Journal of Information Systems Education
Volume 11(3-4)

MOO: An Active-Learning Environment For Teaching Object-Oriented Concepts In Business Information Systems Curricula

John Towell[†]
Department of Computer Science, Carroll College
Waukesha, WI 53186, U.S.A

Abstract

Object-oriented concepts may become increasingly necessary for understanding and using business information systems. Business students are often exposed to object- oriented concepts in non-programming courses. We have used a text-based virtual reality, called a MOO, to provide students with an opportunity to learn object-oriented concepts by actively creating and using objects - but without writing code. After one lecture and two fifty minute labs, 75% of 172 business students successfully solved a goal-oriented exercise which required the use of object-oriented concepts. The MOO environment allowed the student to experience as well as learn object-orientated concepts without the use of a rigorous programming language.

Keywords: Object-oriented, business students, virtual reality, MOO, teaching, presence, constructionist

1. INTRODUCTION

Educating business students during these times of tumultuous technological change often appears an uncertain task. There is no doubt that the complexities of business information systems will continue to increase and there are those who believe this complexity will require the use of thinking styles based on object-orientation (Fingar, 1996). Teaching fundamental object-oriented (OO) concepts is often conducted in non-programming courses in the business college curriculum. Hence, in the absence of an active-learning experience, such as programming, the students' understanding remains descriptive. We were interested in the use of text-based virtual reality to create an active-learning OO experience without the rigors of programming. This manuscript describes a type of text-based virtual reality called a MOO, and how it was used as a tool for teaching OO concepts in an introductory business information systems course. The results reported here demonstrate that OO concepts can be learned by business students after one traditional lecture and two laboratory exercises in the MOO.

2. METHODS

NETWORKED VIRTUAL ENVIRONMENTS – MOO

The text-based virtual reality used in the studies reported here is of the MOO (Multi-user dimension Object Oriented) type. This system, developed primarily at Xerox PARC (Palo Alto Research Center) by Pavel Curtis (Curtis, 1992), is composed of a server and a database which are available (ftp://ftp.lambda.moo.mud.org/pub/MOO/) at no cost. The server can provide simultaneous connections for hundreds of Internet users via the telnet protocol (or other more specialized clients). It acts as a parser for interpreting commands given by connected users, and it serves as a database management system. The database contains information about objects that constitute the environment in

[†] jtowell@cc.edu

which the user operates. This information includes the structure of the environment, or topography which typically consists of rooms connected by entrances/exits that can be navigated with the use of simple commands. The topography of the environment used here, called OMIS MOO (Figure 1), was recorded on a map which could be easily seen by the user. The database also contains information about objects contained within the topography and finally, it contains information about the object to which the user is connected. This object can be thought of as an avatar or virtual representation of the user and will be referred to in this manuscript as simply the virtual student. Virtual students can easily communicate by textual exchange with any other virtual students (and the instructor) who occupy the same room. More sophisticated techniques are available for communicating with those who are in other rooms or even in other networked MOOs. The MOO environment is extensible and students need not know how to program to build and characterize their own rooms, exits/entrances and objects. We have hypothesized that this combination of "being in" an architecture of connected rooms (in a virtual sense), building and interacting with objects, and communicating with others, creates an environment which is aptly suited for active-learning or constructionist experiences (Papert, 1991), particularly with regard to object-oriented concepts. Others have also recognized the potential of this environment for teaching (Haynes, 1998).

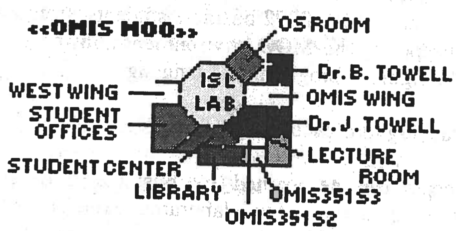

Figure 1: Topography of OMIS MOO

SAMPLE POPULATION

The subjects in the current studies were composed of students in two sections of "Introduction to Business Information Systems" taught in the College of Business at Northern Illinois University (NIU) spring 1999. The total number of students was 172. Marketing and management majors composed roughly half of the classes, operations management and information systems (OMIS) majors constituting approximately 25%, and the remaining 25% was composed of various majors including finance and accounting.

