Instructional Scenario
Choosing a Computer for Your School Division

Course: Programming

Duty/Concept Area: Exploring Programming Concepts

SOL Correlations:
English 10.2, 10.5, 11.2 11.5, 12.2, 12.5
History and Social Science GOVT 9, 15; VUS 13, 14

Scenario:
Your school division is debating whether they should purchase Chromebooks, Macbook Air laptops, Dell desktops, or iPad tablets to replace all of the aging computers in the school. They have asked you to research the different models and create a presentation highlighting the pros and cons of each type of computer and to make a recommendation. You must investigate the following features of the computers:

- CPU
- Operating system
- Memory
- Storage
- Monitor or screen size
- Other accessories
- Cost

Big Question:
What computer is best suited for the needs of the school division?

Focused Questions:

- What are the specifications of the different computer models?
- In what classes will the computers be used, and what technology needs do those classes have?
- Which features are most important for classroom use?
- Which computer best meets the needs of the classroom?

Project-Based Assessment:
Present your findings using digital media. Your final presentation should include

- a comparison of the different computer models
- which computer you chose
- justification for choosing that computer.

Scenario submitted by Kirsten Poland, Washington-Liberty High School, Arlington County Public Schools

Instructional Scenario
Extreme Snowboards

Course: Programming

Duty/Concept Areas:

Exploring Programming Concepts
Implementing Programming Procedures
Mastering Programming Fundamentals

SOL Correlations:
English: 10.5, 11.5, 12.5
Mathematics: COM.1, COM. 2, COM.3, COM.4, COM.6, COM.7, COM.9, COM.10, COM.11, COM.14, COM.15 COM.17, COM.18, COM.19, COM.20

Scenario:
Three young entrepreneurs have been making snowboards in their garage and selling them to friends. Their boards have become so popular that they would now like to enter the e-commerce market in a small way. Their most popular snowboard sells for $299 and comes in five colors—red, purple, pink, orange, and lime. You have been hired to create an e-commerce application with a graphical user interface (GUI) that allows customers to create their own user ID, including their name, address, phone number, and e-mail. The application should also allow customers who have user IDs to place a snowboard order, choose any color, and use a PayPal account to pay. The application should total the number of snowboards ordered, calculate the total cost, and add a 12% sales tax and a standard shipping fee of $50.

Big Question:
What will the graphical user interface (GUI) for this application look like, and what programming will be needed to meet the specifications?

Focused Questions:

- What elements will be included on a flowchart for this program?
- What control structures will be needed?
- How will you evaluate the effectiveness of the program you created?
- What steps are involved in the debugging process?
- How can you use outside resources to enhance the program?

Project-Based Assessment:
The computer program should incorporate accepted programming standards and styles and meet the required specifications. The program should be error-free with accurate output.

Instructional Scenario
Flowcharting a Guessing Game

Course: Programming

Duty/Concept Area: Using Algorithmic Procedures

SOL Correlations:
English 10.5, 11.5, 12.5
Mathematics COM.1, COM.3, COM.4
History and Social Science GOVT.1

Scenario:
You and your business partner want to develop a guessing-game app. The app will function according to the following criteria:

- The app will choose a random number between 0 and 100.
- The user will guess the number.
- The app will print out either "Guess higher," "Guess lower," or "You are correct!"
- If the user guesses incorrectly, the user may guess again for a total of eight guesses.
- If the user does not guess the number correctly after eight guesses, the user loses the game.
- After the user wins or loses the game, the user will be given the option to play again, and a new random number will be chosen.

Your job is to outline a flowchart to help in the programming of the guessing-game app.

Big Question:
What will the flowchart for this application look like, and what programming is needed to meet the specifications?

Focused Questions:

- What inputs and outputs are needed for this app?
- What processes are needed for this app?
- What decision-making structures are needed for this app?
- How will you evaluate the efficiency of the program you created?

