

# Unit 5: Big Data

Content Area: **Technology**  
Course(s): **Sample Course**  
Time Period: **MarApr**  
Length: **Full Year, Grades 9-12**  
Status: **Published**

**Computer Science Principles, Big Data**

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**Department of Curriculum and Instruction**



**Belleville Public Schools**

**Curriculum Guide**

**Computer Science Principles, Grades 9-12 High  
School**

**Big Data**

**Belleville Board of Education**

**102 Passaic Avenue**

## **Belleville, NJ 07109**

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Board Approved:

### **Unit Overview**

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Discover new knowledge through the use of large data sets.

### **Enduring Understanding**

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- Computers are used in an iterative and interactive way when processing digital information to gain insight and knowledge.
- Computing facilitates exploration and the discovery of connections in information.
- Transforming information can be effective in communicating knowledge gained from data.

## **Essential Questions**

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- How can computational models and simulations help generate new understanding and knowledge?
- Do considerations and trade-offs arise in the computational manipulation of data?

## **Exit Skills**

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- Assess the risks and benefits of drawing conclusions from patterns found in large data sets.
- Combine visuals, content knowledge, and interaction to create a dynamic infographic that clearly communicates discrete information about a data set.
- Differentiate usable and useful data from unusable data and useless data based on the characteristics of each.
- Extract structured information from unstructured data.
- Extract information from online sources, including structured and unstructured search engines, screen scrapers, and spiders.
- Examine features and functions of modern relational databases.
- Explore the use of data mining in the discovery of patterns in large data sets.
- Examine the use of cluster analysis and data classification in the processing of large data sets.
- Examine the causes and impact of data breaches involving sensitive personal data.

## **New Jersey Student Learning Standards (NJSL-S)**

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### 8.1 Educational Technology

8.1.12.A.1, 8.1.12.A.2, 8.1.12.D.1, 8.1.12.D.4, 8.1.12.E.1, 8.1.12.E.2, 8.1.12.F.1

## 8.2 Technology, Engineering, Design and Computational Thinking

8.2.12.A.1, 8.2.12.B.1, 8.2.12.C.2, 8.2.12.C.3

### **Interdisciplinary Connections**

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Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please list all and any additional **Interdisciplinary Connections/Cross-Curricular** New Jersey Student Learning Standards that link to this unit, and which are not included in the NJSL section above.

### **Learning Objectives**

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Data Science:

- Relate the impact of computing to large-scale data processing.
- Discover the ways that patterns within large data sets can be used in a predictive manner.
- Assess the risks and benefits of drawing conclusions from patterns found in large data sets.
- Combine visuals, content knowledge, and interaction to create a dynamic infographic that clearly communicates discrete information about a data set.
- Differentiate usable and useful data from unusable data and useless data based on the characteristics of each.

Data Aggregation:

- Explore the purposes of processing tasks, including collection, knowledge extraction, and data storage.

- Identify multiple techniques for data collection, both on and off of the Internet.
- Extract structured information from unstructured data.
- Extract information from online sources, including structured and unstructured search engines, screen scrapers, and spiders.
- Examine features and functions of modern relational databases.

#### Data Analysis:

- Analyze the trade-off of utility and confidence in descriptive, predictive, and prescriptive data analysis.
- Investigate traditional statistical hypothesis testing and exploratory data analysis.
- Explore the use of data mining in the discovery of patterns in large data sets.
- Examine the use of cluster analysis and data classification in the processing of large data sets.

#### Global Impact:

- Debate the benefits and costs of large-scale data storage and data persistence on privacy and utility.
- Explore security risks and responsibilities assumed by companies that collect and store sensitive personal data.
- Examine the causes and impact of data breaches involving sensitive personal data.

## **Suggested Activities & Best Practices**

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#### Exploration and Research:

- Investigate a computing innovation that has had a significant impact on society, economy, or culture.
- Produce a computational artifact that describes the intended purpose and function of the computing innovation and demonstrates how it fulfills that purpose.
- Document the development process, tools, and techniques used in creating the computational artifact.
- Analyze the beneficial and harmful effects of the computing innovation on society, economy, or culture.
- Identify and discuss how the computing innovation consumes, produces, and/or transforms data and address concerns about data storage, data privacy, or data security..
- Design, research, and create a computational artifact.

#### Creative Development:

- Design, implement, and test a program that solves a problem of personal interest to the student.
- Summarize, describe, and reflect on the development process of the program.
- Create a video demonstrating the use and functionality of the program.

## **Assessment Evidence - Checking for Understanding (CFU)**

Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

By identifying the **Evidence of Student Learning with Checking for Understanding (CFU)** techniques used during the lesson and/or for Closure (Madeline Hunter), please list the variety of means used to assess students' learning (e.g. quizzes, tests, academic prompts, observations, homework, journals).

