

Analyze the Student Behavior in Virtual Classroom with Problem Based Learning Environment

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Abstract

The advance step of e-learning is 3D Multi User Virtual Environment uses 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. This research study was carried out to analysis the behavior of the students who are attaché to the e-learning system. The activities of a sample of students who are in Second Life were recorded during the class session and stored data could be analyzed. We developed a relationship among the student activities and the involvement in education. Student feel more comfortable and increase the involvement of education during them used their native tongue for communication. In addition, the performance and student involvement depend on the capability of teacher and the content of the subject.

Keywords: e-learning, virtual environment, chat, movement

1. Introduction

Learning is a process of acquire new or modify existing knowledge, skills, behaviors and values. The innovative information may be arising through out 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 for 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. 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 Second life virtual environment which is developed by Linden Lab launched on June 23, 2003.¹

Using 3D environment, the practical sessions, tutorials, class sessions, discussion sessions, educational activities etc, can be conducted. Although distance learning has numerous advantageous, student behavior is difficult to measure and analyze. Student behavior is important topic when the classes are conducted in virtual environment. Because of 3D virtual space facilitate to carry out different kind of activities such as flying. As well as, the attractiveness of the virtual environment affect their behavior. Student behavior may affect the involvement of education. In each session, student activities affect the involvement of education in different rate. If we can identify the appropriate student activity for each session, teacher can keep the student alive with the subject.

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Identify the best method which is the optimal way to deliver the knowledge in each session is the target of this research.

This paper describes the possibility of monitor and analysis the avatar behavior during the class session to improve their involvement in education. To accomplish it, the avatar monitoring tool was developed. The behavior of a sample of students was recorded in each session during the experiment. We could observe avatar movement and chat data for given data and time period through the developed tool. The appropriate data were gathered and conducted a statistical analysis to identify student behavior. The student involvement in education in each occasion could be estimated and identify the reasons for such behavior. Through this analysis, we can be able to propose some characteristics which encourage the active participation of student avatars.

The remainder of this paper is arranged in to five sections. The monitoring tool, gathered data and statistical analysis were described in next sections. This is the potential area for future research. In future, we will be able to propose some method to get the student avatar feeling during the class session.

2. The Related Work

Today e-learning is not only for the student to gain knowledge but also it is useful to workers for training.⁶ Workplace learners can be better served by e-learning environments rather than conventional training. E-learning is being spared among all over the world with the virtual environment. Students who engage with e-learning enjoying the class more, being more engaged, and having greater intentions to participate than students from the traditional classroom.⁸

To enhance the effectiveness of e-learning, the language barrier is major problem. There is a tool developed for the multi-linguistic to destroy the language barrier among the e-learning participants³.

Some of the authors have already investigated the possibility of carrying out Problem Based Learning in virtual environment.³ They were successful and already established a PBL model in a virtual space. Universities

conduct their various educational projects and courses using second life.

Exercises, assignments and some activities are conducted based on this platform⁵⁾. Through the activities, try to develop the creativity, improve the programming skills, measure the preference to use virtual world.

Teacher difficult to observe students' interactions in an E-learning environment, the peer assessment appears more important. In that case they used peer assessment method to assign the appropriate score to each student.⁷⁾

In the real world, tracking systems were developed to analyze the behavior of students. Try to identify the activities and determine the situations⁴⁾.

In the virtual environment, analyze the student behavior is some what difficult. Although, the various courses and experiments conduct based on virtual environment, the analysis of student behavior in such environment is very rare.

3. Background of the Experiment

Second life is a 3D virtual space where Avatars are active on behalf of the human users. One of the qualities for learning in virtual environment is that it gives one a strong sense of reality. Therefore virtual classrooms were built like real world classes. Six students and two teachers were participated in this experiment. One teacher from the Nagaoka University and a student play the teacher's role 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. One group of each day uses their native tongue for communication by using the translation system. English language is used by other group.

Electronic structure & atomic orbital and BCC crystal structure were the topics of two classes. The classrooms were consisted with different architectures to represent the subject content. BCC crystal models and atomic structure model were established in appropriate classrooms. To give some educational background before the class, different kind of molecular and atomic models were placed in the Nagaoka Island which is used for the experiment. First day, the experiment includes three sections. The basic knowledge relevant to experiment 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 session started with the problem. Students trying to find the solution separately and finally they discussed their findings and problems occurring during the problem solving. In the discussion session, students could be able to move to other places with the permission of teacher. They can be accessed the crystal and other models to answer the question and verify their findings.