Project-Based Assessment:
The flowchart should incorporate accepted flowcharting symbols and styles. It should model all possible outcomes of the app. After you develop your flowchart, you should compare your flowchart with another and identify differences and similarities. With your business partner, you should decide whether you should incorporate any differences to improve your solution.

Project-Based Assessment:

- How to create flowcharts and diagrams in G Suite
- Flowchart Tutorial (with Symbols, Guide and Examples)

Scenario submitted by Kirsten Poland, Washington-Liberty High School, Arlington County Public Schools

Instructional Scenario
Get Out the Vote

Course: Programming

Duty/Concept Area:
Using Algorithmic Procedures

SOL Correlations:
Mathematics: COM.1, COM.2, COM.3, COM.4, COM.5, COM.6, COM.7, COM.8, COM.9, COM.10, COM.11, COM.13, COM.14, COM.15, COM.16, COM.17, COM.18, COM.19, COM.20

Scenario:
Each year, Sunshine High School holds an election for prom king and queen. The senior class votes by marking check boxes beside their candidates' names on old-fashioned paper ballots, which are stuffed into cardboard boxes. The Prom Committee then manually counts the ballots and announces the winners. Last year, several students reported seeing other students vote twice, and they also voiced concern over the counting process.

Upon investigation, administrators discovered a number of voting irregularities. The total number of ballots cast exceeded the number of students in the senior class, and a recount revealed tabulation errors, caused by careless addition. Although the recount did not change the election outcome, the Prom Committee was embarrassed by the investigation. The faculty advisor stressed that the voting process must be changed and improved. The chair and co-chair of the Prom Committee have asked the Business and Information Technology teacher if the Programming class can help automate the voting process, and thus restore student confidence.

Big Question:
How can a computer program be used to automate and validate the election of the prom king and queen?

Focused Questions:

- What are the key problems with the current election process?
- How can the current problems be resolved?
- What are some possible programming solutions?
- What input will the computer program need from the user (voter)?
- What platform will be used for voting?
- How can duplicate votes from a single student be eliminated?
- How can accurate vote counting be ensured?
- What reports should be generated from the data collected from an automated voting program?
- Why is it important for the Programming class to evaluate the outcome?
- Why is program maintenance an essential component of programming?

Project-Based Assessment:
Write and test a voting program.

Resources:
Alice
http://www.alice.org/index.php

Zak, D. 2004. Microsoft Visual Basic .NET: Reloaded. Boston: Thomson Course Technology.

Liberty, J., Quirk, K. & Weiss, S. 2004. Introduction to computer science using Java. Woodland Hills, Calif.: Glencoe/McGraw-Hill.

Liberty, J., Quirk, K. & Weiss, S. 2004. Teacher resource manual to accompany introduction to computer science using Java. Woodland Hills, Calif.: Glencoe/McGraw-Hill.

Knowlton, T. et al. 2002. Programming basics: Using Microsoft Visual Basic, C++, HTML, and Java. Boston: Course Technology; Thomson Learning.

Instructional Scenario
Restaurant Order Confirmation Application

Course: Programming

Duty/Concept Area: Mastering Programming Fundamentals

Scenario:
JoJo's Restaurant wants an application developed for checking the accuracy of customer orders before the meal is prepared. The customer will input their choices: one appetizer, one entree, one dessert, and one drink. The application should show the user the total order requested.

Big Question:
In what ways can an application take data input from a user and give the user appropriate feedback?

Focused Questions:

- How should the application request information from the user?
- How should the data entered be processed?
- How should the processed data be returned to the user in an appropriate format?

Project-Based Assessment:
The computer program should incorporate accepted programming standards and styles and meet the required specifications. The program should be error-free with accurate output.

