

# Investigate the Student Behavior in Virtual Classroom with Problem Based Learning Environment

Dharmawansa AD<sup>1</sup>

## ABSTRACT

The advance step of e-learning is 3D multi user virtual environment use for educational activities. Educational institutes conduct their courses, assignments, projects through the virtual environment. Such institutes evaluate only final output. The student behavior of the classroom is important factor for improve the effectiveness of e-learning. In this research, student activities were recorded during the class session in virtual environment. Stored data could be analyzed using statistical tools and develop a relationship between activities. Due to attractiveness of virtual environment student prefer to move. Student movement negatively influences the educational behavior.

**KEYWORDS:** Chat, E-Learning, Virtual Environment, Movement

## INTRODUCTION

Learning is a process of acquire new or modify existing knowledge, skills, behaviors and values. The innovative information may be arising throughout the world. As a result of globalization, no country can remain isolated. The heaviest barrier to gain or exchange information is the distance. E-learning plays a massive role for overcome the distance barrier. E-learning can be classified in to four categories from the view points of synchronous-asynchronous and digital-analogue learning styles. Students can be able to catch their learning contents easily when it becomes face to face format. Digitized-synchronous e-learning system may be a better option of e-learning.

The rapid advancement of the Information Technology improves the effectiveness of distance learning. Multi-user virtual environments and virtual worlds in general show significant potential for educational activities. They are particularly appropriate for educational use due to their alignment with the concept of experiment learning. Metaverse (social media) seems to have the potential as an educational to serve this purpose. There are numerous potential advantageous of using virtual worlds in education, either as a supportive tool or as the main platform for teaching.

In this paper, described the experiment which is done using the virtual environment. The remainder of this paper is arranged in to five sections as follows. Next section provides some background and related work information. Part three describes the environment which is used for experiment. The methodology describe under the section four. Get the recorded activities during the class session and then analyze the records using some statistical tools are described in section five. Section six concludes and lists some potential future work.

## THE RELATED WORK

Some of the authors have already investigated the possibility of carrying out Problem Based Learning in Metaverse. They were successful and already established a PBL model in a virtual three dimensional space. Universities conduct their various educational projects and courses using second life. Exercises, assignments and some activities are conducted based on this platform [1]. Through the activities, try to develop the creativity, improve the programming skills, measure the preference to use virtual world.

In the real world, tracking systems were developed to analyze the behavior of people. Try to identify the activities and determine the situations [2].

In the virtual environment, analyze the student behavior is somewhat difficult.

---

<sup>1</sup>Graduate, Department of Industrial Management, Faculty of Applied Sciences, Wayamba University of Sri Lanka

## INVESTIGATE THE STUDENT BEHAVIOR IN VIRTUAL CLASSROOM WITH PROBLEM BASED LEARNING ENVIRONMENT

Although, the various courses and experiments conduct based on virtual environment, the analysis of student behavior in such environment is rare.

### EXPERIMENT

Metaverse is a 3D virtual space where Avatars are active on behalf of the human users. One of the merits for learning in Metaverse is that it gives one a strong sense of reality. Therefore virtual classrooms were built. Six students and two teachers were participated in this experiment. It was conducted in two days as separate sessions. Two classrooms are used and participants divide in to two classes. One teacher and three students are included in one classroom. Electronic structure & atomic orbital and BCC crystal structure were the topics of two classes. First day, the experiment conducts as three sections. The basic knowledge relevant to this activity was given before the class as tutorial section for the whole participants. It takes around 16 minutes. Then two groups have entered their classroom. The class takes around 30 minutes.

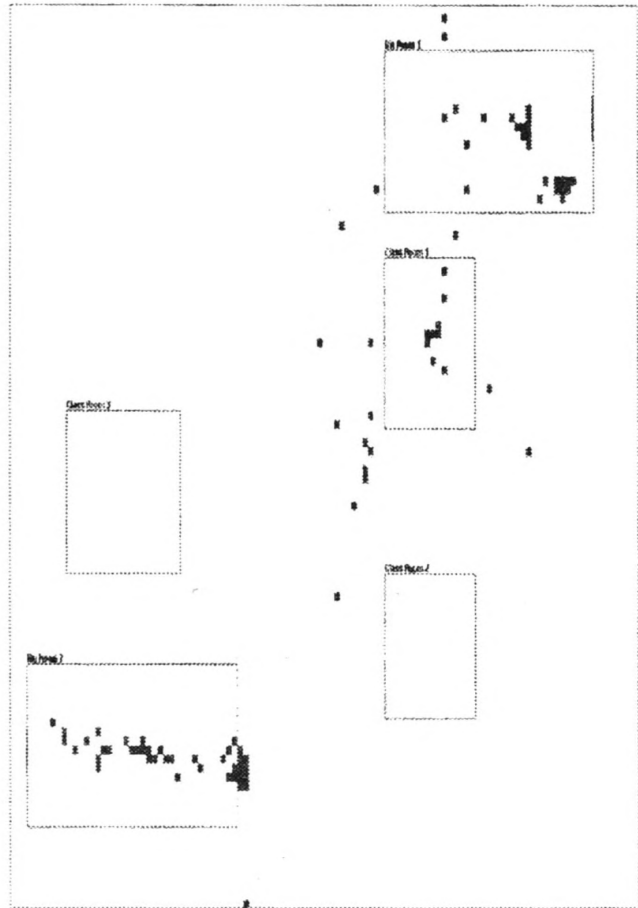
End of the class, teacher was given a question. The discussion section started with the problem. Students trying to find the solution separately and finally they discussed their findings and problems occurring during the problem solving.