4. Methodology

Students and teachers enter the second life and the activities can be carried. Second life indicate the

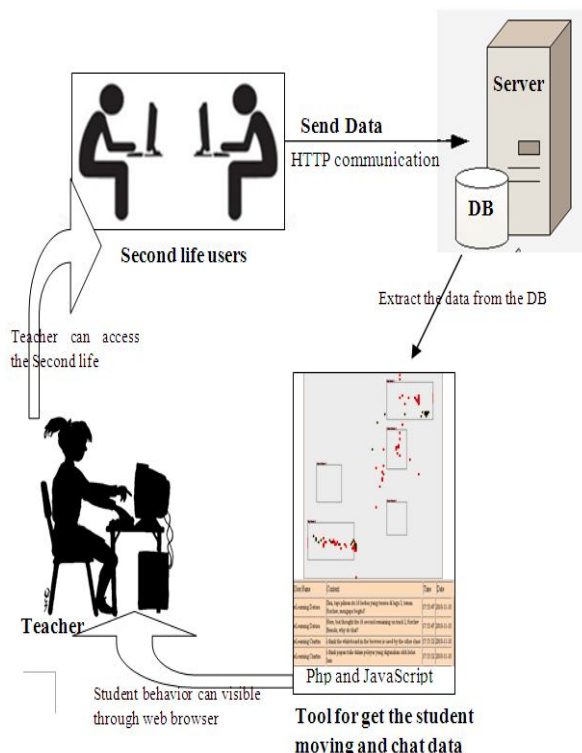


Figure 1: Architecture of the system position(x,y,z coordinates), status (walking, running, flying,etc.) of each avator and it facilitate to chat with other avators.

The position of the avator, chat data and other related data were possible to collect by installing sensor primis in diferent parts of the classroom.²⁾ In addition the activieities which are carried during the experiments can be collected. The details of their activities send to the server using the

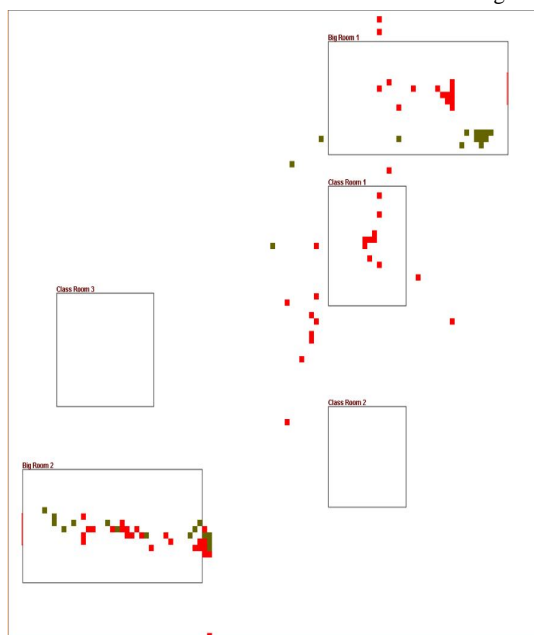


Figure 02: Map the Nagaoka Island to web page. Red and green dots indicate student group and teacher center of gravity respectively

http and post method. The data were recorded in the server database. Then we can retrieve necessary information from the database as shown in Figure 1. Recorded data used for following analysis. The center of gravity for each group can be found through the position of avatars. Teacher can observe student behavior through the second life and web browser simultaneously.

According to the time, the chat data and center of gravity

User Name	Content	Time	Date
eLearning Datura	Sini, tapi pukuran 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 03: chat data for given time and date

changed. The virtual island, map to the web page using php and JavaScript as shown in Figure 2. Then, chat data and center of gravity movement showed based on the time. It has facility to get the data for particular date and any time duration. The teacher and students movements and chat data can be visualized through the system. Using that system the analysis part could be carried.

5. Result and Discussion

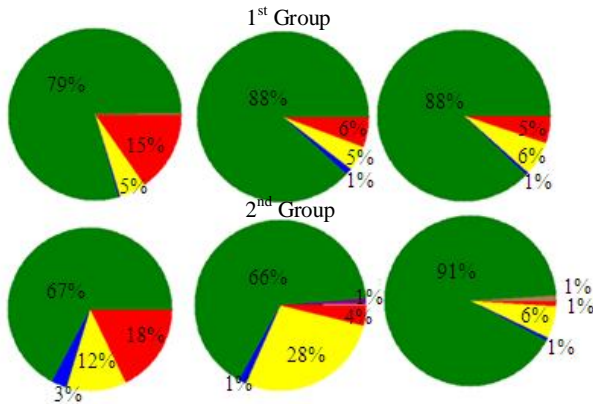


Figure 4: Different Situation in First Day

Students carried out different kind of activities through out the each session. Sitting, standing and typing are the major activities. Six students in two session's activities can be shown in Figure 4 and 5.

