Chapter 03

Multiple Regression analysis for identifying relevant parameters that explains student's emotions

3.1 Introduction

The framework developed uses the same scenario to identify the constructive learning the student has gone through by using the e-Learning system. This means, in this framework, how well the student has learnt is measured using the quiz marks he obtains at the end of the study session of the subject. As explained in chapter 05, this is used as the dependent variable of the parameters or independent variables used in the multiple regression analysis. Using this analysis, it is intended to find out how much a particular parameter ***correlates*** to the marks obtained by the student. This method is used by Bunt et al [1].

Removing irrelevant variables under study can also be done using Principal Component Analysis. This method was also taken into consideration but due to time constraints, Multiple Regression was used. Microsoft Excel is used for the analysis that comes with inbuilt functionality to carry out Multiple Regression. This approach was used to reuse available software and reduce time of development.

But, the design of the system enables to easily incorporate Principal Component Analysis to the system and find out the relevant parameters as only parsing of data collected analysis are separated out as modules. Microsoft Excel can be used with an add-on, which is free to use.

Data collection for the project was carried out using a combination of a web based system and a desktop application. E-Learning system, content providing system and its administration is web based, and the technology used is PHP, JavaScript and HTML as web technologies and MySQL as the back end. These options were based on two main considerations. The first consideration is, Moodle e-learning system is a PHP system. Since our system is also interacting with moodle, same technology is used in our system. The other reason is the technologies are free.

3.2 Learning and Emotions, interconnection with dependent parameters

If students are in emotions that contribute to constructive learning, they tend to grasp new concepts easily, according to Candy Lawson [26]. Further to this, Kort et al [24] of MIT Media Laboratory, in his research Analytical Models Of Emotions, Learning And Relationships: Towards An Affect-Sensitive Cognitive Machine defines a four quadrant model relating to emotions and learning. As figure 3.1 depicts, the x- axis explains emotions while the y – axis explains learning.

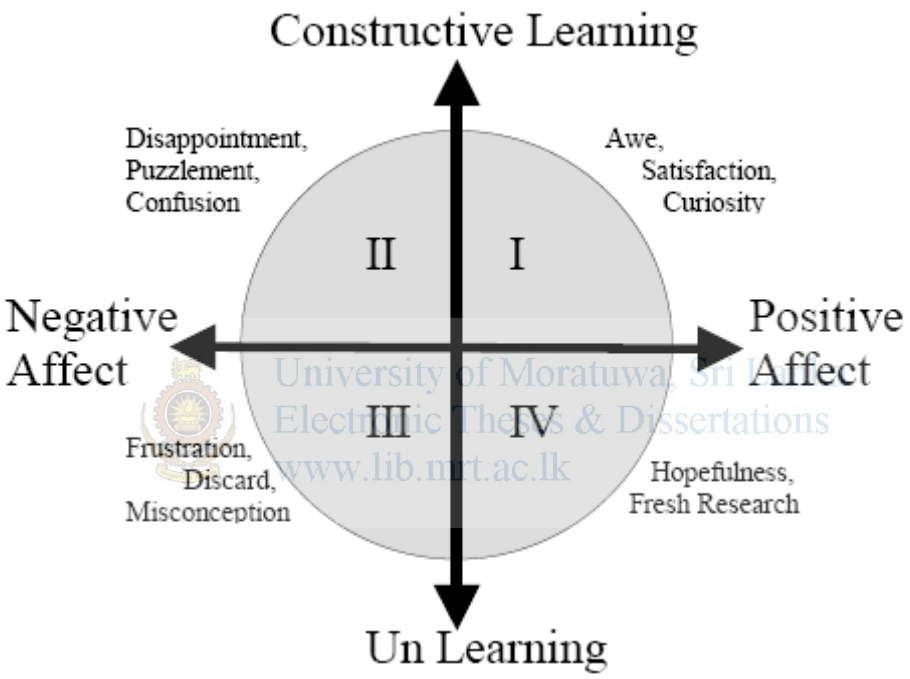

Figure 3.1 : Four Quadrant model relating to emotions.

The idea behind this is further explained with examples by Kapoor [23]. He quotes "A typical learning experience involves a range of emotions, moving the student around the space as they learn (Kort et al. [2001]). Typically, movement would begin in quadrant I and proceed in a counter-clockwise direction. The student might be curious/fascinated and/or interested when he begins in quadrant I. He might be puzzled /disappointed/ confused and/or motivated to reduce confusion in quadrant II. In either case, the student is in the top half of the space if his focus is on constructing or testing knowledge. Movement happens in this space as learning proceeds. For

example, when solving a puzzle in the software product The Incredible Machine, a student gets an idea how to implement a solution and then builds its simulation. When he runs the simulation and it fails, he sees that his idea has some part that doesn't work – that needs to be deconstructed. At this point it is not uncommon for the student to move down into the lower half of the diagram (quadrant III) where emotions may be frustration/ hopelessness/ boredom and the cognitive focus
changes to eliminating some misconception. As he consolidates his knowledge—what works and what does not—with awareness of a sense of making progress, he may move to quadrant IV (hopefulness/ excitement/confident)."

This is used as the basis in developing the framework to obtain the connection between learning and emotions.

Ultimately, the effectiveness of constructive learning is measured by the marks the student obtains and hence marks (Y_i) are taken as the quantitative parameter that explains affect in constructive learning.