### METHODOLOGY

User Name	Content	Time	Date
eLearning Datura	Sini, tapi pikiran itu 16 kedua yang tersisa di lagu 3, teman foxclaw, mengapa begitu?	17:53:47	2010-11-18
eLearning Datura	Here, but thought the 16 second remaining on track 3, foxclaw friends, why do that?	17:53:47	2010-11-18
eLearning Czartza	i think the whiteboard in the browser is used by the other class	17:55:52	2010-11-18
eLearning Czartza	i think papan tulis dalam pelayar yang digunakan oleh kelas lain.	17:55:52	2010-11-18

**Figure 02: Chat Date For Given Time and Date**

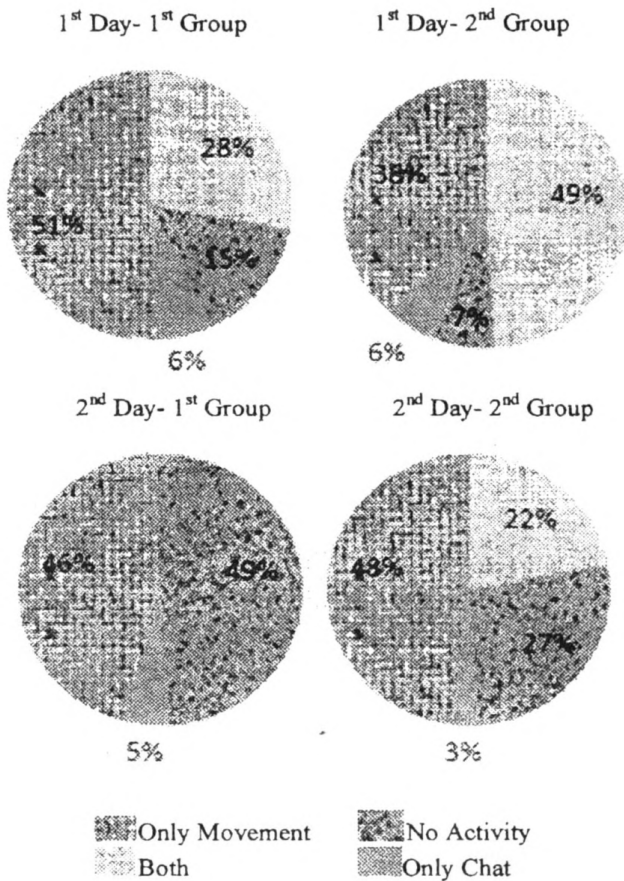
Second life indicate the postion(x,y,z cordinates) of each avator and it facilitate to chat with other avators.



**Figure 01: Map the Nagaoka Island to web page, red and green dots indicate student group and teacher center of gravity respectively**

The position of the avator and chat date are possible to collect by installing sensor prims in diferent parts of the classroom. The data send to the server and stored in a server. Recorded data used for following analysis. The center of gravity for each group can be found throuh the position of avators. According to the time, the chat data and center of gravity changed. The virtual island, map to the web page using php and javascript. Then, chat data and center of gravity movement showed based on the time. It has facility to get the data for perticular date and any time duration. From that system, the teacher and students movemts and chat data can be visualized. Using that system the analysis part could be carried.