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports

- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

## **Primary Resources & Materials**

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Online Edhesive Computer Science Program.

## **Ancillary Resources**

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General Resources:

- Computers and Internet Access
- AP Central at Collegeboard.org
- Massive Open Online Course
- Code.org
- Multimedia Applications Tools
- Abelson, H., Ledeen, K., and Lewis, H. R. Blown to Bits: your life, liberty, and happiness after the digital explosion. Upper Saddle River, N.J.: Addison-Wesley, 2008.

AP Approved Programming Resources:

(may choose one or more)

- Alice - This 3-D modeling environment allows students to create and animate 3-D worlds. This environment lends itself well to creating stories and games.
- App Inventor - This open-source Web application allows students to create their own applications on mobile devices. App Lab - This is a programming environment for creating web applications with JavaScript. It allows students to develop programs and toggle back and forth between block-based and text-based programming modes.
- EarSketch - This browser-based application allows students to create their own music using either JavaScript or Python. Greenfoot - This Java IDE is designed for use in education to create two-dimensional graphic applications, such as simulations and interactive games.
- Java - There are several IDEs that can be used to write in Java. The Java language allows students to create and solve problems that vary widely in difficulty.
- JavaScript - This language is commonly used to create interactive effects within Web browsers.
- Lego Mindstorms NXT - This product integrates programming with Lego bricks and sensors to create and program robots. The instructions are assembled by linking together function blocks.
- Processing - This programming language was initially created to serve as a software sketchbook, and it can be used to teach programming using a visual context.
- Python - This language has the benefit of readability that might be helpful to new programmers.
- Scratch - This blocks-based programming language allows students to build scripts to run animations. This product can be downloaded and installed on a computer or run in the browser.
- Snap! - This Scratch-style programming language is block-based and allows users to define new primitives in JavaScript. Users can read and write information from the Internet using server-defined APIs and make mobile applications.
- Swift - This programming language is designed for use with iOS, OS X, tvOS and watchOS. This environment allows students to create their own Apple apps and includes interactive environments that allow students to see the effects of changes or additions to code as they type.

Design and Development Process:

- “What Is the Software Development Life Cycle?” Official Blog Airbrake Bug Tracker. <https://airbrake.io/blog/insight/what-is-the-software-development-life-cycle>
- “Engineering Design Process.” [https://www.teachengineering.org/ engrdesignprocess.php](https://www.teachengineering.org/engrdesignprocess.php)
- “The Engineering Design Process.” <http://www.eie.org/overview/engineeringdesign-process> Mohammed, Nabil, Ali Munassar, and A. Govardhan.
- “A Comparison Between Five Models of Software Engineering.” IJCSI International Journal of Computer Science 7.5 (2010): 94-101. Open Source:
- “What Is Open Source?” Opensource.com. <https://opensource.com/resources/whatopen-source>
- Open Source Initiative. <http://opensource.org/>



## **Technology Infusion**

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Upon completion of this sections, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

What **Technology Infusion** and/or strategies are integrated into this unit to enhance learning? Please list all hardware, software and strategies. Please find a technology pedagogy wheel for assistance while completing this section.