These activities are directly related with the education behavior. Fortunately, there are no any students showed the away status. There are small percentage goes for walking and flying activity. Because of students go outside and play with the models to find or verify their answers. Then we are trying to get the relationship between walking and flying with the education. In the class session there is no movement appeared from the students. Therefore discussion session is only relevant to identify a relationship.

In the discussion session, students had done 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, they spend more time

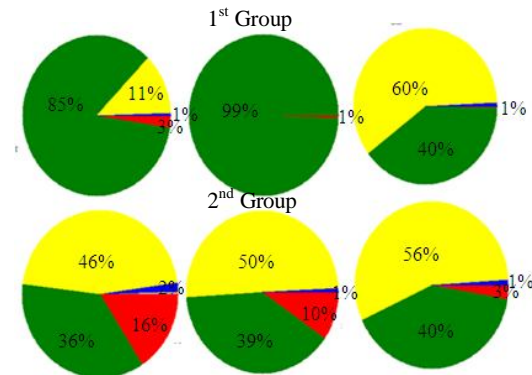


Figure 5: Different Situation in Second Day

with no activity according to figure 6.

We can assume that the students hasn't done any activity during they try to find the solutions individually. Then secondly, students spend time for 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.

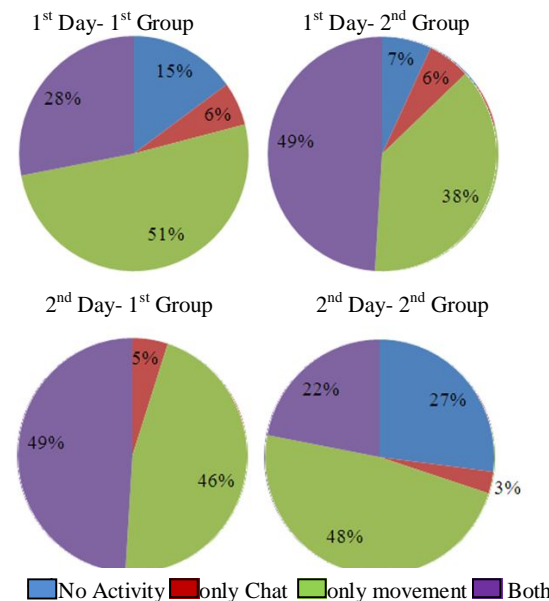


Figure 6: Activity breakdown in Discussion

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 help to identify whether movement is increased the learning capability or not. Usually movements are reduced the chat speed. That can be visible in Figure 5. When there is movement, (blue line) chat amount (red line) was reduced or got the zero level. In the same time, it is difficult to conduct two activities. Therefore, when they move the chat amount was reduced. This is only qualitative assumption. We have developed a quantitative analysis using chat data.

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

Y- Movement Times with in five second
N- Size of the sample

According to the Pearson's correlation values in Table 1, there is a negative but very weak relationship between movement and chat data. Overall, the movement reduces