**RESULT AND DISCUSSION**

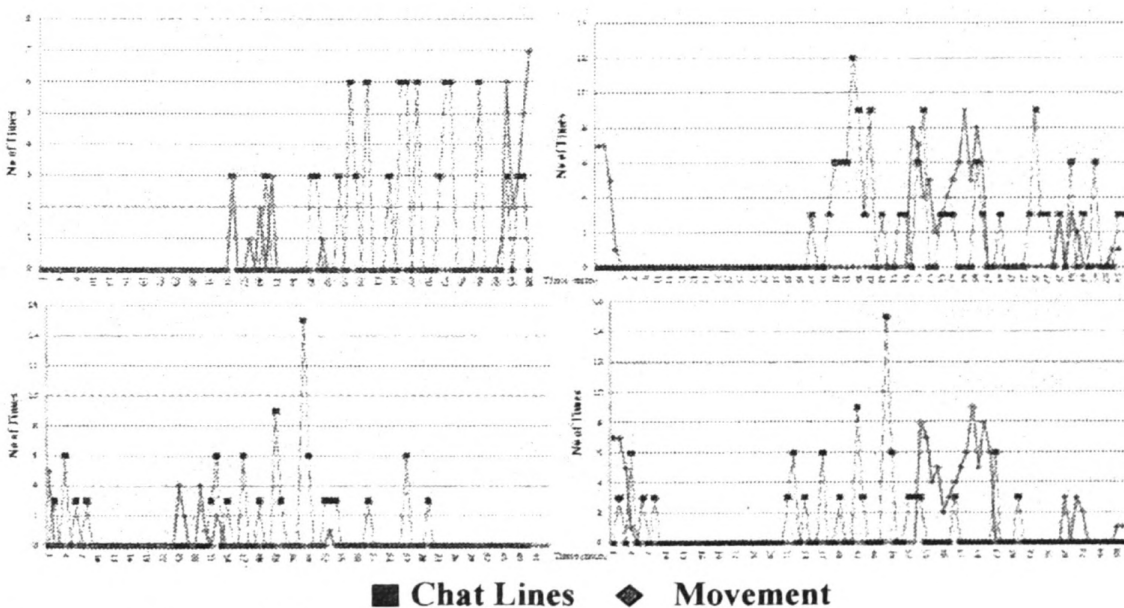


**Figure 3: Activity breakdown in Discussion session**

In the discussion session, students did three activities. They try to solve the problem

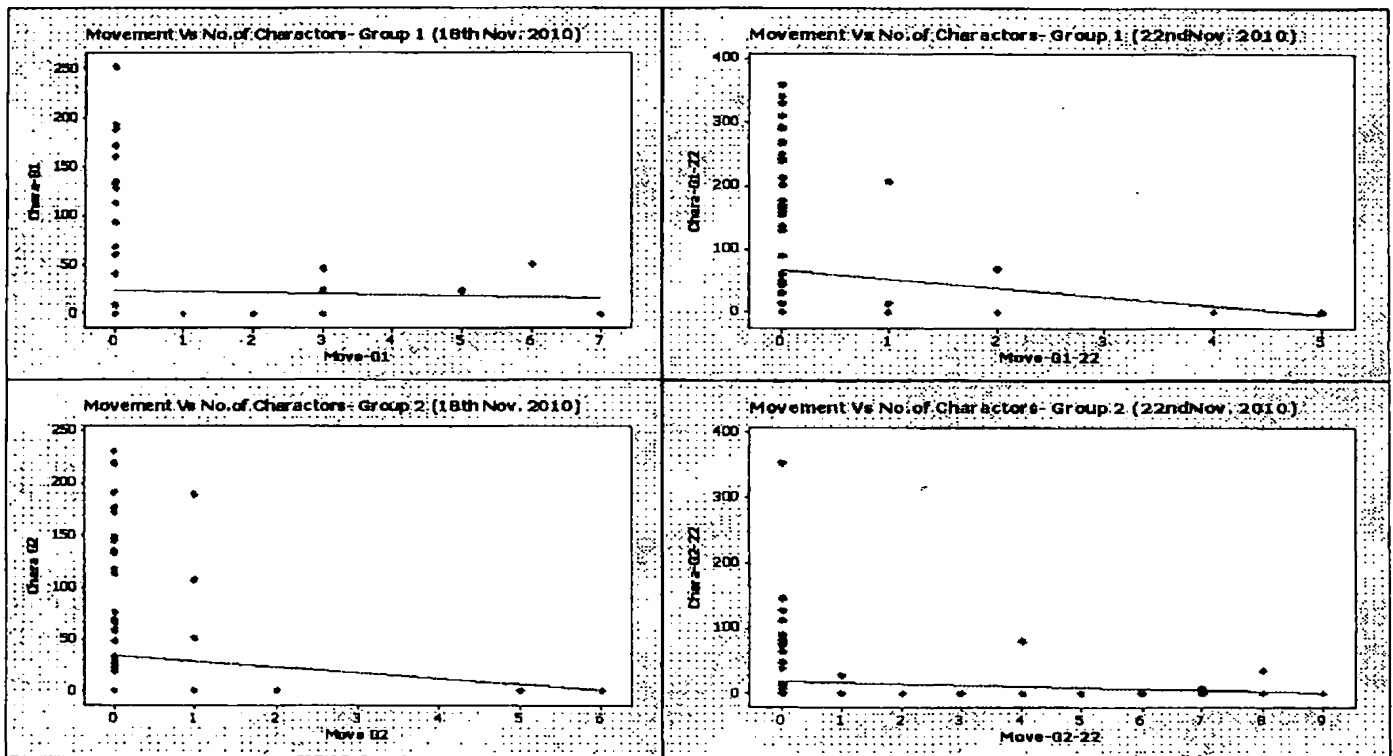
individually, chat with others to gain or provide support and move to other places. Based on the stored data, the activities which carried during the discussion stage can be shown in Figure 3. They spend more time with no activity. We can assume that the students hasn't did any activity during they try to find the solutions individually. Students spend more time with chat discussion. In that time, students directly involve with the learning process. It is help to evaluate their answers and get the feedback from the teacher.

