PROBLEM BASED LEARNING IN METAVERSE

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Abstract:

Problem Based Learning (PBL) is a powerful tool for both science and engineering education in the real world. Therefore, Japanese educators/researchers (with assistance from a US educator) carried out a pilot study to determine the effectiveness of using PBL activities in Metaverse. Their project was carried out by student teams from the US and Japan. Each team worked independently on the same PBL project. A discussion about this successful pilot study is provided.

Introduction:

Problem Based Learning (PBL) is a powerful tool for both science and engineering education. It can enhance creativity and has been used successfully to carry out many projects in the real world. Since our global community continues to change, scientists and engineers are needed to creatively solve the new and challenging problems of the future. PBL, as an educational tool, may be used to address this problem. Problem Based Learning may be simply defined as an instructional setting in which students work in small groups to solve ill-structured problems. Their teachers provide guidance and serve as facilitators.[1]

Over the past few years educational organizations in Japan and the US have used and analyzed the effect of PBL in the courses that they offer to their students. Since PBL is very useful in real classrooms, some Japanese educators wondered if it would be effective in the virtual world. To find out, they tried a pilot study for a PBL project in Metaverse. Their project was carried out by student teams from the US and Japan. Each team worked independently on the same PBL project.

Details of the PBL Project in Metaverse:

Metaverse provides three dimensional virtual space services throughout the world.[2] It offers complementary activities between traditional face to face learning and e-learning, with cutting-edge technology that can be used for experimental education. A representative example for it is Second Life (SL), an online 3D community which started

its service in 2003. Here one can buy land, establish buildings on it, and carry out activities through Avatars (which act on behalf of their human users).

To start, the Japanese Educators/Researchers bought an island in SL. This island is owned by Nagaoka University of Technology (NUT). Researchers at the University built virtual buildings containing virtual classrooms, so that PBL projects could be carried out in virtual space.[3] They wanted the virtual learning environment to resemble the real life situation as much as possible. A typical classroom usually has enough room for a group of students to meet and share ideas. It includes items such as tables, chairs, and blackboards. For this project, two buildings with similar structures were established and placed close to each other. This way, group discussions for PBL could take place simultaneously and independently. See Figure 1.

Figure 1. Virtual buildings on the Japanese Island in SL.

Each building contains a virtual classroom with two tables and seven red chairs per table. See Figure 2. Here students can communicate by chatting. Their conversations are

recorded by an auto-recording system. The blue box on the wall of the virtual classroom (Figure 2) collects the chat dialogues. It was made by Linden Script Language for SL. These recordings are sent to a Web server through HTTP by using a Post Method. The data is stored there and can later be accessed by teachers and students by using browsers such as the Internet Explorer and Fire Fox.

After preparing a virtual learning environment, the Japanese educators arranged for a group of Japanese students (16 years old and older) to carry out a PBL project in SL. At the same time, they invited a US educator and her group of US students (16 years old and older) to independently carry out the same PBL project, using their virtual classrooms in SL. See Figure 2. The student teams were asked to solve the following problem. What will the ordinary (typical) house look like in the near future (during the global warming era)? Their final answers include information about the function of the house as well as the house itself.

Figure 2. US team members hold a brainstorming session in the virtual classroom.

It must be mentioned that in order for students to carry out the PBL activity in SL, they need to perform various functions in the virtual world. To start, they register and name an Avatar to carry out activities on behalf of them. They make their Avatars move by using tasks such as walking, running, and flying. They use the teleport function to transport their Avatars to different locations in SL. The students brainstorm and participate in group discussions (in the virtual classroom) by using the chat function. Also they design and prepare prims (three-dimensional objects, such as cubes, written in Linden script) in order to build their typical house of the future.

Each student group began this project (in the virtual classroom) by brainstorming and holding discussions about the problem that needed to be solved. For the duration of this project, the educators provided guidance and served as facilitators. Some US student chat recordings (about the purpose of their house of the future) are written below.

AVATAR	DIALOGUE	TIME	DATE
Teacher	"What do you think the purpose of the house should be?"	19:53:25	2009-03-05
Joey	"Comfortable housing."	19:53:40	2009-03-05
Joey	"Energy & cost efficient."	19:53:50	2009-03-05
Leroy	"Environmentally friendly."	19:53:50	2009-03-05

Garth	"Reduce our dependence on oil."	19:54:06	2009-03-05

The students also traveled to various locations in SL to obtain information for solving the problem and to learn about making prims at Natoma, etc. Figure 3 shows students making prims.

Figure 3. US student team members practice making prims.

Project Results:

The student teams in the US and Japan successfully designed and built typical houses for the future (Figure 4). The US house is environmentally friendly. It is a dome-shaped structure with solar panels on the roof and a floor made of synthetic wood to preserve the Earth's trees. The Japanese building (on the right) is an energy efficient, dome-shaped house with a ceiling that automatically opens so that cool breezes can flow though it.

Figure 4. US house (front left) and Japanese house (back right).

This PBL project showed that there are certain benefits for carrying out such an activity in a virtual world (actually a form of advanced e-learning). Here the students are not restricted by time and geographical location. They can work at any time and can enter SL from most locations throughout the world. Also it is not necessary for them to spend lots of money on building materials as needed in real life situations.

To obtain more information about the PBL project in SL, each student was asked to complete two questionnaires, relating to the project.[4] The results showed that both the US and Japanese teams felt that prim building was a difficult task and that the teleport task was relatively easy. On the other hand, the Japanese team found the task of chatting difficult, while the US team found it easy. This may be due to the fact that the Japanese language is more difficult than English. The Japanese students found basic movements (such as walking and flying) to be relatively easy, while the US team considered them to be relatively hard. In addition, both teams gave a relatively high rating of satisfaction for the PBL class in Metaverse. However, the US students seemed to be more satisfied with the PBL project in Metaverse than the Japanese team.

REFERENCES

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