Scenario submitted by Selwyn Lawrence, South Lakes High School, Fairfax County Public Schools

Instructional Scenario

Selecting a Programming Language for an eLearning Business

Course: Programming

Duty/Concept Areas:

- Exploring Programming Concepts
- Using Algorithmic Procedures
- Implementing Programming Procedures
- Using Web Technology
- Developing Employability Skills

SOL Correlations:
English: 10.5, 11.5,12.5
Mathematics: COM.1, COM.2 COM.3, COM.4, COM.18, COM.19

Scenario:
You have just been hired to work in the Information Technology (IT) department of a company that designs eLearning curricula for various customers. Because of your background and expertise, the IT director has assigned you the responsibility of conducting a study that will help the management team determine the type of programming language that will best fulfill the task of creating an in-house curriculum design tool. This tool will be used by instructional designers to enter content and graphics, which also will be displayed on web pages. The company does not want to use an off-the-shelf product, like Dreamweaver or FrontPage, but would like to have its own proprietary design tool. The company wants to hire a programmer to complete this task but must first decide on a programming language that would be best suited to complete the job.

All of the company computers use the most current operating system, with Internet and network connections that allow multiuser access. Database connectivity using the network is possible, provided that the in-house tool includes this capability.

Your job is to research the most common programming languages in use today and to prepare a website that includes a comparison of the features and constraints of the programming languages. You should also recommend a programming language best suited for an in-house curriculum design tool.

Big Question:
What programming language is best suited to create this in-house design tool?

Focused Questions:

- What are the important features needed for full application development?
- What hardware and bandwidth are needed to develop an application with each language?
- What integrated development environment (IDE) would be needed for each language, and how much does it cost?

- What questions should a needs analysis include to help guide the selection of a language?
- What are the overall costs associated with hiring a programmer with knowledge of one or more of the major programming languages?
- For the local region, how difficult would it be to hire a programmer with knowledge of the selected language?

Project-Based Assessment:

The website should include a comparison of the features and constraints of the principal programming languages and a recommendation for the one most suited for an in-house curriculum design tool. Assess outcomes using rubrics, such as the examples provided.

Instructional Scenario
Recycling Rush

Course: Programming

Duty/Concept Area: Developing Interactive Multimedia Applications

SOL Correlations:
Mathematics COM.1, COM.2, COM.3, COM.4, COM.5, COM.6, COM.7, COM.8, COM.9, COM.10, COM.11, COM.12, COM.13, COM.14, COM.15, COM.16, COM.17, COM.18
Science LS.11

Scenario:
Your school's environmental club is frustrated because students keep putting garbage in the recycling bin. Not only is it unpleasant for them to sort through, but it also degrades the quality of actual recyclable material. In some cases, the contamination is so bad that everything in the recycling bin must be thrown away. Adding more trash to the landfills is unacceptable, so the environmental club wants to start an awareness campaign to teach students what they can and cannot recycle.

The environmental club has asked you to create an educational game to teach players what refuse can be recycled and what must be thrown in the trash. Club members have given you complete creative control over the project. They do not care about the genre of the game, the platform it is developed on, or how you get the message across. They are only concerned that students who play the game learn about appropriate recycling at school.

Big Question:
How can you design a program to meet a specific need or elicit a specific change?

Focused Questions:

- Who is the intended audience for your game?
- What is the intended outcome of someone playing your game?
- What is the best type of game to solve the Environmental Club's problem?
- What is the story that your game will tell?
- How will a player input commands to your game?
- How will a player win the game?
- What objects will you need to create in your game?
- How will each object interact with other objects in your game?
- How will each level add something new to your game?
- How will you incorporate learning into the game experience?

Project-Based Assessment:
The final product should be a game that meets the criteria set above. The program should be error-free and include appropriate comments throughout the code. The program should be tested thoroughly prior to submission to check for possible errors.

