



Data Detectives Instructor Manual

by

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PART ONE | INTRODUCTION

"It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts."

-- Sherlock Holmes in "A Scandal in Bohemia" by Arthur Conan Doyle

The best-selling book entitled *How to Lie With Statistics* (by Darrell Huff) was first published in 1954. Accordingly, an understanding of how statistics and graphs can be misleading and misused has been in the public consciousness for more than a half a century. Yet, in the same way observations, data, and the visual display of data can be misleading, observations, data, and the visual display of data tell us a lot about our experiences and the world around us. In particular, when we analyze our observations we make comparisons and generalizations and where possible, theorize about cause and effect.

In the same way 2-dimensional data and graphs can be misleading and misused, 3-dimensional data and graphs can be misleading and misused. Still, a 3-dimensional learning environment (read: 3D virtual world) can provide a uniquely effective and interactive platform for learning about the critical thinking skills that enable reasoning about the world around us. Looking specifically at the features of the Data Detectives School (tutorials and games) set in a 3D virtual world environment, this learning simulation includes:

- Integrated new user tutorials;
- A museum-inspired guided path through the critical thinking skills tutorials;
- An instructor and student view of each component (for illustration only -- when the simulation is used in teaching, only the student view will be displayed);

- The use of more realistic mesh non player characters (also known as NPCs);
- Individual clue analysis boards to focus students'/players' attention on the different clues and how the clues are interrelated;
- Dual instructor clue analysis center controls to speed up or equalize game play;
- The extensive use of media-on-a-prim capabilities to create in-world tools; and
- An instructor manual plus a student handbook.

PART TWO | GETTING STARTED

"The game is afoot."

-- Sherlock Holmes in "The Adventure of the Abbey Grange" by Arthur Conan Doyle

SECTION 2.1 | ICE BREAKER WAITING AREA



When students enter the Data Detectives School, they touch the stack of books on a stand to learn about the ice breaker activities located in the lobby waiting area. More specifically, students can click on the "web site" buttons associated with different popular fictional detective personas or learn about different lessons from Sherlock Holmes, including "Why Most of Us Wouldn't Be Able to Tell That Watson Fought in Afghanistan" by Maria Konnikova (with more in the series of "Lessons from Sherlock Holmes" by Maria Konnikova displayed throughout the Data Detectives School).

In addition, voting for a favorite detective (see below), provides a non high stakes opportunity for students to practice using an interactive feature in the 3D virtual world simulation.



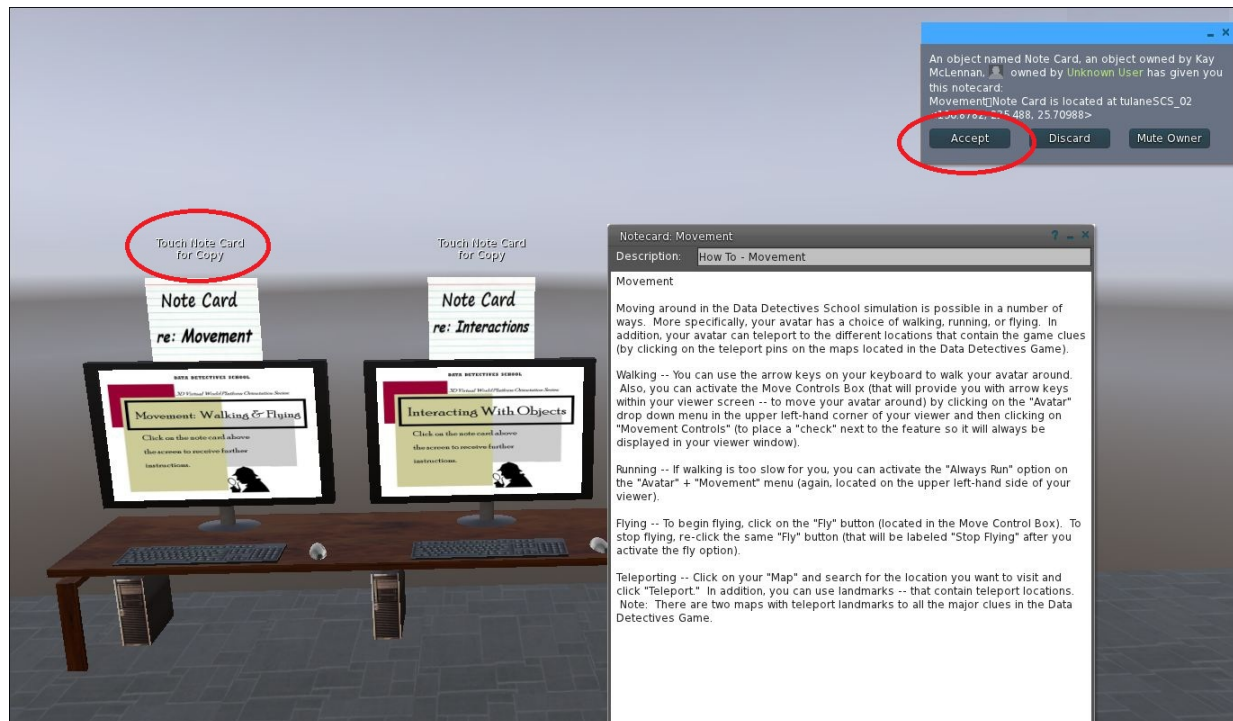
Finally, there is a waiting area (see below) for a group of students to assemble -- if multiple students or an entire class will be using the tutorials and playing the Data Detectives Game at the same time.



SECTION 2.2 | INTEGRATED NEW USER ORIENTATION AREA



If a student is a new virtual world user, they will find a new user tutorial area adjacent to the Lobby Meeting Area in the Data Detectives School.



More specifically, the new user tutorial area includes note cards with "how to" steps and tips (with the note cards accessed by simply touching the items and then accepting the note card delivery -- see the circled items in the picture above). Note: Copies of the note card "how to" note cards are located in Appendix One of this manual.

Also (or as an alternative to using the note card textual materials), new users can watch a short machinima video clip that explains how to (1) set-up a viewer, (2) move around in the virtual space, (3) communicate with others, and (4) change the appearance of their avatar. The video clip is accessed by touching the movie screen in the new user tutorial space -- see the picture below.



SECTION 2.3 | CRITICAL THINKING LEARNING OUTCOMES

Reasoning about our environment and experience is critical in economics and other disciplines. In particular, reasoning about the world enables evaluations of what is and what is not accurate.

In this simulation, each participant-player will find tutorials about the topics below.

- **Statistics** - An examination of how statistics can be used and misused when making claims.
- **Graphs** - An examination of how graphs and charts can be misleading.
- **Comparisons** - An examination of how to reason using comparisons (known as analogies). Where analogies are incomplete arguments, careful analysis can clarify the accuracy of claims.

- **Generalizations** - An examination of how to generalize from experience – to understand what is true about a group based on an understanding of part of the group.
- **Cause and effect** - An examination of how to determine cause and effect – leading to an understanding of the methods used to determine causes based on statistical evidence.

To continue, follow the arrows in the floor to the next "Skill Level Pre Test" center -- to test your initial understanding about the five critical thinking skills listed above.

INSTRUCTOR TIP | PREVIEW OF THE GAME PORTION OF THE SIMULATION

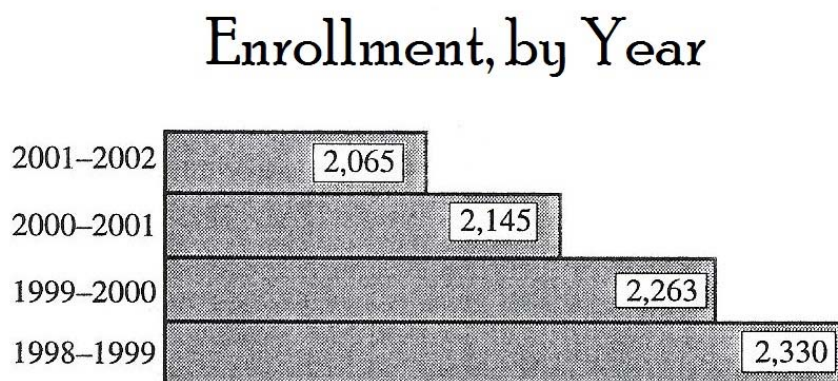
After individual participant-player finishes their review of the five different tutorial centers (or groups or an entire class finishes their review of the five different tutorial centers), the guidance provided on how to best evaluate and analyze information and data will be applied to a case study detectives game. More specifically, working individually or in teams, game participant-players will collect clues, analyze the clues, and make a recommendation on how to respond the information gleaned.

SECTION 2.4 | PRETEST

The demonstration pretest center is set-up with a two question self-test assessment (that includes the answers to the self-test assessment). When used in a learning exercise, the instructor has the choice of using a self-test or another type of e-mailed or web-based assessment.* Also, when used in a learning exercise, it will be important to match the pretest questions with the expected skill level of the student players. For example, students with a high school education will necessarily be given a different pretest (and postgame assessment) than students with an undergraduate or higher degree.

Pretest question #1: True or False, the average or mean of a group of numbers (calculated by adding the numbers together and then dividing by the number of items) is always the most useful statistic to know.

Pretest question #2: Analyze the presentation of the data in the graph (below).



Socorro, N.M. Consolidated Schools Accountability Report, 2000–2001

INSTRUCTOR TIP | PRETEST GUIDANCE FOR STUDENTS

Direct your students to touch one of the computer screens on the left-hand side of the "Pretest" sign and they will receive the pretest questions in a note card. After a student answers the questions on the note card, the student can check their answers by touching the mouse next to the computer screen (and another note card will be delivered). Again, the current demonstration version of the Data Detectives pretest (and postgame assessment) just includes a few sample questions (but can easily be customized to include a more comprehensive set of questions).

Answer to the pretest question #1: FALSE -- an average is useful to know ONLY if there is not too much variation in the group of numbers, the average is fairly close to the median number, and the distribution is more or less bell-shaped.

Answer to the pretest question #2: The data presented in the "Enrollment, by Year" graph is likely correct but the graph visually provides an over magnification of the differences between the years (by not using zero as the baseline and by using bars instead of a line graph).

* See Appendix Three for a sample script to collect student answers to assessment questions (via chat) that are e-mailed directly to the instructor.



PART THREE | CRITICAL THINKING SKILLS TUTORIALS

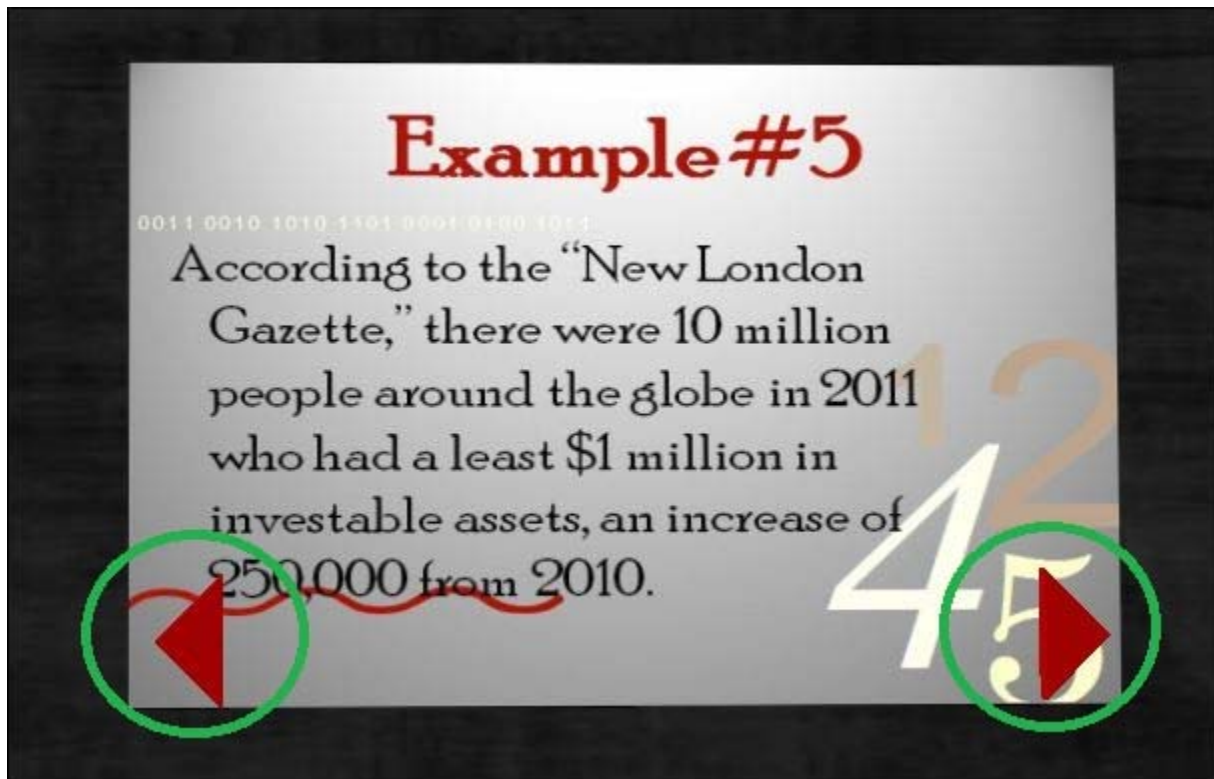
"They say that genius is an infinite capacity for taking pain," he remarked with a smile. "It's a very bad definition, but it does apply to detective work."

-- Sherlock Holmes in a "A Study in Scarlet" by Arthur Conan Doyle

SECTION 3.1 | USING THE TUTORIAL CENTERS

To get started reviewing the tutorial materials, use the red triangle forward and back buttons to scroll through the different example slide shows that are located at each tutorial center (see the picture below with the forward and

back buttons circled in green). In addition, each tutorial station includes needed definitions and summary information on how to evaluate information in that critical thinking skill category.



[Again, there are five critical thinking skill categories explored -- statistics, graphs, comparisons, generalizations, and cause and effect.] Further, each tutorial center has a "take-away" note card with the essential definition information and summary conclusions (see the picture of the shopping cart with a take-away note card below).



Finally, follow the guided path arrows -- see picture below -- to the next tutorial station (and eventually, to the Data Detectives Game).



SECTION 3.2 | A CLOSER LOOK AT STATISTICS



The "A closer look at **Statistics**" take-away note card includes the following.

Definition: Mean - The average or mean of a collection of numbers is obtained by adding the numbers together and then dividing by the number of items.

Definition: Median - The median is the midway mark, with the same number of items above the median mark as there is below the median mark.

Definition: Mode - The mode is the number most often included in the set or most often attained (in the case of test scores).

[Conclusions to keep in mind...] An average is a useful figure to know only if:

- There is not too much variation in the figures or scores or numbers;
- The average is close to the median amount; and
- The distribution is more or less bell-shaped.

INSTRUCTOR TIP | STUDENT AVERSION TO MATH

Whether from inadequate early educational experiences or owing to a long period of time since taking a math course or owing to something else, many students have an aversion to math. In turn, while the Data Detectives Student Handbook provides math-related assurances as well as a mini review of how to calculate averages and use percentages, be on the lookout for students in need of additional math-related assurances and/or review materials.

Excerpt from the *Data Detectives Student Handbook*:

Before looking at the materials included in the STATISTICS tutorial, please keep in mind you will NOT be called upon to make complex statistical calculations. Rather, the most complex statistical calculation you may need to perform includes adding four (or less or more) numbers and then dividing the sum by four (or less or more) to find the average of the four numbers.

As a numerical example of the above:

$$45 + 73 + 80 + 14 = 212 / 4 = 53$$

Also, as a brief review of percentage(s), a percent is another way of expressing parts of a whole. Further, 100% equals one whole and when we convert percentages to decimal numbers, 100% becomes 1.00 (and 40% becomes 0.40). To calculate percentages, see the example below.

40 Students like multiple choice tests; 77 Students do not like multiple choice tests; and 30 Students are undecided (re: multiple choice tests) -- what is the percent of students that do not like multiple choice tests?

$$\text{Add } 40 + 77 + 30 = 147 \text{ and divide } 77 \text{ by } 147 = 0.52 \text{ or } 52\%$$

SECTION 3.3 | A CLOSER LOOK AT GRAPHS



The "A closer look at **Graphs**" take-away note card includes the following.

Definition: Correlation – The degree to which two or more attributes or measurements on the the same group of elements show a tendency to vary together.

[Conclusions to keep in mind...] Graphs distort comparisons when the:

- Baseline in the graph is not zero;
- Graph uses bars;
- Spacing of the points on the axes are either expanded or contracted too far;
- Time period selected to display is not representative; and
- Reader is unclear about the data used and/or the origin of the data.

INSTRUCTOR TIP | STUDENT AVERSION TO GRAPHS

In the same way some students have an aversion to math, some students have an aversion to graphs. In turn, be on the lookout for students in need of additional graph-related assurances and/or review materials.

Excerpt from the *Data Detectives Student Handbook*:

Graphs are a visual representation of data displayed (or "plotted") on the space within two axes. The horizontal axis in a graph is known as the x-axis and the vertical axis is known as the y-axis. A point on the graph is denoted by an ordered pair of coordinates, with the first number in the pair referring to the horizontal position on the x-axis and the second number in the pair referring to the vertical position on the y-axis. The x-axis and y-axis intersect at the origin or at the point (0,0).

SECTION 3.4 | A CLOSER LOOK AT COMPARISONS



The "A closer look at **Comparisons**" take-away note card includes the following.

Definition: **Analogies** – A comparison becomes reasoning by analogy when it is part of an argument. On one side of the comparison we draw a conclusion, so on the other side we say the conclusion should be the same.

Definition: **Fallacy of composition** – It is a mistake to argue what is true of the individual is therefore true of the group, or what is true of the group is therefore true of the individual.

[Conclusions to keep in mind...] To Evaluate Analogies:

- Is this an argument? What is the conclusion?
- What is the comparison?
- What are the premises (the sides of the comparison)?
- What are the similarities?
- Can we state the similarities as premises and find a general principle that covers the two sides?
- Does the general principle really apply to both sides? What about the differences?
- Is the argument strong or valid? Is it good?

SECTION 3.5 | A CLOSER LOOK AT GENERALIZATIONS



The "A closer look at **Generalizations**" take-away note card includes the following.

Definition: Generalizing – To *generalize* is to conclude a claim about a group, the **population**, from a claim about some part of it, the **sample**. To generalize is to make an argument. Sometimes the general claim that is the conclusion is called the **generalization**; sometimes we call the whole argument a generalization. The claims about the sample are called the **inductive evidence** for the generalization.

Definition: Representative sample – A sample is representative if no one subgroup of the whole population is represented more than its proportion in the population. A sample is **biased** if it is not representative.

Definition: Random sampling – A sample is chosen **randomly** if at every choice there is an equal chance for any of the remaining members of the population to be picked.

Definition: Sample size – For a generalization to be good, the sample has to be big enough. Generalizing from a sample that is obviously too small is called a **hasty generalization** based on **anecdotal evidence**.

Definition: Well studied sample – For a generalization to be good, the sample has to **studied well**. If a generalization is based on questionnaire or survey data, the questions have to be constructed without bias. In addition, questions need to be constructed to check for internal consistencies (read: measures of truthfulness).

Definition: The gambler's fallacy – The gambler's fallacy is to reason that a run of events of a certain kind makes a run of contrary events more likely in order to even up the probabilities.

[Conclusions to keep in mind...] **Premises needed for a good generalization:**

- The sample size is representative;
- The sample is big enough; and
- The sample is studied well.

SECTION 3.6 | A CLOSER LOOK AT CAUSE AND EFFECT



The "A closer look at **Cause & Effect**" take-away note card includes the following.

Definition: **Causal claims** – A causal claim is a claim that can be rewritten as “X causes (caused) Y.” A **particular** causal claim is one in which a single claim can describe the (purported) cause and single claim can describe the purported effect. A **general** causal claim is a causal claim that generalizes many particular causal claims.

Definition: **Normal conditions** – The obvious and plausible unstated claims that are needed to establish that the relation between purported cause and purported effect is valid or strong are called the normal conditions for the causal claim.

Definition: **Post hoc ergo propter hoc** – (“after this, therefore because of this”) is the fallacy of claiming that there is cause and effect just because one claim became true after another.

[Conclusions to keep in mind...] **Necessary conditions for cause and effect:**

- The cause and effect happened (are true).
- It is (nearly) impossible for the cause to happen (be true) and the effect not to happen (be false), given the normal conditions.
- The Cause precedes the effect.
- The cause makes a difference – if the cause had not happened, the effect would not have happened, given the normal conditions.
- There is no common cause.

Common mistakes in reasoning about cause and effect:

- Tracing the cause too far back – when we trace a cause too far back, the problem is that the normal conditions begin to multiply.
- Confusing cause with effect – if reversing cause and effect sounds just as plausible as the original claim, a further investigation of the evidence is needed.
- Looking too hard for a cause – when sometimes it is sometimes just a coincidence.

PART FOUR | THE DATA DETECTIVES GAME

"Data! Data! Data!" he cried impatiently. "I can't make bricks without clay."

-- Sherlock Holmes in "The Adventure of the Copper Beeches" by Arthur Conan Doyle

SECTION 4.1 | GAME NARRATIVE

You have been hired by the Cloud Buds™ Music Company as the director of business development. Cloud Buds™ sells an innovative cloud-based MP3 player. More specifically, Cloud Buds™ are lightweight ear buds that use sophisticated satellite based transmitters and Internet technology to deliver the customer's preprogrammed playlists of music. In addition, Cloud Buds™ sell for \$69 a pair (plus an optional \$10 a year insurance policy to automatically replace one or more lost ear buds) -- substantially less than the most established competitor, High Notes MP3 players (that sell for \$99 per player).

As the director of new business, your first assignment is to accompany BILL-I-AM (of the Sweet Peas Band) to New London where he will perform with the New London artist Paprika Spice (of the Spicy Girl Band). Cloud Buds™ is sponsoring BILL-I-AM's and Paprika Spice's joint performances -- in the hope of laying the foundation for introducing the Cloud Buds™ product to New London consumers (and especially the consumers in the demographic of 13-24 year-olds). In the same way celebrity endorsements are one of the mainstays of the U.S. marketing campaign for Cloud Buds™, your boss expects New Londoners will be influenced by the celebrity endorsement from BILL-I-AM and Paprika Spice.

More specifically, while in New London, your boss wants you to find out what you can about New London, including:

- Economic factors (read: current conditions and outlook);
- How easy it is to do business in the city;
- What is the state of the available technology infrastructure (including how robust are the local data centers, transmission control systems, and system security measures);
- Demographics (including the age distribution of the city residents);
- Political and cultural factors;
- Other competitors in the market; and
- Any other factors of relevance.

Also, your boss has been told retail space rents for about \$45 a square foot per month (on average) and the company would require at least a 1,500 square foot shop to open a new Cloud Buds™ store. Also, based on a square foot

rental of \$45 (times the 1,500 square foot size of the shop times 12 months a year), the highest hourly salaries Cloud Buds™ could afford for the two clerks needed to run the shop will be \$10 an hour for the store manager and \$8 an hour for the assistant manager (with each salary times 40 hours a week and 52 weeks a year).

Performance sponsored by:

Cloud Buds Music

bill i am **&** **Paprika Spice**
of the Sweet Peas Band *of the Spicey Girls*



***Playing this Saturday &
Sunday @ 9:00 p.m.***

As further background, your boss provided you with some comparison information from the market for MP3 players in the United States. In turn, your boss suggests comparing what you learn about New London to what you know about the U.S. market -- to make an assessment of whether New London would be good market for Cloud Buds™.

Percent of the Population That Owns a MP3 Music Player, In Each Age Category, in the U.S. Market

Aged 13 to 17 years old.....	30%
Aged 18 to 24 years old.....	27%
Aged 25 to 34 years old.....	25%
Aged 35 to 49 years old.....	12%
Aged 50 to 54 years old.....	8%
Aged 55 to 64 years old.....	3%
Aged 65 years and older.....	2%

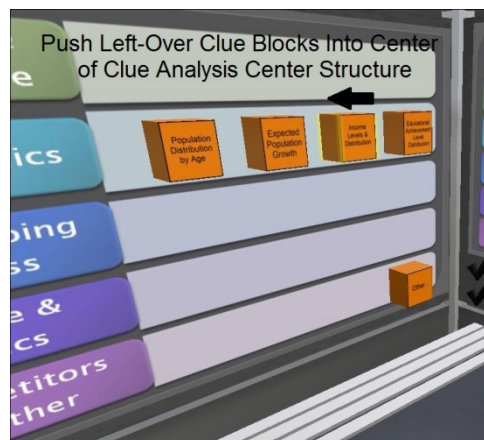
Distribution of MP3 Music Player Owners, by Income, in the U.S. Market

Up to \$25,000.....	8%
\$25,001 to \$50,000.....	18%
\$50,001 to \$75,000.....	19%
\$75,001 to \$100,000.....	17%
\$100,001 and up.....	38%

Note: The U. S. market for MP3s is known to be about 20 percent higher (re: ownership levels) than the New London market (but the New London market is forecast to match the U.S. market in one year).

SECTION 4.2 | GAME PLAY COMPONENTS

Important Notes: (1) *Make sure the clue analysis centers (#1 through #4) are free of clue blocks (with the exception of the "Other" clue block that is locked in place). More specifically, when you see left-over clue blocks on a clue rezzing panel in the clue analysis centers, just push the clues into the center of the clue analysis center structure (see picture below).*



(2) *Make sure the check marks on the clue analysis panels (in the clue analysis center structure) are sett to the starting positions (at the bottom of the panel). If the check marks need to be reset, click on the "Reset Check Marks" button and click on "Build" (see picture below).*



The available game play components include the following:

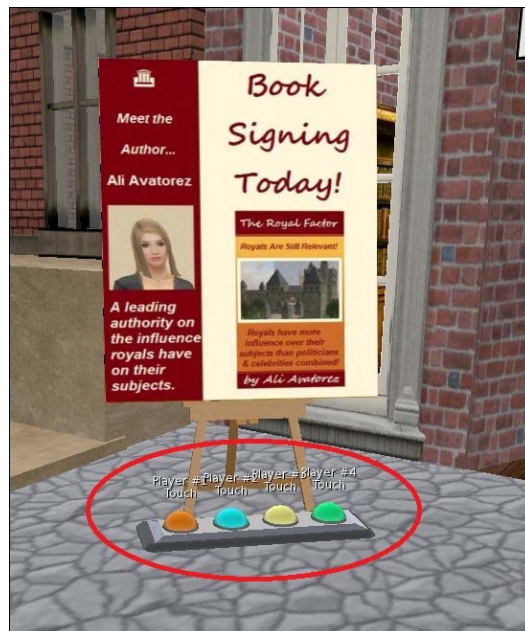
- Written instructions in a note card that is dispensed when a player touches the stack of books on a stand (see the picture below).

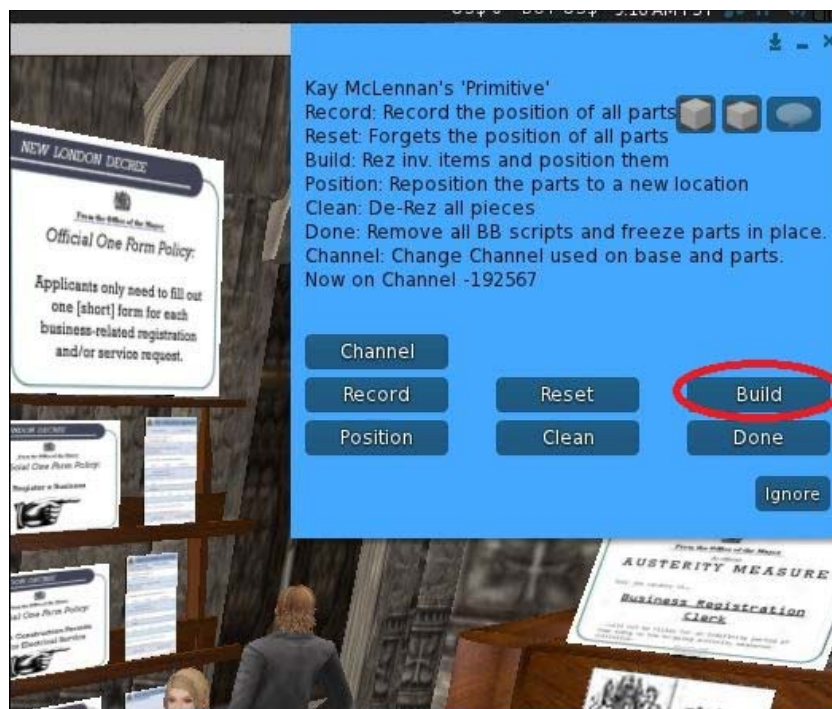
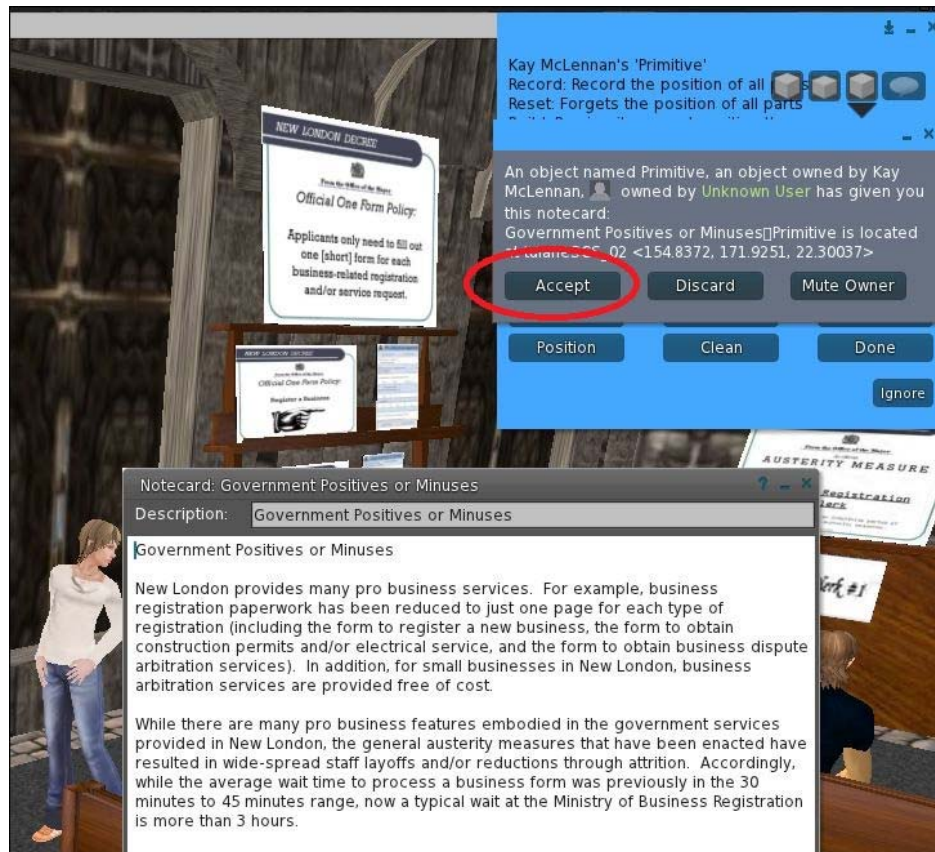


- A map with landmark teleports to the major clues [see the picture below with the landmark giver push pins circled in red, the telephone booth instructor message center circled in blue, and the exit landmark giver (to the wrap-up discussion area) circled in green].



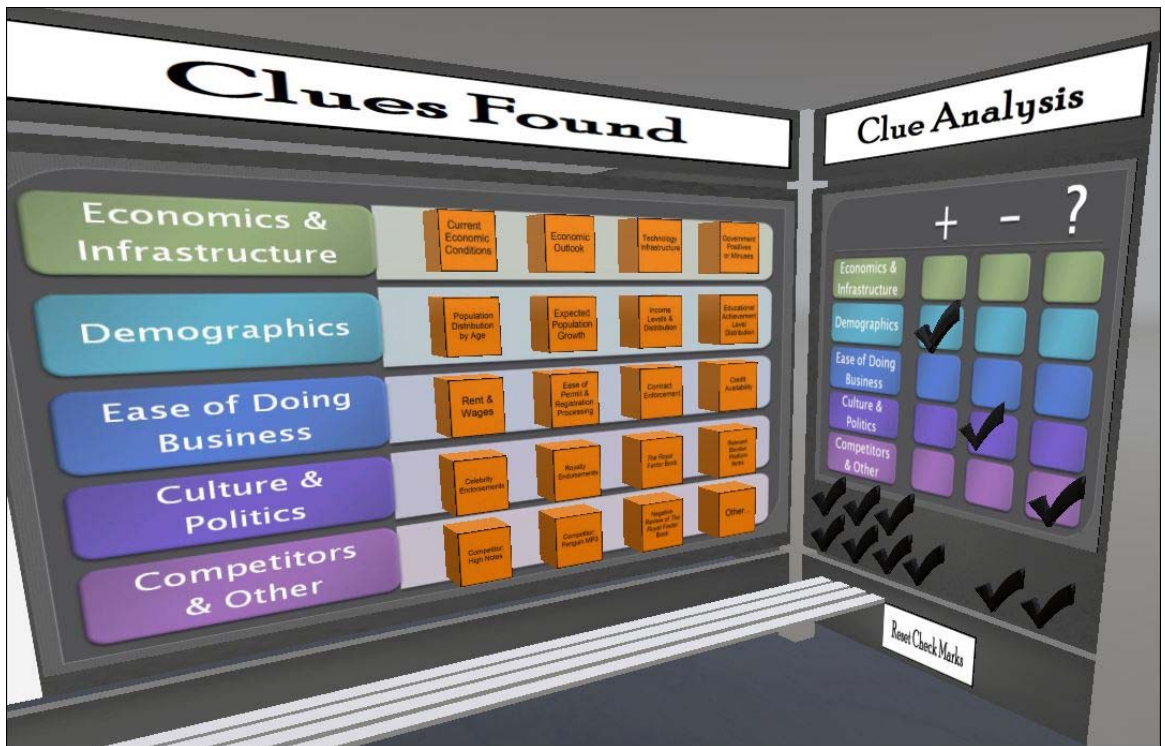
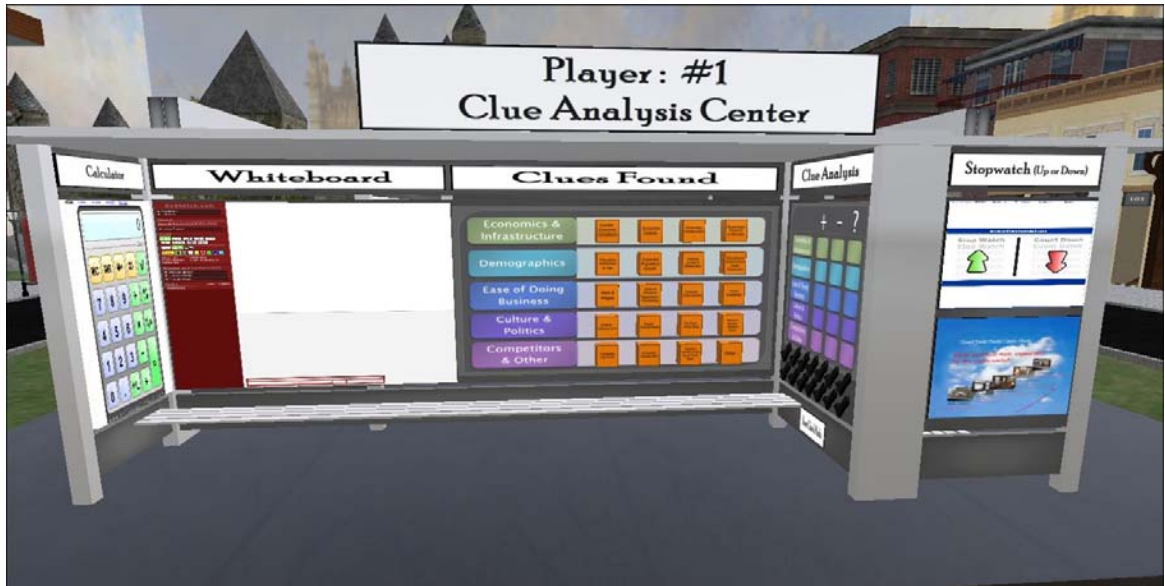
- Clue rezzers (with accompanying explanatory note cards) -- see the picture of the rezzers below.
Note: Each player will be Player #1 or Player #2 or Player #3 or Player #4 during the duration of the game. Further, each player will press their button on each clue rezz found, accept the note card that will be delivered, and then will press "Build" on the control box that will appear in the upper right-hand side of their viewer.





More specifically, after pressing a clue rezz button, students need to accept clue note card delivered and second, click on the "Build" button (see the pictures above).

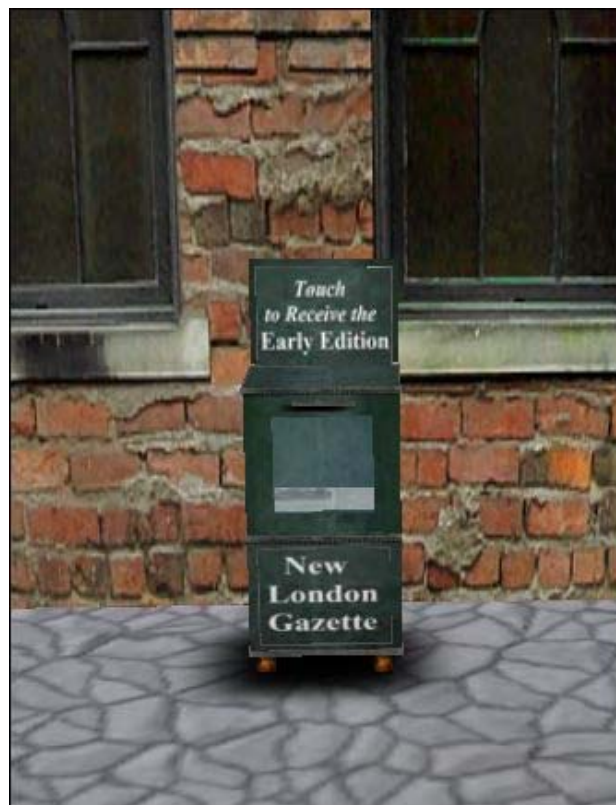
- A clue analysis center (with four analysis stations) -- see the pictures below. Note: Each clue analysis center includes a media-on-a-prim (MOAP) stopwatch, a MOAP calculator, a MOAP whiteboard, a found clues board (where each clue will be rezzed after the player presses the accompanying button on the clue rezzer device), and a clue analysis board with moveable checkmarks to keep track of player conclusions. After a player presses "Build" on a clue rezzer device, the accompanying clue(s) will appear on the "Clues Found" panel on their assigned Clue Analysis Center.



- [Possible] Additional clues built into the simulation details (including signage -- see the picture below).



- [Possible] Additional clues in the early and late editions of the New London Gazette (see the newspaper dispenser below).



- A telephone booth communications center that lets students know if the instructor is online and if the instructor is not online, includes an answering machine that records student messages.



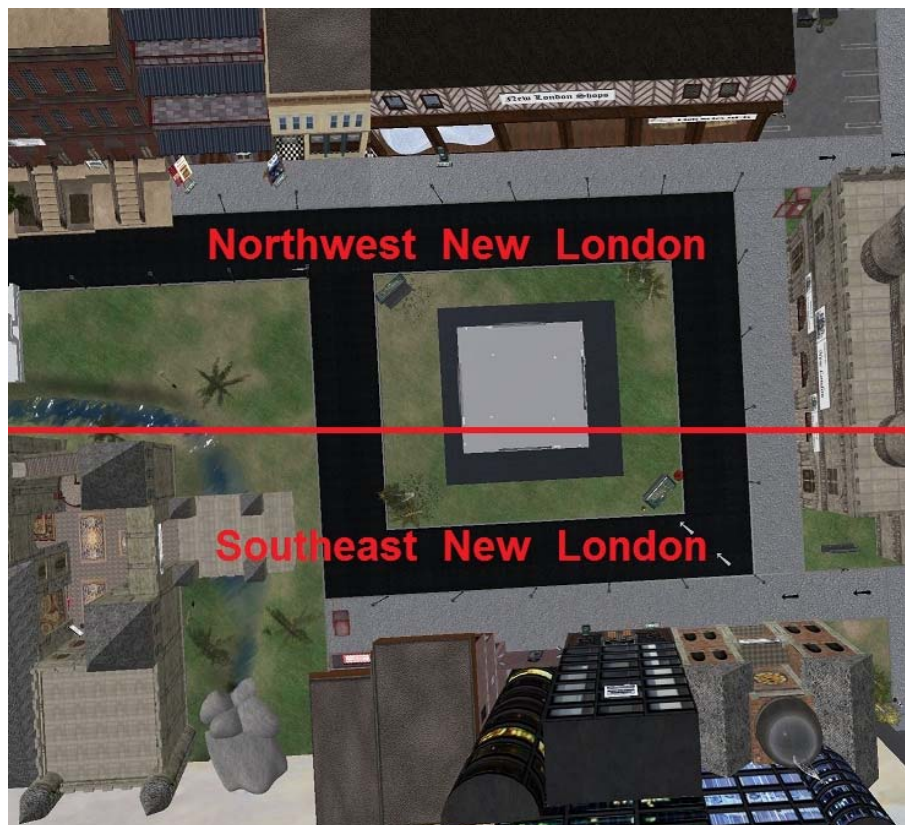
SECTION 4.3 | SOLITAIRE PLAY

In the solitaire version of the Data Detective Game, students will be required to keep a written record of how they arrived at the conclusions they made as they evaluated the relevance and veracity of the available clues. Further, maximizing the learning outcomes from solitaire play will require detailed feedback from the instructor (re: the game summary provided by a student as well as feedback on any clues a solitary player may have missed).

SECTION 4.4 | TWO TO FOUR PLAYERS

The Data Detective Game is ideally suited for two to four players. More specifically, with four different clue analysis centers, when two to four players are simultaneously searching for clues, each player will have their own clue analysis center (that will need to be assigned by the instructor).

Note: With multiple players (and team play), depending on the skill level of the players and well as the volume of players, it may be necessary to direct half of the players to the clues located in the Northwest portion of New London and half of the players to the clues located in the Southeast portion of New London (see the picture below).



SECTION 4.5 | TEAM PLAY

Team play is a way to accommodate more students at one time. However, four teams of four players each is likely to be the maximum number of avatars that can be accommodated on a standard Open Simulator island simulation. Also (and as illustrated in the picture above), the best approach for managing larger groups within the simulation includes dividing the group in half and assigning half to the Northwest side of New London and the other half to the Southeast side of New London.

SECTION 4.6 | INSTRUCTOR RESOURCES

The demonstration version of the Data Detectives School includes integrated instructor notes (see the mini hot air balloon note card givers around the simulation, as pictured below).



More specifically, when relevant, instructors can touch a mini hot air balloon objects on a stand to receive a note card. Still, all of the notes that are available in the instructor hot air balloon note card givers, are included in this instructor manual.

Further, the main instructor resource in-world is the actual hot air balloon command center located above the field of play in the Data Detectives Game -- see the pictures below.





The specific instructor features located in the instructor command center include the following.

- Duplicate clue rezzing panels for each player (see item "A" above). In this way, the instructor can follow the progress of players and even advance the play by sending select clues to players or rezzing all of the clues on all four of stations included in the clue analysis center (see item "B" above).
- Simulation use statistics, including memory usage, concurrent users, and framerate reduction indicators (see item "F" and below).
- A preprogrammed panel that will open the world map upon touch -- to see where players are in the game (with players displayed as green dots on the world map -- see item "G" below). See Appendix 3 for a sample list-maker script to deploy at key locations throughout the game field of play.
- An active web page MOAP -- to check for student e-mails, etc. (see item "H" below)
- A MOAP whiteboard for notes (see item "I" below).
- A complete set of landmarks to the clues -- to send to students, if needed (see item "K" below).
- A MOAP stopwatch (with both count-up and count-down capabilities - see items "C" and "D" above).
- An automatic teleport back to the ground level (see item "E" above).



SECTION 4.7 | ENDING PLAY

The likely scenario for most simulation exercises include a predetermined length of play based on class length. In turn, using the example of a 60 minute class (and assuming the students in the class previously studied the tutorial materials in the Data Detectives School), the instructor will need to divide the available time between (1) clue finding and analysis, and (2) the wrap-up discussion. Further, a recommended division of time includes allocating 40 minutes to clue finding and analysis and 20 minutes to the wrap-up discussion.

INSTRUCTOR TIP | THE INSTRUCTOR DETERMINES THE PARAMETERS OF PLAY

The above suggested play time and division of time between (1) clue discovery and analysis, and (2) the wrap-up discussion can be modified in any way needed. Again, a 3D virtual world platform simulation provides tremendous flexibility when it comes to staging learning exercises and events.

PART FIVE | POST GAME WRAP-UP

"Having gathered these facts, Watson, I smoked several pipes over them, trying to separate those which were crucial from others which were merely incidental."

-- Sherlock Holmes in "The Crooked Man" by Arthur Conan Doyle

SECTION 5.1 | DECONSTRUCTING THE CLUES

Important Note: The Data Detectives Game was designed to NOT have a clear answer to the question: "would New London would be good market for the Cloud Buds™ to establish a new store (?)." That is, the clues are designed to be equally divided between clues that fall into the "plus" category and clues that fall into the "negative" category. Accordingly, the object of the game is for students to exercise their abilities to thoughtfully analyze the available clues.

Clue: Current Economic Conditions - New London

Despite a recent recession, a modest but steady recovery is underway in New London. Lower inflation (and the accompany lower prices on food and energy) is providing a means for expanded consumer spending. Further, current conditions do not support a short term or long term rise in interest rates and credit for business is in abundant supply.

	Q1 ---	Q2 ---	Q3 ---	Q4 ---
Real GDP growth.....	+1.4.....	+1.9.....	+2.1.....	+2.3
Inflation.....	-2.7.....	-2.0.....	-1.9.....	-1.8
Consumer Spending Growth.....	+1.2.....	+1.4.....	+1.8.....	+1.9

Note: Quarterly estimates are expressed at seasonally adjusted annual rates, unless otherwise specified.

INSTRUCTOR TIP | CURRENT ECONOMIC CONDITIONS

The first thing to make sure students recall (from the graphing tutorial) is how the use of bar graphs can distort data. That is, rather than just comparing the magnitude of the amounts, visually, the differences in the bar graphs displayed in the Ministry of Statistics exaggerate the differences since each item is comparing "areas" instead of just "lengths" (read: the actual amount).

Clue: Economic Outlook - New London

The outlook for growth and employment in New London is promising. While the economic outlook in many nearby countries includes relatively fragile recoveries to the recent recession, the New London economy demonstrated more agility in responding to recessionary pressures and further, has overall responded in a more rapid fashion to evolving global economic conditions.

More specifically, real GDP is forecast to continue to grow in the 2.3 to 2.5 percent range (on a annual basis*), inflation will continue on a downward trend (albeit at a continuing slower rate), and consumer spending is expected to continue to grow at modest levels.

* Quarterly estimates are expressed at seasonally adjusted annual rates, unless otherwise specified.

INSTRUCTOR TIP | CURRENT & FORECAST ECONOMIC CONDITONS

Looking at the data, the recent and projected growth in GDP and consumer spending is modest but significant and trending in the right direction. In addition, low (or as in this case negative) inflation is a good finding (and the finding that the rate of inflation is picking up somewhat signals a rebound in the economy). In short, there are no concerns related to current and forecast economic conditions in New London.

Clue: Technology Infrastructure

Looking exclusively at telecommunications infrastructure, infrastructure includes all of the hardware, transmissions media (telephone lines, cable TV lines, satellites, and antennas), data processing centers, equipment to control the transmission paths (routers, aggregators, repeaters, and other needed devices), and the software used to send, receive, and manage the signals sent. In addition, telecommunications capabilities include redundancies and resiliencies related to mitigating disruptions in service and maintaining the security of the systems.

With an industry rating of five through one stars (with five being the highest rating) New London's basic telecommunications systems are rated as three star or in the "Adequate" range. Still, while the basic telecommunications systems throughout New London are in the Adequate range, the reliability and security of the systems are rated two stars or in the Inadequate range.

INSTRUCTOR TIP | AVAILABLE TECHNOLOGY INFRASTRUCTURE

Based on the ratings of the telecommunications systems in New London, it is clear the systems could benefit from substantive upgrades and additional security measures. In other words, New London is in need of significant upgrades to the available telecommunications systems and accordingly, this finding is a negative.

Clue: Government Positives or Minuses

New London provides many pro business services. For example, business registration paperwork has been reduced to just one page for each type of registration (including the form to register a new business, the form to obtain construction permits and/or electrical service, and the form to obtain business dispute arbitration services). In addition, for small businesses in New London, business arbitration services are provided free of cost.

While there are many pro business features embodied in the government services provided in New London, the general austerity measures that have been enacted have resulted in wide-spread staff layoffs and/or reductions through attrition. Accordingly, while the average wait time to process a business form was previously in the 30 minutes to 45 minutes range, now a typical wait at the Ministry of Business Registration is more than 3 hours.

INSTRUCTOR TIP | GOVERNMENT POSITIVES OR MINUSES

The government in New London supports business by providing streamlined filings for new business and other business matters. Further, New London provides no cost arbitration services to small businesses (that otherwise might not have the resources to hire a lawyer to defend their interests).

Still, the austerity measures in place have resulted in significantly fewer services being provided for businesses and citizens. In addition, the wait times for filing business paperwork has increased significantly. None-the-less, the posted wait time in the Ministry of Business Registration was 3 hours and 10 minutes not that much longer than the average person would have to wait at a local motor vehicle administration in the U. S. In turn, a determination of whether a wait time of more than three hours is excessive may rely on student players' views of what is an excessive wait time for services in real life. In other words, the determination of the plus or minus characterization of government services in New London will be an individual call (with some players likely to find the government services a plus on balance and some players likely to find the services a negative on balance).

Clue: Expected Population Growth

-- In Thousands --

Year

2000.....	299.876
2010.....	302.700
2020.....	305.600
2030.....	308.163
2040.....	310.652

INSTRUCTOR TIP | EXPECTED POPULATION GROWTH

This clue would only have a bearing on the case if the expected population growth was found to be explosive or was significantly in decline. In other words, the modest growth forecast is neither a plus nor a minus.

Clue: Income Levels

Income Levels Per Year and Distribution, 2010

-- Percent of the Population--

Up to \$6,000.....	5%
\$6,001 to \$15,000.....	40%
\$15,001 to \$30,000.....	36%
\$30,001 to \$50,000.....	14%
\$50,001 to \$100,000.....	4%
\$100,001 and up.....	1%

INSTRUCTOR TIP | INCOME LEVELS

As detailed in the game narrative, higher income levels are highly correlated with higher levels of MP3 player ownership. However, since MP3 ownership is also highly correlated with age (and there is no information on how the different income levels are broken down by age), the income levels clue is not useable information. Still, some student players may [correctly] note the expected finding that income levels generally increase with age. Accordingly, the high MP3 player ownership levels of younger persons coupled with the expected lower income levels of the younger persons in the population could bode well for Cloud Buds™ players since they are significantly less expensive than the other major competitor in the market -- High Notes.

Clue: Educational Achievement Levels

The number of residents in New London with a college degree increase by 15% between 2005 and 2010.

Educational Attainment By Diploma/Degree, 2010
-- Percent of the Population--

High School Diploma or Equivalent.....	31%
Some College (No Degree).....	16%
2-Year College Degree.....	23%
4-Year or Bachelors Degree.....	15%
Trade/Apprenticeship.....	9%
Graduate Degree.....	6%

INSTRUCTOR TIP | EDUCATIONAL ACHIEVEMENT LEVELS

The educational achievement levels of New London adults may be relevant to spending habits but there is no relevant information provided to make this clue useful. In other words, this clue is neither a plus or minus.

Clue: Population Distribution by Age

New London has a much younger age than the rest of the country and the surrounding countries in the continent. In particular, 55% of the population in New London is 34 years of age or younger. More specifically, see the population distribution below.

As of June 2010:

Under 5 years old.....	7%
Aged 5 to 15 years old.....	11%
Aged 16 to 24 years old.....	13%
Aged 25 to 34 years old.....	24%
Aged 35 to 59 years old.....	33%
Aged 60 years and older.....	12%

INSTRUCTOR TIP | POPULATION DISTRIBUTION BY AGE

Like the educational achievement levels clue above, the population distribution by age clue does not have corresponding information that would make it relevant to the analysis.

Still, astute students could turn the above information into a plus by "layering" the information provided in the narrative with the information in the clues. For example, in the narrative we learn 30 percent of persons aged 13 to 17 years old, 27 percent of the persons aged 18 to 24 years old, and 25 percent of the persons aged 25 to 34 years old own MP3 music players in the U. S. (or on average, approximately 27% of the persons aged 13 to 34). If -- as is suggested in the narrative -- the ownership levels for MP3 player by age are 20 percent below the U. S. levels but will match the U. S. levels in a year's time, the ready market for MP3 players in New London includes more than 6 million purchasers aged 16 to 34. More specifically, the game players know:

- There are at least 302,700,000 people in New London (as of 2010);
- In New London, 13% of the population is aged 16 to 24 years old and 24% of the population is aged 25 to 34 years old;
- $302,700,000 \times 13\% + 24\% = 111,999,000$ persons aged 16 to 34 in New London;
- $111,999,000 \times [\text{an average ownership level of}] 27\% = 30,239,730$ total owners of MP3 players within a year's time and $30,239,730 \times 20\% =$ the number of MP3 players to be potentially purchased in the coming year in New London (or more than 6 million MP3 player purchases within the year). Note: The forecast number of purchases of MP3 players include Internet purchases or not all of the purchases will be made in New London stores.

Clue: Rent & Wages

The vacant New London shop rents for \$40 a square foot. Note: The average rent for Zone A commercial property of \$45 a square foot includes \$55 a square foot for the newest high rise building space, \$50 a square foot for loft office space, \$35 a square foot for [older] brownstone office space, and \$40 a square foot for retail space in the New London Shops mall.

Also, based on the flier information, store clerk staff earn \$12 an hour.

INSTRUCTOR TIP | RENT AND WAGES

In comparison to the parameters provided to the player(s) in the narrative, the clues above include a lower rental rate per square foot for retail space and a higher hourly wage for clerk staff to run the store. Still, in contrast to the casual assumption that the decrease in rental costs and the increase in clerk staff costs cancel each other out, after calculating the differences, it is clear the actual costs are a decided plus.

Initial acceptable costs:

- \$45 a square foot for a 1,500 square foot shop = $\$45 \times 1,500 \times 12 \text{ months} = \$810,000$ per year; and
- $\$8/\text{hr} + \$10/\text{hr}$ (for an assistant store manager and a store manager, respectively) = $\$18 \times 40 \text{ hours} \times 52 \text{ weeks a year} = \$37,444$ per year.

Totaling, $\$810,000 + \$37,444 = \$847,444$

Actual costs:

- \$40 a square foot for a 1,500 square foot shop = $\$40 \times 1,500 \times 12 \text{ months} = \$720,000$ per year; and
- $\$12/\text{hr} + \$14/\text{hr}$ (for an assistant store manager and a store manager, respectively) = $\$26 \times 40 \text{ hours} \times 52 \text{ weeks a year} = \$54,000$ per year.

Totaling, $\$720,000 + \$54,000 = \$774,000$

Based on the above, the annual rent and salary costs of opening a new Cloud Buds™ store would be \$73,444 less than the initial acceptable level of costs.

Clue: Ease of Permit & Registration Processing

Business registration paperwork has been reduced to just one page for each type of registration (including the form to register a new business, the form to obtain construction permits and/or electrical service, and the form to obtain business dispute arbitration services). In addition, for small businesses in New London, business arbitration services are provided free of cost.

INSTRUCTOR TIP | EASE OF PERMIT AND REGISTRATION PROCESSING

The streamlined registration procedures in New London in concert with the no cost arbitration services are pluses (or taken together, a plus).

Clue: Contract Enforcement

The New London legal system, including the New London court system, is highly functional. In addition, for small businesses in New London, business arbitration services are provided free of cost.

INSTRUCTOR TIP | CONTRACT ENFORCEMENT

There are worries when it comes contract enforcement and an established legal system in New London.

Clue: Credit Availability

Owing to low interest rates and government support for small business endeavors, credit is readily available to business owners. Also, banks in New London are known for providing superior services to business owners.

INSTRUCTOR TIP | CREDIT AVAILABILITY

Credit, including credit for small businesses, is readily available in New London.

Clue: Celebrity Endorsements

The joint BILL-I-AM (of the Sweet Peas Band) and Paprika Spice (of the Spicy Girl Band) performances are sold out. Again, Cloud Buds™ is sponsoring BILL-I-AM's and Paprika Spice's joint performances -- in the hope of laying the foundation for introducing the Cloud Buds™ product to New London consumers (and especially the consumers in the demographic of 18-29 year-olds).

INSTRUCTOR TIP | CELEBRITY ENDORSEMENTS

The finding that joint performances by BILL-I-AM and Paprika Spice are sold out is a plus for the reach of Cloud Buds™ endorsement of the duo. Still, since the venue for the conferences (within the virtual game setting) is in the

Criteria Pub (or a bar with a 21 year old minimum age limit), part of the targeted group cannot even attend the performances. In addition, the venue selected is small and will not reach many individuals. Still, one way to counter the limited reach of the concert sponsorship is to have reporters cover the concerts and/or to advertise the concerts (along with a mention of Cloud Buds™ sponsorship).

Clue: Royal Endorsements

The Queen's recent sky jump into a widely publicized sporting event was touted as signaling a new modern era for the monarchy -- that at long last, the Queen must be ready to embrace the modern era. Still, as evident from the dated television, telephone, and radio in her office, it is unlikely the Queen uses or has plans to use an MP3 player. In other words, no endorsement of the new Cloud Buds™ product is likely to be forthcoming from the Queen.

INSTRUCTOR TIP | ROYAL ENDORSEMENTS

The likely lack of an endorsement from the Queen is at best a neutral finding. Still, in concert with the clue below, is likely to be a negative factor.

Clue: The Royal Factor

As a factor relevant to the missing royal endorsement(s), a newly published book -- entitled "The Royal Factor" -- details the findings from an extensive study of New London residents. More specifically, "The Royal Factor" book details how New Londoners are highly attentive to the monarchy. In particular, New Londoners emulate most of the style and behaviors of the royals.

INSTRUCTOR TIP | THE ROYAL FACTOR BOOK

The Royal Factor book written by Ali Avatarez discusses the findings from her research. More specifically, Ms. Avatarez discovered New Londoners are very attentive to the fashion and behavior style-setting of their royals. Accordingly, it could be that the assumption that the Cloud Buds™ company's endorsement of the BILL-I-AM and Paprika Spice concerts will not have as much of a positive impact on New Londoners. In other words, the generalization made -- that New London consumers are like U. S. consumers when it comes to being influenced by celebrity endorsements -- is false (or NOT based on an actual representative sample or a hasty generalization).

Clue: Election Platforms

The Conservative Party platform includes:

- Through austerity measures, aim to eliminate "the bulk" of New London's structural deficit within five years.
- Spending cuts in all areas apart from health and foreign aid.
- Scrap the identity card initiative.

The Labour Party platform includes:

- Scrap the austerity measures and utilize "targeted" increases in public spending over the next two years to "sustain the recovery."
- Protect "frontline investment" in healthcare, childcare, schools, policing, and infrastructure.
- Guarantee work experience or training to citizens aged 18-24 (if they are unemployed for more than six months).

INSTRUCTOR TIP | ELECTION PLATFORMS

The item in the Labour Party platform that is of particular relevance to the introduction of Cloud Buds™ into the New London economy is the promise to "protect frontline investment in infrastructure, including telecommunications infrastructure." In contrast, the Conservative Party platform promises of continued austerity measures would likely result in less spending on telecommunications infrastructure in the near term. In turn, the forecast outcome of the election (and the unknown of which party will win the election) provides examples of cause and effect to discuss with the student players. In particular, any discussion of the election outcomes (in terms of a plus or minus) can be described in terms of the language of cause and effect, including whether the claims are causal, particular, or general.

Clue: High Notes Competitor

High Notes MP3 players is the established MP3 player product in the New London market. Still, the list price for a High Notes player is \$99 and looking around the store, there are only a few customers in the store.

INSTRUCTOR TIP | HIGH NOTES COMPETITOR

The higher price of a High Notes player is a plus for Cloud Buds™. Also, the appearance of few customers in the High Notes store is a plus.

Clue: Penguin MP3 Music Competitor

Penguin MP3 Music has been testing their "hands free" player for some time in New London and further, will be opening a shop to sell their players in the coming weeks. Further, the Penguin player is reasonably priced at \$69 and like Cloud Buds™ is a hands-free device. Still, while the Penguin player uses similar cloud technology to stream music to customers, the device is bulky (and accordingly, owing to its ear muff appearance, is being marketed as the perfect cold weather accessory).

INSTRUCTOR TIP | PENGUIN MP3 PLAYER COMPETITOR

The clues related to the Penguin MP3 player are mixed. More specifically, the Penguin player is bulky in comparison to the Cloud Buds™ player (a plus) but retail for slightly less than Cloud Buds™ when one considers the [likely needed] insurance cost associated with Cloud Buds™ players.

Still, one of the extra clues that appears in the late edition of *The New London Gazette* involves the performance problems reported by the early testers of Penguin MP3 players. In turn, it is unknown whether the Penguin players have some manufacturing defect or the performance problems Penguin player testers encounter might be related to inadequate telecommunications infrastructure in New London.

Clue: Royal Factor Refute (?)

As reported in the late edition of the "New London Gazette," the author of the "The Royal Factor" is actually part of the royal family herself.

INSTRUCTOR TIP | ROYAL FACTOR REFUTE

When discussing the suggestion that Ali Avatarez is herself part of the royal family, the key "take-away" for students is the possible BIAS in the work from this author. Further, this possible bias is a good segue into a discussion of bias in sampling techniques.

Clues: Other Clues Build into the Game Simulation

The other clues not formally identified but apparent in the game simulation include:

- Malfunctions in the Penguin player (as mentioned above) and whether the malfunctions are the result of bad equipment or inadequate bandwidth;
- Support local business night on Thursday nights (a plus for businesses) as identified in signs in the shops;
- Upcoming infrastructure debate between the different party candidates; and
- The polling information (in *The New London Gazette*) related to the upcoming election.

Clues: Not Part of the Game But None-the-Less Obvious (?)

Astute student players are likely to point out the expectation that consumers are using the smart phones more and more in lieu of MP3 players. In other words, is the outlook for separate MP3 players still as brisk as it was prior to the introduction of smart phones with built in MP3 players (?).

In lieu of setting-up and managing a new store, would Internet sales (marketed heavily in New London) be a better [read: more profitable] alternative (?).

As another non defined potential negative, are there any health concerns related to the Cloud Buds™ (and Penguin player) technology (?). That is, unlike the High Notes type of MP3 player without a transmitter attached to the ear, the Cloud Buds™ player is part of the transmitting and receiving components that are placed in the consumers' ears - close to their brain. Are there any cancer risks associated with the use of this type of technology (?).

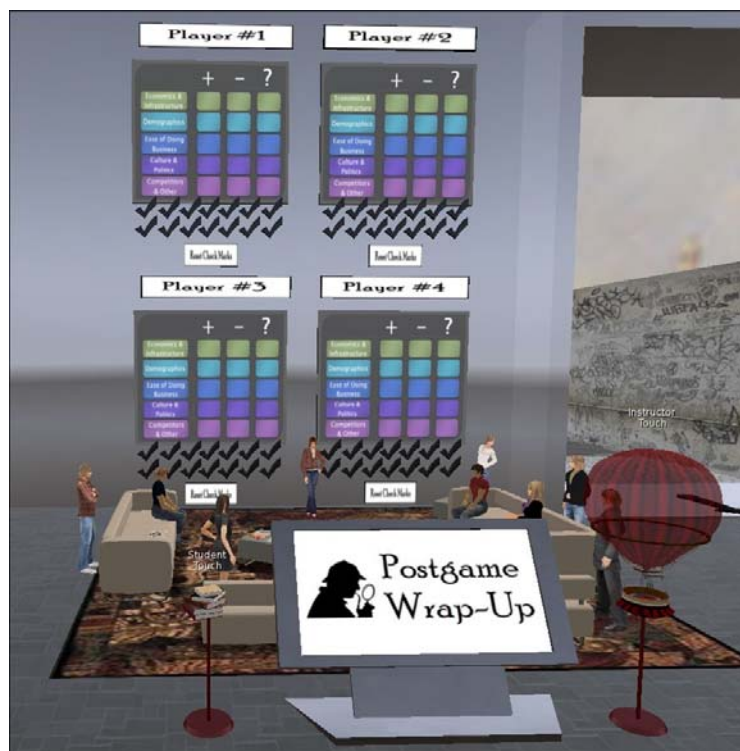
Finally, are there any hearing obstruction advantages or disadvantages associated with the comparative MP3 player technologies (read: High Notes players versus Penguin players versus Cloud Buds™ players)? That is, does one

type of player cause (like in cause and effect) less/more mishaps owing to the wear's ability/inability to hear surrounding sounds (?).

SECTION 5.2 | FORMATS FOR SOLITAIRE PLAY & GROUP PLAY WRAP-UPS

When the Data Detectives Game is played with multiple players,** the wrap-up station -- that includes multiple clue analysis boards (for facilitating side-by-side comparisons of the players' different/similar conclusions) -- is the definitive choice for staging the wrap-up discussion (see the picture of the postgame wrap-up station below).

When the Data Detectives Game is played alone, the full value of the learning exercise will be diminished if no opportunity is available for the student player to get feedback from the instructor. Accordingly, requiring/suggesting solitaire student player submit written discussions of the conclusions (in exchange for written feedback from the instructor) is one way to maximize the learning outcomes for single/solitaire players.



** As depicted below, while the default set-up of the Data Detectives Game is for Player #1 through Player #4 (on the clue analysis centers and wrap-up panel boards), there are alternative labels an instructor can deploy -- with Group #1 - Group #4 -- to facilitate group play.



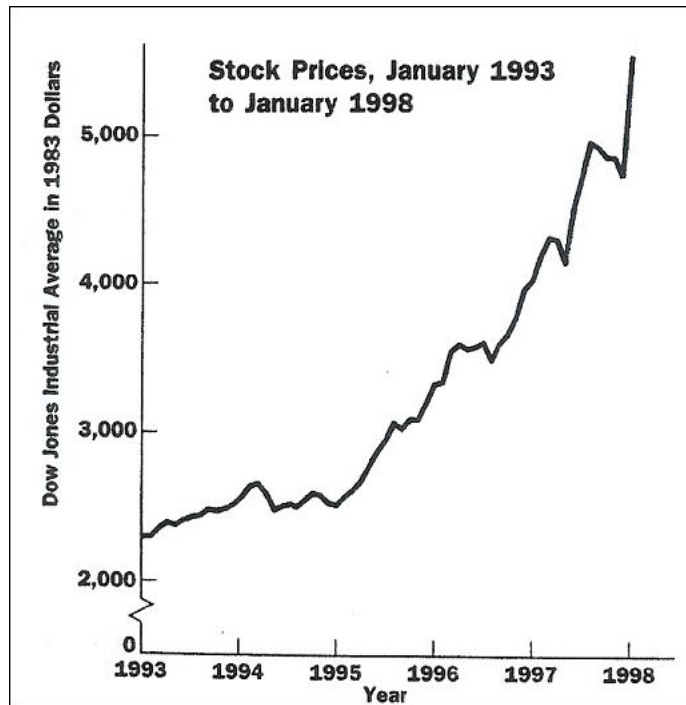
SECTION 5.3 | POSTGAME TEST



Like the pretest center, the demonstration postgame assessment center is set-up with a two question self-test assessment (that includes the answers to the self-test assessment). When used in a learning exercise, the instructor has the choice of using a self-test or another type of e-mailed or web-based assessment.*

Pretest question #1: What can you conclude from the statement, "there were twice as many burglaries as aggravated assaults in a nearby suburban neighborhood" (?).

Pretest question #2: Analyze the presentation of the data in the graph (below).

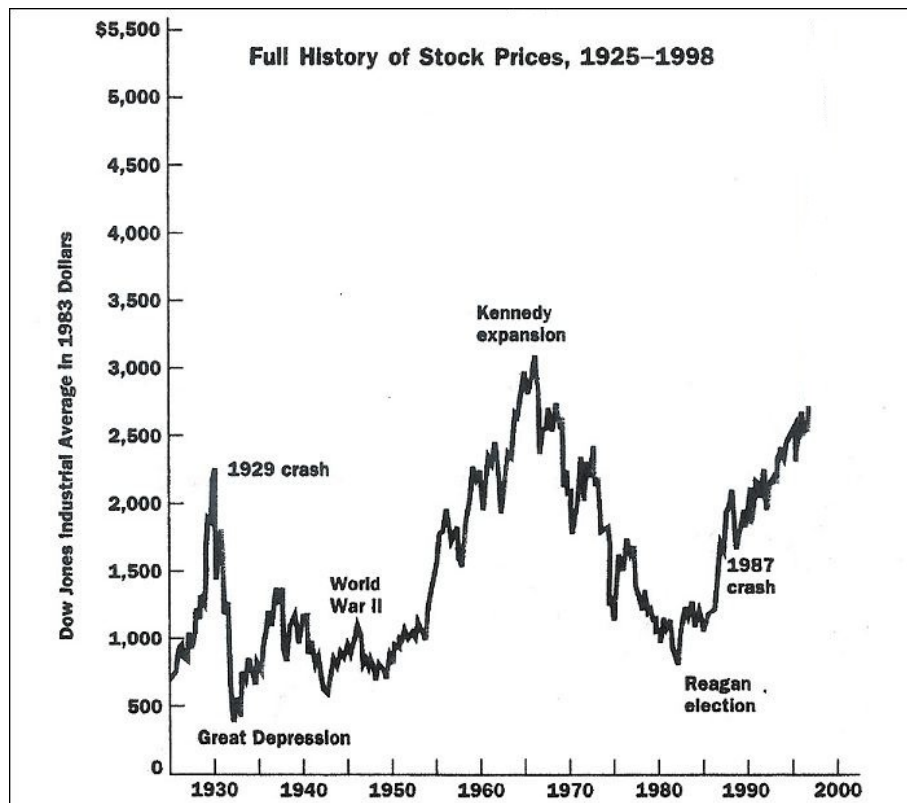


INSTRUCTOR TIP | POSTGAME GUIDANCE FOR STUDENTS

Again, direct your students to touch one of the computer screens on the left-hand side of the "Post-Test" sign (pictured above) and they will receive the postgame questions in a note card. After a student answers the questions on the note card, the student can check their answers by touching the mouse next to the computer screen (and another note card will be delivered). Again, the current demonstration version of the Data Detectives postgame assessment (and pretest assessment) just includes a few sample questions (but can easily be customized to include a more comprehensive set of questions).

Answer to the pretest question #1: Based on the statement alone, nothing can be concluded. Whenever statistics are cited it seems like something important must be behind the statement. Still, saying there were twice as many burglaries as aggravated assaults is like saying Tom has 4 apples and Mary has 2 apples, so Tom has twice as much (?). Twice as much of what?

Answer to the pretest question #2: Not only is the scale on the y-axis spliced to only show the top portion of the graph (and thereby over emphasizing the upward trend in this portion of the graph), it is often necessary to see data in the context of a longer period of time. For example, looking at a larger period of time (1925 to 1998 instead of just 1993 to 1998), a much different view of stock prices emerges (see below).



* See Appendix Three for a sample script to collect student answers to assessment questions (via chat) that are e-mailed directly to the instructor.

SECTION 5.4 | LESSONS FROM SHERLOCK HOLMES

The "Lessons from Sherlock Holmes" posters (displayed throughout the Data Detectives School as well as displayed as a collection in the wrap-up hall -- see the picture below), include link buttons to the online blog articles (by Maria Konnikova) that appeared in *Scientific American* magazine in 2011. The purpose of including the lessons is to provide more examples of critical thinking and in this case, critical thinking by the colorful and entertaining fictional persona, Sherlock Holmes. Sample titles from the series are listed below.

- *Lessons from Sherlock Holmes: Don't Just See, Observe: What Sherlock Holmes Can Teach Us About Mindful Decisions* by Maria Konnikova (August 19, 2011).
- *Lessons from Sherlock Holmes: Paying Attention to What Isn't There* by Maria Konnikova (August 23, 2011).
- *Lessons from Sherlock Holmes: Cultivate What You Know to Optimize How You Decide* by Maria Konnikova (August 26, 2011).
- *Lessons from Sherlock Holmes: Perspective is Everything, Details Alone Are Nothing* by Maria Konnikova (August 30, 2011).
- *Lessons from Sherlock Holmes: Don't Underestimate the Importance of Imagination* by Maria Konnikova (September 2, 2011).
- *Lessons from Sherlock Holmes: The Situation Is in the Mindset of the Observer* by Maria Konnikova (September 9, 2011).
- *Lessons from Sherlock Holmes: the Power of Public Opinion* by Maria Konnikova (September 13, 2011).

- *Lessons from Sherlock Holmes: Don't Tangle Two Lines of Thought* by Maria Konnikova (September 16, 2011).
- *Lessons from Sherlock Holmes: Breadth of Knowledge is Essential* by Maria Konnikova (September 20, 2011).
- *Lessons from Sherlock Holmes: Trust in The Facts, Not Your Version of Them* by Maria Konnikova (September 20, 2011).
- *Lessons from Sherlock Holmes: From Perspective-Taking to Empathy* by Maria Konnikova (October 25, 2011).
- *Lessons from Sherlock Holmes: Why Most of Us Wouldn't Be Able to Tell That Watson Fought in Afghanistan* by Maria Konnikova (November 1, 2011).



SECTION 5.5 | GIFT SHOP



The Gift Shop in the Data Detectives School includes a few items student participants can purchase for \$0. More specifically, t-shirts, diplomas, detective badges, mugs, and teddy bears are available for purchase (for \$0).

INSTRUCTOR TIP | YOU MAY NEED TO HELP STUDENTS PURCHASE/OPEN ITEMS

The new user tutorials include instructions for purchasing (for \$0) new looks for an avatar. Still, it may be that a few student players need to be reminded how to purchase and open items.



APPENDIX ONE | NEW USER GUIDE



New User Tutorial Area Adjacent to the Lobby Meeting Area in the Data Detectives School

HOW TO | MOVE AROUND IN A VIRTUAL WORLD

Moving around in the Data Detectives School simulation is possible in a number of ways. More specifically, your avatar has a choice of walking, running, or flying. In addition, your avatar can teleport to the different locations that contain the game clues (by clicking on the teleport pins on the maps located in the Data Detectives Game).

Walking -- You can use the arrow keys on your keyboard to walk your avatar around. Also, you can activate the Move Controls Box (that will provide you with arrow keys within your viewer screen -- to move your avatar around) by clicking on the "Avatar" drop down menu in the upper left-hand corner of your viewer and then clicking on "Movement Controls" (to place a "check" next to the feature so it will always be displayed in your viewer window).

Running -- If walking is too slow for you, you can activate the "Always Run" option on the "Avatar" + "Movement" menu (again, located on the upper left-hand side of your viewer).

Flying -- To begin flying, click on the "Fly" button (located in the Move Control Box). To stop flying, re-click the same "Fly" button (that will be labeled "Stop Flying" after you activate the fly option).

Teleporting -- Click on your "Map" and search for the location you want to visit and click "Teleport." In addition, you can use landmarks -- that contain teleport locations. Note: There are two maps with teleport landmarks to all the major clues in the Data Detectives Game.

HOW TO | INTERACT WITH OBJECTS

The interactive objects included in the Data Detectives School (tutorial centers and Data Detective Game) include:

- Note card givers -- are activated by touching the "giver" objects to receive a text note card;
- Embedded web pages -- open up automatically within your viewer when you touch an object that is linked to a web page;
- Media on a prim (MOAP) objects (like the calculator, whiteboard, or stopwatch) -- are activated automatically when an avatar approaches the object and further, just require touching the relevant buttons on the MOAP object;
- Slide show viewers -- are activated by using the red "forward" and "backward" arrows on each slide show viewer (in the tutorials included in the Data Detectives School); and
- Clue boxes (on your clue analysis station in the Data Detectives Game) -- are activated by touching the player button (for your player position = "Player #1," "Player #2," etc.) and then clicking on the "Build" button.

HOW TO | SET-UP YOUR VIEWER

The recommended viewer set-up (to enable the quick rezzing of all of the sculpted objects in the Data Detectives Game) includes increasing the Render Load Factor (or a change that will not impact the performance of your viewer).

To increase the Render Load Factor:

- After you are logged into MOSES, hold down your CTRL + ALT keys and then press the "D" key (to activate the Advanced menu tab on a PC or hold down the CTRL + OPT keys and then press the "D" to activate the Advanced menu tab on a Mac);
- Click on the Advanced menu (located in the upper left-hand portion of the viewer screen);
- Click on "Debug Settings," type in "RenderVolumeLODFactor," change the value to 8.0, and hit the enter button on your keyboard.

In addition, set-up your viewer draw distance to include at least 300 meters and as much as 400 meters, if possible.

To increase the draw distance on your viewer:

- Click on the "Avatar" drop down menu in the upper left-hand corner of your viewer;
- Click on "Preferences";
- Use the slider control button to increase the draw distance; and
- Click on "Apply."

HOW TO | COMMUNICATE

When you are on the Data Detectives School simulation at the same time as other students and/or your instructor, you can communicate using text chat or voice chat. If your instructor is not online at the same time you are online, you can leave a text message for your instructor by locating one of the red telephone booths, clicking on the red button on the answering machine located in the telephone booth (see the attached picture), and typing your message into the "Nearby Chat" text window located in the lower left-hand side of your viewer screen (see the picture of the instructor message center telephone booth below).



To communicate via text chat with others in the Data Detectives Game at the same time you are in the Data Detectives Game, type a message into the "Nearby Chat" window and click on the enter button on your keyboard.

To communicate via voice chat (with others in the Data Detectives Game at the same time you are in the Data Detectives Game), you need to have a noise reduction headset attached to your computer (with the person you are trying to communicate with similarly outfitted with a noise reduction headset). Next, make sure voice is "enabled" on your viewer settings -- by clicking on the "Avatar" drop down menu, clicking on "Preferences," clicking on "Sound & Media," and making sure the box in front of "Enabled Voice" is checked. Also, click on the "Audio

Device Settings" button on the same window as above to make sure your headphone device is working properly. Finally, when you want to speak to someone, press the microphone button near the text chat box in the lower left-hand corner of your viewer.

HOW TO | USE YOUR INVENTORY

Everyone starts out with both an Inventory folder and a Library folder. You can retrieve items from the library, but you cannot use this area for storage. That is why you have an Inventory folder.

In turn, here are the recommended best practices for inventory management in a virtual world:

- Organize Inventory content/items each time you enter the virtual world. More specifically, try not to keep two or more copies of the same item.
- Sub folders are your friends. Sub folders can be named and moved to any other folder. Try to avoid having loose items floating around in main folders.
- Make a back-up copy of your inventory when possible. You can lose files and folders just as easily as you can in your first life.
- Make a point of emptying the trash before you leave. This way you will have more room for all the new cool stuff that you can get the next time you come in-world.

To rezz an object in your inventory, open up your inventory (by clicking on the suitcase icon in the lower right-hand side of your viewer). Next, just drag the object onto the ground to rezz the object in-world.

To open a note card in your inventory, open up your inventory, right click on the item and click on "Open."

To change avatar outfits (to an outfit in your inventory), open up your inventory, right click on the clothing item, and click on "Wear."

HOW TO | CHANGE YOUR APPEARANCE

In a 3D virtual world (like the OpenSimulator 3D virtual world that houses the Data Detectives School), you can look like nearly anyone, or anything, you want!

To make changes to your avatar's appearance:

- Right-click on yourself. Select "Appearance..."
- Click the "Edit Shape" tab to edit your body shape.
- Click the "Body" button. Now try moving the "Height" and "Thickness" sliders.
- Click the "Nose" button and try moving the "Nose Size" and "Nose Thickness" sliders. How about that!
- Try some of the other buttons and sliders. Click "Randomize" for a whole new look!
- If you don't like what you got, click "Revert" to go back to your original look.
- If you like what you see, click "Save As..." and choose a name for your new shape.

Remember that you can change your appearance anytime, as often as you want, for free -- so don't worry if everything isn't perfect. Move on any time you're ready.

APPENDIX TWO | GLOSSARY

Avatar. A graphic, cartoon-like, representation of a real life person.

Floater (also known as "hoover text"). Text that describes objects and appears to be floating above an object.

Grid. An entire virtual world (as in the OSGrid, MOSES, etc.).

HUD (or "handy utility device" or "heads-up display"). Provides a menu-like add-on to a viewer window that allows the user to utilize tool, animation, or gadget features and functions.

Lag. The inability of the server housing the grid and/or the users computer and/or the Internet bandwidth connection between the grid server and the user's computer to keep up with the demands of the software platform. In turn, lag results in a long delay time before the objects in the virtual world come into focus and/or stalled avatar movements.

Inventory. The objects, note cards, landmarks, clothing, etc. collected or created by a person when using a virtual world. Inventory items are associated with a particular avatar and are accessed by clicking on the suitcase icon in the lower right-hand corner of the viewer.

Landmark. The island location and coordinates associated with a particular spot in a virtual world.

Media-on-a-prim (or MOAP). The ability to display web pages on an object's surface in a virtual world set.

Non player character (also known as a NPC). Avatars that are not controlled by a real person.

Note card (spelled "notecard" in OS grid platform references). Text messages that are transmitted to avatars and stored in an avatar's inventory.

Permissions. Objects created in an open simulator virtual world can be given away with "full permissions" equal to the ability to modify the object, the ability to copy the object, and the ability to transfer the object. Alternatively, objects created in a virtual world can be given away with some combination of the abilities to modify, copy, and/or transfer the object. In addition, permissions can include the ability to move an object.

Prim. The basic building block in a 3-D virtual world.

Rezzing. Bringing objects or items into existence in a virtual world.

Script. A mini program used in a virtual world set.

Teleport. The movement of an avatar from one location in the virtual world to another location in the virtual world without flying or walking.

Touch. Using your mouse curser to click on an object.

Viewer. The software (like a browser window) that enables users to control their avatars to see and interact in a virtual world.

Voice-enabled. The ability to talk with others in the virtual world through a noise reduction headset.

Voting machine. A device that records an avatar's selection.

World map. The overhead [map] view of the entire virtual world.

APPENDIX THREE | SCRIPTS

As another of the affordances of using the OpenSimulator 3D virtual world platform for education and training, there are an abundance of GNU General Public License (and open source) script recipes. See below for two sample scripts used in the Data Detectives Game.

SCRIPT | IN-WORLD SURVEY WITH E-MAIL ANSWERS

As one alternative for the pretest and postgame assessment, student players can take a survey (in chat) with the answers e-mailed directly to the instructor (by deploying the script below).

```
//=====
//SL SURVEY, 0.9.5
//Gathers survey responses via dialog, emails results from Second Life
//Copyright (C) 2006 Eloise Pasteur and Jeremy Kemp
//=====

//LICENCE =====
//This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the
//Free Software Foundation; either version 2 of the License, or (at your option) any later version. This program is distributed in the hope that it will
//be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details. You should have received a copy of the GNU General Public
//License along with this program; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301,
//USA. See: http://www.gnu.org/licenses/licenses.html

//SETTING UP THE OBJECT =====
//Create an object, its name will be the "From" field in the results email
//Include the script and a questions notecard
//The notecard name will be listed in the body of the results email
//Enter questions on one line, answers on the next, alternating lines
//Denote separate options in the answer line with a | pipe character
//You may need to fiddle a little with the order of your answers - there is no way to automatically adjust them irrespective of the number of
//answers you have that will also allow you to ask a reasonable number of questions. The dialog box displays as follows:
//10, 11, 12
//7, 8, 9
//4, 5, 6
//1, 2, 3
//Example:
//What color is the sky?
//blue|orange|green|red
//This will display the answers as:
//red
//blue, orange, green
//On the buttons.

//No line can be more than 255 characters
//Answers are truncated at 8 characters - they can be up to 24 characters but there is only space for 8 characters to display on the buttons.

//LAUNCHING THE SURVEY =====
//Upon resing, the script will request an email address for results - or you can enter your email directly into the script in the first non-orange line
//below in the format string address="example@aol.com";
//The script will take longer to setup with more questions
//Changes to the card after a survey is started require a manual reset of the script

string address; //The email address. email is a restricted word in lsl - it's an event name. - if you don't want to set these each time you can
enter your email directly here - the script will automatically adjust and not ask you for your email.
integer pointer=0; //Where we are in the various cycles - reading notecards, asking questions etc.
list questions; //The questions we've read in
list answers; //The answers in raw form (still in one string per answer set)
integer listenID; //So we can turn listeners on and off - less lag that way.
key owner; //So I can listen to only the owner, and potentially add some admin functions off a touch (not implemented but the code is
there).
integer chan; //Channel for the silent email registration - required in state_entry AND listen, hence a global.
string card; //Name of the notecard you're using.
```

```

key questionnaire; //Key of the person taking the questionnaire
string totalq; //Total number of questions
string responses; //The actual answers given, plus querent's name and card name.
float timePerQuestion=60.0; //Although there is a sensor to detect crashed etc. people it's not 100% reliable according to some. This lets you set a
time (in seconds) per question (so it's currently 1 minute per question) so that if they take too long they time out. For tricky questions you might
want to have some more time...

setQuestions() //A function - we need to access this from a couple of places, hence putting it in as a function
{
    string question=IList2String(questions, pointer); //Raw question
    question=IIDumpList2String(IIParseString2List(question, ["|"], []), "\n"); //Swaps | for /n (new line)
    if(IIStrLength(question)!=0)
    {
        IIDialog(questionnaire, question, IIParseString2List(IIList2String(answers, pointer), ["|"], []), -1001); //Asks the questions in a dialog box.
    }
}

default //Set everything up
{
    state_entry()
    {
        IISetText("Setting up", <1.0, 1.0, 1.0>, 1.0); //Show what we're doing.
        owner=IIGetOwner(); //Grab the owner's key for lower down
        //chan=(integer)("0x"+IIGetSubString((string)owner, 0, 1)); //Set up a channel (not 0) based on the key (1-255) so there's silent entry.
        if(address=="") //They've not entered their email address in the script.
        {
            chan=0;
            listenID=IIListen(0, "", IIGetOwner(), ""); //Listen only to the owner as well.
            IIOwnerSay("To what email shall I send responses?"); //Tell them what to say - revised for v0.9.3
        }
    }
    listen(integer cha, string name, key id, string msg) //Listen event - grab their details and make sure it's all OK.
    {
        if(cha==chan)
        {
            address=msg;
            IIListenRemove(listenID); //Tidy up the listen, just in case.
            listenID=IIListen(-1001, "", owner, "");
            IIDialog(owner, "The email address for results is "+msg+". Is that correct?", ["Yes", "No"], -1001); //Check the email address is right
        } else if(cha=-1001)
        {
            if(msg=="Yes") //Email is OK, so...
            {
                IIListenRemove(listenID);
                if(IIGetInventoryNumber(INVENTORY_NOTECARD)!=1) //there's not 1 notecard, so I'm not sure which one to use. Complain!
                {
                    IIOwnerSay("You must put exactly one card in me with the questions and answers on it before I can set up!"); //Complain
                    politely...
                } else //There is only one, so we'll assume (however rashly) it's the right one.
                {
                    card=IIGetInventoryName(INVENTORY_NOTECARD, 0); //Get the card's name
                    pointer=0; //reset the pointer (this is paranoia, but it doesn't hurt)
                    IIGetNotecardLine(card, pointer); //Start reading the card (handled in the dataserver event).
                }
            } else //They put their email address in wrong
            {
                IIResetScript(); //Well we've not really done anything. We could cycle back to ask again if we'd done more.
            }
        }
    }
}
dataserver(key id, string data) //This handles various things - this time it's reading data from a notecard.
{
    if(data!=EOF) //It's real data, not the end of the file.
    {
        if(IIStrLength(data)==0)
        {
            IISay(0, "CAUTION! Line "+(string)pointer+" of the notecard is blank! This may cause errors, questions to display out of sync with
their answers etc.");

```

```

    }
    if(pointer%2)          //is it an odd numbered line
    {
        answers+=data;      //if so, it's an answer line
    } else
    {
        questions+=data;    //else it's even (0 first remember) - so it's a question
    }
    pointer++;             //Advance the pointer
    llGetNotecardLine(card, pointer); //Get the next line.
} else                    //It IS the end of the file, so we've grabbed it all...
{
    totalq=(string)llGetListLength(questions); //Get the number of questions
    state ready;          //Go into a ready state, so we can take answers.
}
}
changed(integer change)
{
    if((change & CHANGED_OWNER) || (change & CHANGED_INVENTORY)) //They've changed the contents, or the owner, so reset it -
probably a new card after all.
    {
        llResetScript();
    }
}

state ready              //Waiting for victims to answer questions.
{
    state_entry()
    {
        llSetText("Touch to start survey\n"+card+" - "+totalq+" ?s.", <0.0, 1.0, 0.0>, 1.0); //Tell punters what to do
    }
    changed(integer change)
    {
        if((change & CHANGED_OWNER) || (change & CHANGED_INVENTORY)) //They've changed the contents, or the owner, so reset it -
probably a new card after all.
        {
            llResetScript();
        }
    }
    touch_start(integer num) //Process the touch
    {
        key temp=llDetectedKey(0);
        if(temp==owner)      //No admin built in, but it's available as an option
        {
            //offer some options
            questionnaire=temp;
            state running;
        } else                //It's a punter - start the questionnaire.
        {
            questionnaire=temp;
            state running;
        }
    }
}

state running            //We're actually asking questions
{
    state_entry()
    {
        llSetTimerEvent(timePerQuestion * (float)totalq); //This is a timer to clean up people that don't finish but the sensor doesn't catch for
some reason.
        llSetText(llKey2Name(questionnaire)+" is taking the questionnaire, please wait!", <0.0, 0.0, 1.0>, 1.0); //Tell the world so!
        listenID=llListen(-1001, "", questionnaire, ""); //Only listen to the answers, stops spamming
        llSensorRepeat("", questionnaire, AGENT, 60, PI, 30.0); //Keep checking they're still there - they might have got bored and wondered off,
crashed etc.
        pointer=0;          //reset the pointer (recycling variables is good)
        setQuestions();      //Ask the first question (see function above)
    }
}

```



```

listen(integer chan, string name, key id, string msg) //Listen for the answers.
{
  if(pointer==0) //First answer, so say what's happening.
  {
    responses=name+"s answers to the questionnaire on notecard "+card+".\n";
  }
  responses+="Q"+(string)(pointer+1)+": "+msg+"\n"; //Add their answer to this question to the email.
  pointer++;
  if(pointer==(integer)totalq) //Got to last question.
  {
    llSay(0, "Thank you for taking this questionnaire. Please wait whilst I send the results before starting."); //Tell them they're done.
    llSetText("Sending results, please wait.\nThis should take about 20s.", <1.0, 0.0, 0.0>, 1.0); //Tell others they're done too, and
to wait a bit
    llEmail(address, "Questionnaire answers", responses); //Send the email.
    state ready; //Back to the ready state
  } else
  {
    setQuestions(); //Ask the next question
  }
}
no_sensor() //The person's left, so send their partial answers
{
  llSensorRemove(); //Tidy up
  llEmail(address, "Questionnaire answers", responses); //Send email
  state ready; //Back to ready state
}
timer()
{
  llSensorRemove(); //Tidy up - slow sensor repeats aren't THAT laggy, but are a
bit
  llSetTimerEvent(0.0); //Tidies up the timer to stop it firing
  llEmail(address, "Questionnaire answers", responses); //Send their answers
  state ready; //Back to ready state
}
}

```

SCRIPT | LIST-MAKER

As one of many alternatives for collecting information on how student players move through the Data Detectives Game simulation, instructors can deploy simple "list-maker" scripts at key points in the simulation (see one sample script below).

```

// Global variables
list visitor_list;
float range = 90.0; // in meters
float rate = 1.0; // in seconds

// Functions
integer isNameOnList( string name )
{
  integer len = llGetListLength( visitor_list );
  integer i;
  for( i = 0; i < len; i++ )
  {
    if( llList2String(visitor_list, i) == name )
    {
      return TRUE;
    }
  }
  return FALSE;
}

// States
default
{

```

```

state_entry()
{
    llSay(0, "Visitor List Maker started...");
    llSay(0, "The owner can say 'help' for instructions.");
    llSensorRepeat( "", "", AGENT, range, TWO_PI, rate );
    llListen(0, "", llGetOwner(), "");
}

sensor( integer number_detected )
{
    integer i;
    for( i = 0; i < number_detected; i++ )
    {
        if( llDetectedKey( i ) != llGetOwner() )
        {
            string detected_name = llDetectedName( i );
            if( isNameOnList( detected_name ) == FALSE )
            {
                visitor_list += detected_name;
            }
        }
    }
}

listen( integer channel, string name, key id, string message )
{
    if( id != llGetOwner() )
    {
        return;
    }

    if( message == "help" )
    {
        llSay( 0, "This object records the names of everyone who" );
        llSay( 0, "comes within "+ (string)range + " meters." );
        llSay( 0, "Commands the owner can say:" );
        llSay( 0, "'help' - Shows these instructions." );
        llSay( 0, "'say list' - Says the names of all visitors on the list." );
        llSay( 0, "'reset list' - Removes all the names from the list." );
    }
    else
    if( message == "say list" )
    {
        llSay( 0, "Visitor List:" );
        integer len = llGetListLength( visitor_list );
        integer i;
        for( i = 0; i < len; i++ )
        {
            llSay( 0, llList2String(visitor_list, i) );
        }
        llSay( 0, "Total = " + (string)len );
    }
    else
    if( message == "reset list" )
    {
        visitor_list = llDeleteSubList(visitor_list, 0, llGetListLength(visitor_list));
        llSay( 0, "Done resetting." );
    }
}

```

REFERENCES

Critical Thinking About Data

- Epstein, R. L., & Kernberger, C. (2005). *The guide to critical thinking in economics*. Mason, OH: South-Western.
- Leonard, J. (2007). E-Graphing: Perfection, Paradox or Persuasion. In T. Bastiaens & S. Carliner (Eds.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2007* (pp. 2077-2085). Chesapeake, VA: AACE.
- Konnikova, M. (2011). Lessons from Sherlock Holmes (Series). *Scientific American*.
<http://blogs.scientificamerican.com/guest-blog/2011>.

Concept Mapping & Adaptive Learning

- Canas, A. J., et al (2003). *A summary of literature pertaining to the use of concept mapping techniques and technologies for education and performance support* (Prepared for The Chief of Naval Education and Training). Pensacola, FL: The Institute for Human and Machine cognition.
- Pearson, E., Green, S. & Gkatzidou, V. (2008). Enabling learning for all through adaptable personal learning environments. In *Hello! Where are you in the landscape of educational technology? Proceedings ascilite Melbourne 2008*.
<http://www.ascilite.org.au/conferences/melbourne08/procs/pearson.pdf>
- van Seters, J. R., Ossevoort, M. A., Tramper, J., & Goedhart, M. J. (2012). The influence of student characteristics on the use of adaptive e-learning material. *Computer & Education*, 58, 942-952.
- Willingham, D. T. (2007). Critical thinking, Why is it so hard to teach? *American Educator*, Summer, pp. 8-19. <http://mres.gmu.edu/pmwiki/uploads/Main/CritThink.pdf>

Museum-Inspired Display Design

- Dean, D. (1996). *Museum Exhibition*. New York: Routledge.
- Schittich, C. (2009). *In detail: Exhibitions and displays*. Boston: Birkhauser Architecture.
- Serrell, B. (1983). *Making exhibit labels, Step-by-step guide*. Nashville, TN: American Association for State and Local History.
- Simon, N. (2010). *The participatory museum*. Santa Cruz, CA: Museum 2.0.
- Trulove, J. G. (2000). *Designing the new museum: Building a destination*. Beverly, MA: Rockport Publishers.

von Naredi-Rainer (2004). *A design manual, Museum buildings*. Boston: Birkhauser Architecture.

Other

BBC Online (2010). Where they stand: Guide to party election policies. *BBC News*.
http://news.bbc.co.uk/2/hi/uk_news/politics/election_2010/8515961.stm

Higgins, A. & Kanter, J. (2012, November 22). Public anger over Europe's budget, and wine cellar, bubbles before talks. *The New York Times*, p. A16.

OECD (2006). *Infrastructure to 2030, telecom, land transport, water and electricity*.
<http://www.inst-informatica.pt/servicos/informacao-e-documentacao/biblioteca-digital/gestao-e-organizacao/0306011E.pdf>

Stanley, A. (2012, July 28). In Ceremony, Britain Jests in Journey Through Past. *The New York Times*, p. D6

World Bank (2012). *Doing business 2013, smarter regulations for small and medium-size enterprises*.
<http://www.doingbusiness.org/~media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB13-full-report.pdf>