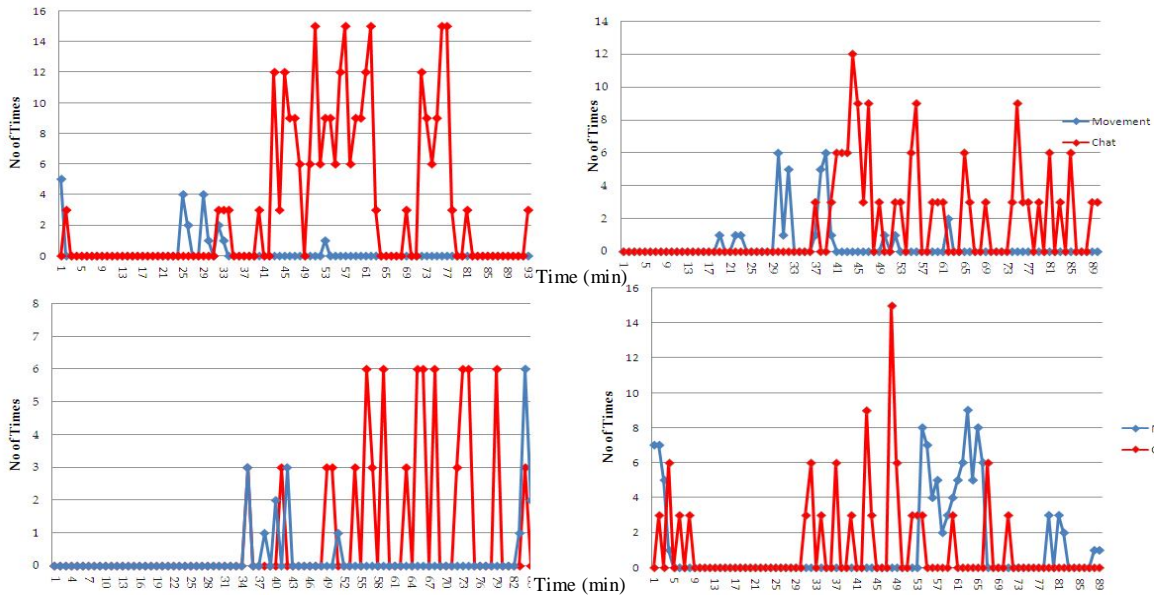


Figure 7: Chat and movement analysis

further, the number of characters can be got instead of chat lines. The analysis data of chat characters can be shown in Table 1. 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 chat data in that experiment. Because any person difficult to conduct two activity in same time. The concentration may be reduced when they do more activity in concurrently. At the movement time, the student's involvement in education may be reduced. In addition, when students used their native tongue the

Table 1: Chat and movement analysis

	1 st Day							2 nd Day						
	Language	Chat lines per minute		Characters per minute		Movements per minute	r	Language	Chat lines per minute		Characters per minute		Movements per minute	r
		No Move	Move	No Move	Move				No Move	Move				
1 st Group	English	4.6	4.25	124	45.5	3.5	-0.02	Native tongue	8.35	5	177	95.67	1.33	-0.36
2 nd Group	Native tongue	5	3	93	115.3	1	-0.14	English	5.3	3	90	57.5	6	-0.12

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

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

Where;

- r- Correlation coefficient between X and Y
- X- Character amounts with in five second

movements per minutes were 1.33 and 1 respectively. Corresponding values were 3.5 and 6 when they utilize English for communication as shown in Table 1. When they used their native tongue the movement rates have been decreased and chat amount was increased. Students have showed high movement rate and low chat amount during they used non-familiar (English) language. The different behavior appeared from student may be the result of language. Students feel difficult to make sentences with less-familiar (English) language. They try to get the help from machine translation or dictionaries. Therefore chat amount was reduced during they used English language. If they didn't understand the lecture or discussion the concentration may be changed to other activity. This may be the reason for get high movement

rate during the English language session. Students feel more comfortable and increase the chat data and reduce the movement when they used native tongue. The involvement in education should be increased during the session which they utilize their native tongue.

In addition, there is a significant characteristic regarding the chat characters. First group used high character rate in both occasions than the second group. In both sessions the first group subject was Electronic structure & atomic orbit and that class was conducted by experienced teacher. That subject has high qualitative rate than the BCC crystal structure subject. The character rate may depend on the teacher's capability and the content of the subject. The student involvement in education varies based on the teacher's method of instructions and subject content.

6. Conclusion

First, the activities which are done by avatars in the virtual environment can be monitored through the sensors. Students have done different activities during the each session in the experiment. Sitting, typing, walking, flying and away are the different activities carried out by students. In class session, student showed only sitting status and typing activities. Sitting and typing indicate the student's involvement of education. There is no significant characteristic during the class session. Therefore lecture session was neglected.

In the discussion session they have done various activities addition to typing. They were in the sitting status. Students have moved outside and verify their acquired knowledge through the models placed in Nagaoka Island. We try to develop a relationship between movement (walking and flying) and the chat data. Through that relationship, movement affection to educational activities can be visualized indirectly.

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.

The analyzed data indicate the high movement rate and low chat amount during the period which student used English (not native tongue) for their communication. Therefore the involvement in education was reduced when they used non-native (English) language. The native tongue increases the user comfort ability and involvement in education. Student is frustrated with the non-native language. The student performance can be increased in an effective way with the native tongue. They don't want to put some extra effort to understand the learning contents. Although this is a new subject to them, they feel some familiar with the learning content because of native language. Student can be given their full attention on

learning content and the innovation can be raised. There is a possibility to improve the thinking ability of students and get the maximum benefits from the lecture. The creativity and logical thinking may be increased due to familiar with the content.

The high character rate was appeared in the period which is conducted by the experienced teacher and the qualitative subject. The student involvement varies based on the Teacher's method of instructions and the content of the subject.

This is a potential area for conduct some future research to provide some better world for e-Learning. The real user face image can be put instead of the avatar face. Then try to analyze the emotional feeling of the real user and indicate their feeling about the class during the learning session. We can find a relationship between students feeling, chat data and the movement through analyze. Student feeling may be affected the chat and the movement. Finally, we can identify which feeling and occasion improves the chat data and reduces the movement rate. The characteristics (feeling) which indicate the high involvement in education and teacher can be changed the method according to the situation to get the maximum usage from the lecture. The effectiveness of the class or student involvement can be raised through these findings.

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