Scenario submitted by Jeffery Timmerman, Brooke Point High School, Stafford County Public Schools

Instructional Scenario
The Downfalls of Downloading

Course: Programming

Duty/Concept Area: Developing Interactive Multimedia Applications

SOL Correlations:
History and Social Science: GOVT.16
English: 10.5, 11.5, 12.5

Scenario:
Ginger downloaded a popular song from a file-sharing Web site. While in her Programming class, she decided to insert the downloaded three-minute song as background music for a video game she created. Although all of the programming requirements were met for this assignment, Ginger's teacher returned the project and asked Ginger to rethink the music before he gave her a final grade.

Big Question:
Has Ginger violated any intellectual property laws?

Focused Questions:

- What are the legal parameters and fair usage terms for copyrighted music used for educational purposes? Where can legal requirements be found?
- What are the dangers of using file-sharing Web sites for music downloads?
- What is the cost of music piracy to artists?
- What is the cost to customers who pay for music downloads?
- What are the legal consequences for individuals who share music illegally?
- What are some ideas for making music file sharing equitable for the artist and the consumer?

Project-Based Assessment:
Options for assessment may include the following:

- PowerPoint presentation using research on court cases and lawsuits related to music copyright laws
- Written paper comparing and contrasting cases involving prosecution of music piracy cases
- Student-created movie, video, or music video answering the big question and focused questions

Resources:
Recording Industry Association of America (RIAA) Programs for Educators
http://www.riaa.com/toolsforparents.php?content_selector=resources-programs-for-educators&searchterms=tools%20for%20educators&terminclude=&termexact=

Teens Less Likely to Download Illegally When They Know the Laws, Microsoft Survey Finds
www.microsoft.com/presspass/press/2008/feb08/02-13MSIPSurveyResultsPR.mspx

Links for Educators and Youth
U.S. Department of State site concerning copyright piracy and trademark counterfeiting; good for learning about intellectual property rights: http://www.state.gov/e/eb/tpp/ipe/education/

Instructional Scenario
Whose Game Is It Anyway?

Course: Programming

Duty/Concept Area: Developing Interactive Multimedia Applications

SOL Correlations:
History and Social Science: GOVT.16
English: 10.5, 11.5, 12.5

Scenario:
Alex, a programmer, has been working for XBT Games for the past two years since graduating from college. During his time with the company, he has been on the development team for a number of successful game designs. For the past three months, between other projects, Alex has been tinkering with his idea for a new online role-playing game. His manager wants Alex to polish the concept further before presenting it to top management, but he thinks the game could be the company's next big seller.

A competing company, RadicalGame, calls Alex with a job offer that he can't refuse. After joining the company, he presents his concept for the new online role-playing game. RadicalGame management immediately allocates resources to develop the game.

Big Question:
Has Alex done anything wrong?

Focused Questions:

- What are trade secrets?
- What is industrial espionage?
- Has Alex violated a trade secret?
- Who owns the idea for the new role-playing game?
- What is a noncompete agreement?
- What is a nondisclosure agreement?
- Why might companies wish to have employees sign these agreements?
- What are the consequences of violating a noncompete agreement?
- What consequences could Alex face from his old company? From his new company?
- What possible consequences could RadicalGame face in releasing the new role-playing game?

Project-Based Assessment:
Options for assessment may include the following:

- Team debate: Divide class into pro-Alex and con-Alex positions (with a panel of judges to rule)
- Mock trial in the case of XBT Games v. RadicalGame
- Written news release summarizing the key issues of conflict in the case
- Written newspaper editorial from one perspective in the case

Resources:
Intellectual Property: Yours or Your Employer's?
http://connection.ebscohost.com/c/articles/462709/intellectual-property-yours-your-employers

Also at: http://www.browsearticle.com/article/6168-Intellectual_property__yours_or_you.html

Who Owns Employee Inventions? The Employer or the Employee?
http://corporate.findlaw.com/human-resources/who-owns-employee-inventions-the-employer-or-the-employee.html

Avoiding an Intellectual Property Rights Quagmire: Come Back with My Idea!
http://www.libertolaw.com/profile_a3.html