science/social studies classes - teacher partnerships)*

Productivity/multimedia tools to support personal productivity, group collaboration, and learning throughout the curriculum

TCT

Design, develop, publish, and present products using technology resources that demonstrate curriculum concepts *(GIS technology across disciplines)*

Collaborate with peers, experts, and others using telecommunications/collaborative tools to investigate curriculum-related problems and find solutions *(investigate external data sources)*

TRT

Select/use appropriate tools/technology to accomplish tasks and solve problems*(partner with other classes to use GIS for problem solving)*

Accuracy, relevance, comprehensiveness, bias, and appropriateness of electronic information sources concerning real-world problems *(generalization, symbolization, and problem solving for purpose and audience)*

Use query builder to analyze geospatial data

TPSD

Demonstrate an understanding of hardware / software / connectivity / application concepts for problem solving

Accuracy, relevance, comprehensiveness, bias, and appropriateness of electronic information sources concerning real-world problems

(9-12)

BOC

Make informed choices about technology needs/requirements *(including when to use GIS)*

Demonstrate appropriate understanding of scale, figure/ground, symbolization, and generalization

Demonstrate appropriate use of visual hierarchy, map projections, and other geospatial analysis tools

SEHI

Capabilities/limitations of contemporary/emerging technology resources and their potential to address personal, lifelong learning, and workplace needs *(including geospatial technologies)*

Make informed choices about technology needs/requirements *(including geospatial technologies)*

Advantages/disadvantages of widespread use and reliance on technology in workplace/society *(including geospatial technologies)*

Legal/ethical behaviors among peers, family, community regarding technology/information *(including geospatial technologies)*

TPT

Managing/communicating personal/professional information using technology tools *(including geospatial technologies)*

TCT

Collaboration, research, publication, communication, and productivity using online information resources

Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning

Compute, analyze, and visually display statistical information for spatial phenomena based on a determined purpose and audience

TRT

Investigate and apply expert systems, intelligent agents, and simulations in real-world situations

Gather data for a real-world problem (spatial interrelationships, interactions, divisions, etc) and use geospatial tools to process and analyze the data and determine possible solutions

Interpret data for relevance, accuracy, bias, and comprehensiveness using geospatial tools

TPSD

Collaborate with peers/experts to contribute to a content-related knowledge base by using technology to compile, synthesize, produce and disseminate information, models, and other creative works

Gather data for a real-world problem (spatial interrelationships, interactions, divisions, etc) and use geospatial tools to process and analyze the data and determine possible solutions