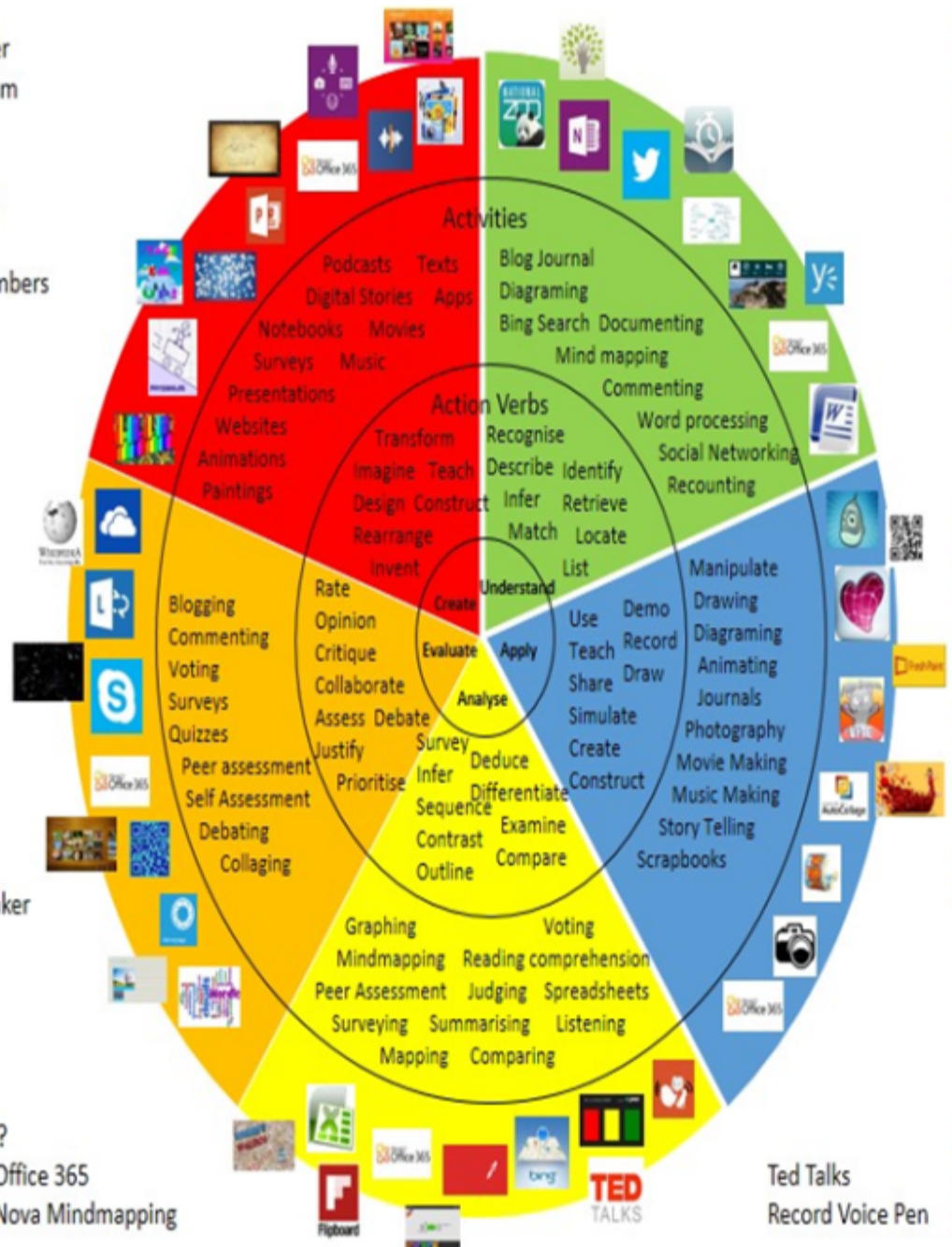
# Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts  
 Photostory 3  
 Kid Story Builder  
 Music Maker Jam  
 Paint A Story  
 Office 365  
 MS PowerPoint  
 Stack 'Em Up  
 NqSquared Numbers  
 Physamajig  
 Xylophone 8

Wikipedia  
 Skydrive  
 Lync  
 SkyMap  
 Skype  
 Office 365  
 Puzzle Touch  
 Easy QR  
 Memorylage  
 Life Moments  
 Word Cloud Maker

Where's Waldo?  
 MS Excel      Office 365  
 Flipboard      Nova Mindmapping

Ted Talks  
 Record Voice Pen



Originally taken from <http://www.coetail.com/zimmer/files/2013/02/IPadagogy-Wheel.001.jpg>  
 And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

## **Alignment to 21st Century Skills & Technology**

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Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Mastery and infusion of **21st Century Skills & Technology** and their Alignment to the core content areas is essential to student learning. The core content areas include:

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

## **21st Century Skills/Interdisciplinary Themes**

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Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please list only the **21st Century/Interdisciplinary Themes** that will be incorporated into this unit.

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

## **21st Century Skills**

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Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please list only the **21st Century Skills** that will be incorporated into this unit.

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

## **Differentiation**

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Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please remember: Effective educational **Differentiation** in a lesson lies within content, process, and/or product.

Please identify the ones that will be employed in this unit.

### **Differentiations:**

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner

- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

#### **Hi-Prep Differentiations:**

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

#### **Lo-Prep Differentiations**

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

## **Special Education Learning (IEP's & 504's)**

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Please identify the **Special Education Learning** adaptations that will be employed in the unit, using the ones identified below.

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multiple test sessions
- multi-sensory presentation
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

## **English Language Learning (ELL)**

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Please identify the **English Language Learning** adaptations that will be employed in the unit, using the ones identified below.

- teaching key aspects of a topic. Eliminate nonessential information

- using videos, illustrations, pictures, and drawings to explain or clarify
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

## **At Risk**

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Please identify Intervention Strategies that will be employed in the unit, using the ones identified below.

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

## **Talented and Gifted Learning (T&G)**

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Please identify the **Talented and Gifted** adaptations that will be employed in the unit, using the ones identified below.

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

## **Sample Lesson**

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Using the template below, please develop a **Sample Lesson** for the first unit only.

Unit Name:

NJSLS:

Interdisciplinary Connection:

Statement of Objective:

Anticipatory Set/Do Now:

Learning Activity:

Student Assessment/CFU's:

Materials:

21st Century Themes and Skills:

Differentiation/Modifications:



Integration of Technology: