

## **Design Document # 2**

### **SIMULATION : BUSINESS**

#### **Introduction**

The main rationale of the simulation is let the learners experience ‘reality’ through the procedural representations of experience. In other words, it aims to maximize learning by making it more experiential and contextualized. The simulation has been designed to introduce the concept of Profit and Loss to the learners. The way in which the simulation tries to achieve its objective is by defining the key terms that the learners will encounter as it forms the background of the concept being taught. Further, the simulation provides a context so that the learner can relate to the applicability of this concept in real-world scenarios. The learners get an opportunity to interact with the interface as the simulation lesson is self-paced. It will also provide feedback for the learner’s choices which can contribute towards the strengthening of concepts. Overall, the simulation will familiarize the novice learners about the mathematical concept of profit and loss.

This topic is important because it forms the backbone of several subjects such as Commercial Math, Economics, Finance and Accountancy. It is relevant not just for academic purposes, but also has practical applications when dealing with monetary transactions. A simulation is considered to be a better medium to teach this concept due to several reasons such as:

- Learner can understand the interplay of different variables involved as they can manipulate one to see its effect on the other in real-time.
- Learning experience will be more situated and context-driven instead of being inert as they will have opportunities to solve advanced real-world problems.

- Usually Math is considered to be difficult for lot of students, so introducing them to a new topic in this experiential way can avoid them feeling overwhelmed by the content.

## Background

- **Target Audience**

The simulation has been designed for the Grade – 6 students since the concept of Profit and Loss is usually introduced to them at that level of formal education. It will approximately take 15- 20 minutes for the learners to go through the lesson plan. It is a self-paced learning management system which gives flexibility to the learners for understanding the concepts. Learners will be expected to have a thorough understanding of basic arithmetic operations such as addition, subtraction, multiplication, division. Learners will also need to be familiar with the process of calculating percentages for solving the advanced levels of this simulation.

- **Learning Objectives**

1. The student will understand the introductory conceptual framework of Profit & Loss.
2. The student will be able to relate the concept to comprehend real-world situations where the knowledge can be applied.
3. Students will be able to understand the impact of input variables (selling price and cost price) on the output variables (profit and loss).

Connection with Bloom's Taxonomy:-

-Knowledge

-Comprehension

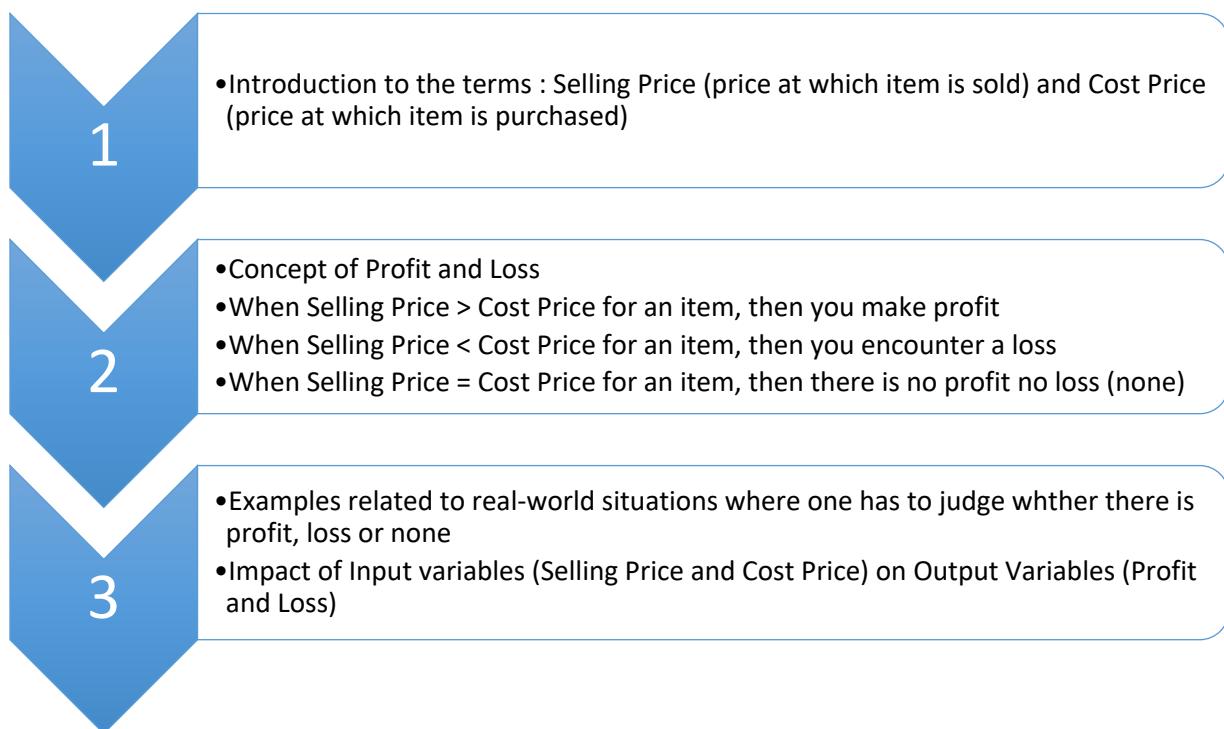
-Application

### -Analysis

By the end of the simulation, learners will be able to appropriately explain the concept of profit and loss as well as apply the knowledge to comprehend word problems (textual) and real-world scenarios (contextual).

#### • Description of Content

The concept of Profit and Loss is a part of Consumer Math which has an objective of introducing the students to the knowledge of money, financial calculations and understand their application in day-to-day activities. In this particular simulation, only the basic terminology and conceptual framework has been established. No formulas or calculations has been included so that it does not increase the burden on learners. The following conceptual map guides the design of the simulation:-



The simulation can be considered to teach the concept at a Beginner's level and its scope is pertaining to providing the conceptual understanding for the topic under consideration. In the next levels of the simulation, learners get an opportunity to manipulate the input variables and the corresponding change in the output variables will be shown through graphs.

- **Market Analysis**

While designing the simulation, I searched for resources that are available online for this particular topic. Several apps, interactive games and activities focus on the higher-level knowledge associated with this concept such as calculating profit and loss through word problems or estimating profit and loss percent from the data given in questions. In the best of my knowledge and the resources that I encountered online, there were none focusing on the basic concept of the topic as most of them dealt with solving problems. Although the online resource 'AdaptedMind Math' (<http://www.adaptedmind.com/Math-Worksheets.html>) was quite helpful to visualize the design of the current simulation as it has topics graded in terms of difficult levels depending on the population for which it is designed, yet it does not focus on the introductory concepts of Profit and Loss, instead requires them to solve questions using the formulae.

## **Design**

- **Overall simulation idea**

The simulation is designed in a way that it helps the novice learners to get acclimatized to the concept of profit and loss which is a topic that is usually taught to Grade 6 level students according to the formal education system. At the initial stage, the terminology associated with the concept have been explained. As the simulation progresses, the relationship between the

terminology and profit/loss has been delineated with the help of images. The mathematical relationship will be introduced in the next stage, following which the examples will be displayed. There are three different scenarios related to day-to-day activities where the concept of profit and loss can be utilized. Since the simulation will be self-paced, it will give an opportunity to learners to interact with the learning material at their own speed. At the end where the examples are shown and students are required to click on the right answer, feedback will be provided to them in the form of different sounds for incorrect and correct answers. The student has to get the correct answer to be able to proceed to the next example. This ensures that a strong conceptual understanding is established for the students to be in a position to tackle the advanced concepts for this topic.

As the students complete the introductory concept level, the simulation proceeds to the next stage where learners will be able to manipulate the input variables (Selling Price and Cost Price) by using the sliders placed beneath them to see its impact on the output variables (Profit and Loss) that are represented graphically. This real-time interaction with the interface and the variables will help learners to make connections with the introductory phase of the simulation where they were exposed to the mathematical relationships between these variables. The narrative will present different situations that a businessman will encounter pertaining to the calculation of profit and loss for the items in his super-market. Initially, the slider bars will reflect the selling and cost price for one item (for eg, 1 water bottle) along with the corresponding value of profit or loss. For the advanced stages, the simulation will have narratives where learners will have to calculate the selling price and cost price for multiple items (for eg, 100 water-bottles) and the graphs will reflect the output of profit or loss for all these items

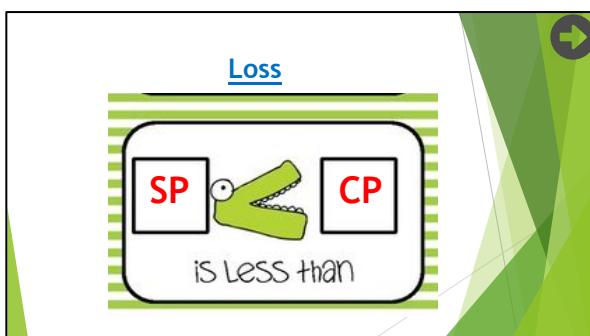
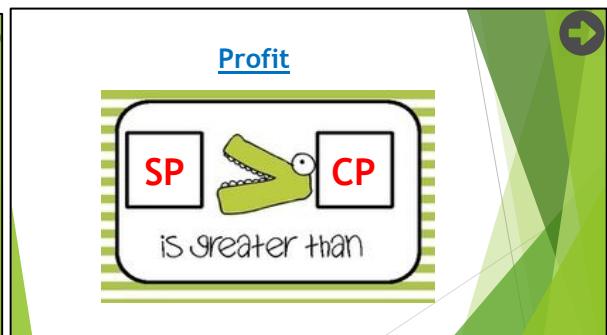
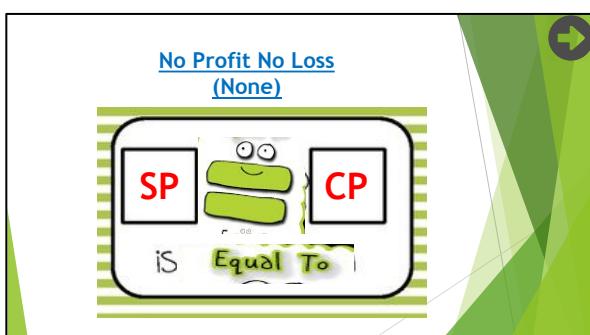
combined. The next levels of the simulations can be conceptualized to have learners calculate the selling price ad cost price by including the manufacturing costs, transportation costs and sales tax. The input variables will have a corresponding change in the graphs for profit and loss.

- **Platform**

The simulation will require the learners to work with a PC and a mouse. Since the simulation is self-paced, learners will have to click with mouse to move ahead or go back to any of the sections. It also requires the use of speakers because in the examples section, the sound played for picking up a particular option (profit/loss/none) will vary depending on the accuracy of the response. It will serve as a hint to the learner for reflecting on the response chosen for that question.

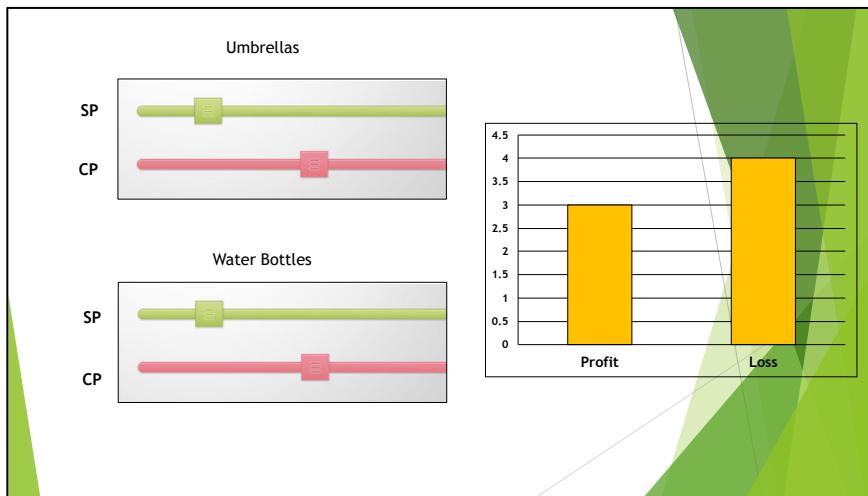
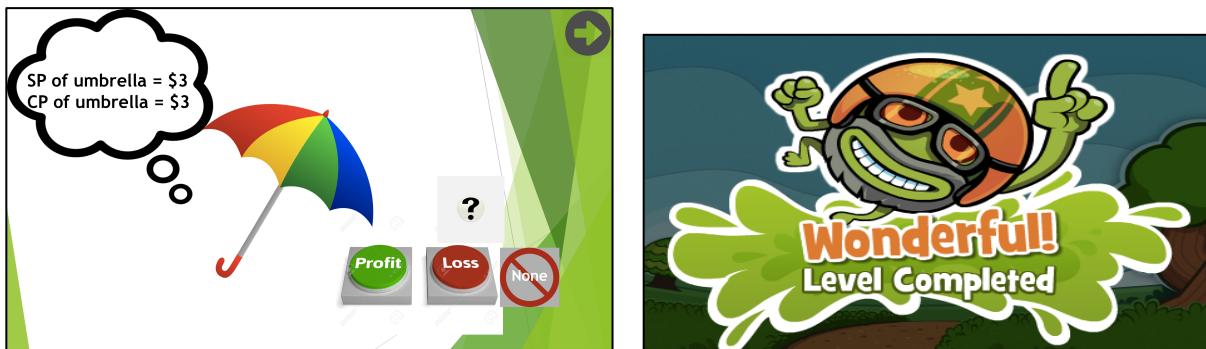
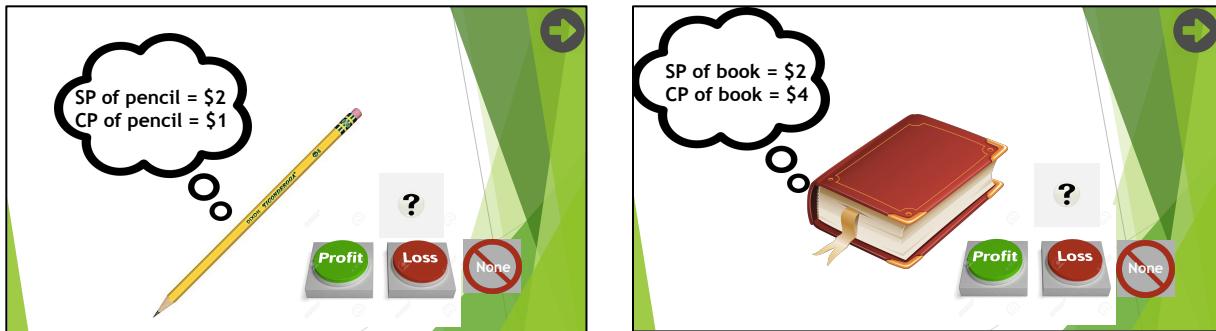
- **Visual Design & User Interaction**

The simulation will have a 2D visual design and the user interaction will include the transition from one section to then next through represented through different icons such as Start buttons and arrow buttons. Each frame of the simulation will address one particular aspect of the conceptual map shown above (Description of Content). The storyboard simulation frames have been created for visualization using Microsoft PowerPoint which will present the information to the learners in a segmented form so that the information is not overwhelming for them and the interface is as user-friendly as possible as the target audience is Grade – 6 students. The following are the prototypes for frames that will be merged to present the simulation in the final form for the learners:-



Examples!

made with sparklee.com



- Description of player experience**

When the simulation starts, the first screen shows the topic (Profit & Loss) and the picture of money gives them an idea that the topic is connected with money and its application will be in doing financial calculations. To begin the simulation, learner will click on 'start' button with the mouse. It will lead to the next frame in which there are two circles (Selling Price and Cost Price).

The learner has to have a clear understanding of these terms to progress on the next stage. Since it is a self-paced simulation, it allows the learners to have flexibility in terms of time taken to comprehend a particular construct.

By clicking on the first circle, the definition of the term is revealed and by clicking on the second circle, the corresponding definition will be revealed. Thereon, the learner will click on the arrow button to proceed to the next segment where the next concept will be displayed. The three different scenarios, that is, when  $SP > CP$ ,  $SP < CP$  and  $SP = CP$  are shown with graphics. These mathematical relationships correspond to the terms Profit, Loss and No Profit No Loss (None) respectively.

After the concepts have been discussed, learner will click on the arrow button to move to the next segment which are the examples for the three categories. The examples are constructed in a way that the learner is given an opportunity to choose the correct answer through trial-and-error approach. The examples also show objects used in day-to-day activities so that the learner can connect the new knowledge with real-world scenarios. The mouse click will be associated with a sound which will give a hint to the learner as to whether the chosen answer is correct or incorrect. This feedback will assist the learner to rectify the error (if committed) or reinforce his/her understanding of the concept. Since the example section is ungraded, it will not make the learner feel stressed about scoring.

The next progression will be to a screen where there will be slider bars for the input variables (selling price and cost price) which can be manipulated by the learners to see the corresponding

change in the graphical representations of profit and loss. If the slider will be at a higher value for Selling Price than the Cost Price, the graph will only show the corresponding value for Profit and the bar representing Loss will disappear. Likewise, if the slider will have higher value for Cost Price than the Selling Price, then the graph for Profit will disappear and only the corresponding value for Loss will be visible.

For advanced levels, when the learner will be presented with multiple items, then it will be possible to see profit on one item and loss for the other item by using their respective slider bars of input variables. Learners can change the slider bars and see the corresponding change in the graphical representations which will help them visualize the relationships between all these variables. The narrative will contextualize their learning experiences so that they are able to apply the knowledge to practical situations.

The simulation has been designed in such a way that the novice learner will be able to grasp the concept of profit and loss along with its allied terminology in a simple and clear way. Usually, Math is a difficult subject for most students, therefore introducing them to the novice concepts in such a way can prevent them from feeling overwhelmed. Rather, the self-paced nature gives them an opportunity to manipulate the interface according to their needs which makes them have a positive outlook towards the interface as well the concepts that the simulation is trying to teach. It makes the experience for learners more meaningful and assists in transfer of learning from one context to another.

## Theoretical Foundation of Game Design

Simulation is considered to be a procedural representation of certain aspects of reality (Salen and Zimmerman, 2004). The aim behind learning through simulation is that it helps the learners to engage in deep learning through meaningful play. The Cognitive Load Theory of Multimedia Learning (Mayer, 1947) guides the design of simulations because it helps in arranging the elements (text/graphics) in a way that it does not increase the extraneous processing for the novice learners. Instead, the aim is to increase the generative processing so that the prior knowledge can be activated and the new schemas can be connected and integrated with them. The Multimedia Principles such as Coherence, Split-Attention (Spatial Contiguity) and Segmenting play an important role while designing the simulation frames. The image of profit and loss along with money helps in building an advance organizer for the learners that the concept of profit and loss is related to the monetary transactions. It will also activate their prior schemas about money. Furthermore, the feedback is given to learners which helps them to reflect on their understanding of the concepts. Finally, the self-paced nature of simulation gives them the flexibility to feel the control over learning environment which is needed to reduce the learner's anxiety.

Apart from the cognitive dimensions associated with the game design, certain other factors that explain the foundation of the simulation are that through the trial-and-error strategy (derives from the behaviorist theory of learning) for problem-solving, the learners feel more immersed in the game play as they enter the Magic Circle which keeps them connected till they get the right answer. Since the examples are more contextualized, it helps the learners to resolve the conflict

and take the right decision as carefully as possible. The model of game design which focuses on challenge, response and feedback are the building blocks for the design of this simulation. The examples represent the challenge presented to the learners and the sound produced after clicking represent the feedback for the response given by the learners. This motivates the learner to be careful about the accuracy of their responses. These meaningful experiences will help in cognitive, affective, social and behavioral engagement with the game. At the end of the simulation, the learner (Grade 6 students) would have achieved the target (concept of Profit and Loss) in accordance with indicators of Bloom's Taxonomy. Therefore, it can be concluded that engagement in meaningful experience with the simulation leads to deeper learning and this introductory knowledge of the topic can be further used to comprehend advanced and complex information in the future.

## Links for images used for Simulation Storyboard Frames

<https://s-media-cache-ak0.pinimg.com/236x/be/d2/75/bed2759ee413eac33e1917900e87b952.jpg>

[http://www.staples-3p.com/s7/is/image/Staples/s0213689\\_sc7?\\$splssku\\$](http://www.staples-3p.com/s7/is/image/Staples/s0213689_sc7?$splssku$)

[http://www.clker.com/cliparts/c/a/4/1/1194984950810759386thought\\_cloud\\_jon\\_philli\\_01.svg.hi.png](http://www.clker.com/cliparts/c/a/4/1/1194984950810759386thought_cloud_jon_philli_01.svg.hi.png)

<http://previews.123rf.com/images/stuartphoto/stuartphoto1402/stuartphoto140200529/26064213-Profit-Loss-Buttons-Showing-Revenue-Or-Deficit-Stock-Photo.jpg>

[http://i3.cpcache.com/product/563323592/mini\\_button.jpg?width=225&height=225&Filters=%5B%22name%22%3A%22background%22%2C%22value%22%3A%22F2F2F2%22%2C%22sequence%22%3A2%7D%5D](http://i3.cpcache.com/product/563323592/mini_button.jpg?width=225&height=225&Filters=%5B%22name%22%3A%22background%22%2C%22value%22%3A%22F2F2F2%22%2C%22sequence%22%3A2%7D%5D)

<http://www.clipartbest.com/cliparts/LiK/rb7/LiKrb7gnT.png>

[https://c1.staticflickr.com/1/26/61056391\\_31343afdc6\\_b.jpg](https://c1.staticflickr.com/1/26/61056391_31343afdc6_b.jpg)

<http://previews.123rf.com/images/dirkercken/dirkercken1310/dirkercken131000029/22661135-profit-or-loss-win-or-loose-financial-on-stock-market-economy-earning-or-loosing-money-trough-the-ri-Stock-Photo.jpg>

<http://blog.thesimonsgroup.com/wp-content/uploads/2012/06/start-button.jpg>

[http://pngimg.com/upload/book\\_PNG2116.png](http://pngimg.com/upload/book_PNG2116.png)

[http://pngimg.com/upload/umbrella\\_PNG494.png](http://pngimg.com/upload/umbrella_PNG494.png)

<http://1.bp.blogspot.com/-I73XWq0WWdw/UTTdOnGXKzI/AAAAAAAAB0/2uyXRgIAclU/s1600/examples.gif>

[https://www.iconfinder.com/icons/176039/arrow\\_button\\_buttons\\_right\\_icon](https://www.iconfinder.com/icons/176039/arrow_button_buttons_right_icon)

<http://civax.net/wpsys/wp-content/gallery/king-cookbook-papa-pear/snag-0056.png>