The remaining activity is the movement. Student can be able to change their positions. Movement affects the student learning behavior. The relationship between chat and the movement analysis want to identify whether movement is increase the learning capability or not. Usually movements reduce the chat speed. That can be visible in Figure 4. As shown in Table 1, when student change the position the chat lines were reduced. In each occasion (four session), it is shown some significant difference of chat lines between movement and non-movement. But there are short chat lines as well as long chat lines. To clarify further, the number of characters can be got instead of chat lines.



**Figure 4: Chat and Movement Analysis**

**INVESTIGATE THE STUDENT BEHAVIOR IN VIRTUAL CLASSROOM WITH PROBLEM BASED LEARNING ENVIRONMENT**



**Figure 5: Statistical Analysis**

The analysis of chat characters can be shown in Table 2. In movement time, average characters per minute are reduced than the non-movement time except one occasion. There is a significant gap of characters in three occasions. The remaining one has highest rate when it has movement. There is a conflict because of one occasion the rate is changed. Then the average movements per

minute were calculated. In that special occasion got the lowest value for the average movement per minute.

There should be negative relationship between movement and character amount which student typed.

Further analysis can be done using Pearson correlation coefficient to find the affection rate as shown in figure 5. The formula for Pearson's correlation is as follows.

**Table 1: Chat and Movement Analysis**

	1 <sup>st</sup> Day	No	Move	2 <sup>nd</sup> Day	No	Move
1 <sup>st</sup> session	line per	4.6	4.25	line per	8.35	5
2 <sup>nd</sup> session	minutes	5	3	minutes	5.3	3

**Table 2: Chat and Movement Analysis**

	1 <sup>st</sup> day	No	Move	2 <sup>nd</sup> day	No	Move
1 <sup>st</sup> session	Chara per minutes	12	45.5	Chara per minutes	177.5	95.67
	Movements per min		3.5	Movements per min		1.33
2 <sup>nd</sup> session	Chara per minutes	93.	115.33	Chara per minutes	90.85	57.5
	Movements per min		1	Movements per min		6

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{(\sum X^2 - \frac{(\sum X)^2}{N})(\sum Y^2 - \frac{(\sum Y)^2}{N})}}$$

[2]. Cucchiara, R., *Probabilistic posture classification for Human-behavior analysis*, volume 35, Issue 1 ;42-54

Where;

r- Correlation coefficient between X and Y

X- Character amounts within five second

Y- Movement Times within five second

N- Size of the sample

In four session results were -0.02, -0.14, -0.36, -0.12 respectively. The values are very near to zero and far to -1. There is a negative, but very slight relationship between movement and characters.

### CONCLUSION

First, the activities which are done by avatar in the virtual environment can be collected through the sensors. Then we have developed a tool to visible the students and teacher center of gravity movement with the chat data. Through that system, any person can get a clear idea about the position of the students and teacher as well as chat records in given date and time period. We have focused the student movement and chat data. Chat data clearly indicate the student's involvement of education.

But student movement reduces the chat occurrences. These results indicate that movement reduces the student's involvement in educational activities.

This is a potential area for conduct some future research to provide some better world for e-Learning. The picture of the avatar will replace with the real user face. Then try to analyze the emotional feeling of the real user and indicate their feeling about the class during the learning session.

### REFERENCES

- [1]. I. Perera, *Managed learning in 3D multi user virtual environments*. International journal of digital society, No 1, 2010