PREPARATION

Three exercises were conducted before the students were presented with an OO goal-oriented task. The first exercise was a traditional lecture on object-oriented concepts which included fundamentals such as objects, methods, attributes, inheritance, encapsulation and polymorphism. This was followed by a demonstration where the students observed in the classroom the instructor logging into the text-based virtual reality, OMIS MOO, navigating the topography (Figure 1), looking at the map, communicating with another virtual student, and creating and manipulating objects. The second exercise involved the students logging into the MOO and was focused on proper use of the telnet client available in the NIU computer labs, connecting to the MOO, navigation, and practicing communication commands. Most of the 60 minute period was spent with the instructor interacting with students in the laboratory having difficulties using the telnet client and logging into the MOO. In between interactions with the students in the laboratory, the instructor gave directions to the virtual students in OMIS MOO for various communication commands and requested that the virtual students practice them. The third exercise required the students to be in the OMIS MOO Lecture Room (Figure 1) and the instructor presented a series of slides which directed the following manipulations: (1) creation of an object called a note; (2) examination of the note's methods; and (3) using the appropriate method for writing on the note, i.e., setting an attribute. After this laboratory, students were able to connect to OMIS MOO at any time to practice and access the slides shown during the exercise. These slides were kept in the OMIS MOO Library (Figure 1).

GOAL-ORIENTED EXERCISE

Students were required to connect during class time to OMIS MOO and conduct the assignment that was posted on an object in the 'ISL LAB' (Figure 1). This required examining the object to understand its methods and then, apply them to gain understanding of the assignment itself. The assignment told the students to go to a designated room in the MOO and write their names on a blackboard found there. Then they were to go to another room and drop the note object they had created during the previous assignment into a box that was there. The instructions for Section 3 were the same as Section 2 except that different locations were used for the object on which they were to write their names, and the box into which they were to deposit their objects. The blackboard on which they wrote their names time-stamped the event when the appropriate command was given. The instructor was connected during the class period but only gave two types of information. First, the students were regularly informed by announcements where the assignment was located. Second, if a student sought out the instructor, the instructor would only tell the student that to learn how an object works, you must 'examine' it. A MOO object reveals its methods when the 'examine' command is given.

3. RESULTS

Of the two sections of 85 and 87 students, 80% and 83% logged into OMIS MOO during their allotted 60 minute time period. The first part of the assignment, that which was required for receiving attendance credit, was accomplished by 85.3% of the Section 2 people and 87.5% of the Section 3 people who logged in. This task required the student to: (1) manipulate the object on which the assignment was located;

(2) go to the appropriate room; (3) determine how to write their name on the blackboard (ascertain the object's methods); and (4) execute the appropriate method (employ method to set the object's attributes). The mean times for task accomplishment for the Section 2 group and Section 3 group were 30.7 minutes and 28.3 minutes, respectively (Figure 2).

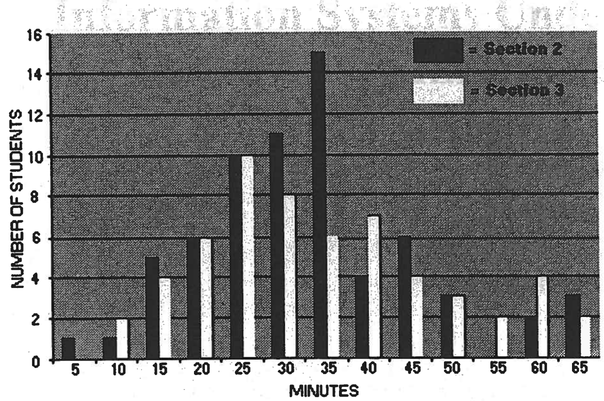

Figure 2: Number of students versus time taken to accomplish object-oriented goal.

The second part of the assignment was to navigate OMIS MOO to a designated room and put a note into a box that was inside the room. The notes found in the designated boxes indicated a 75% success rate for both sections.

4. DISCUSSION

Although it is known that people are less inhibited in computer-mediated communication (Sproull, 1991) , it was nevertheless, a great surprise to observe a generally quiescent class erupt into nearly ceaseless talking when in the MOO environment. This was true for both sections and warrants the use of a moderated room which governs the number of people who may speak concurrently (Towell, 1995). It has been shown that under conditions similar to those reported here, nearly 70% of the people in a MOO report feeling some degree of "being there" or presence (Towell, 1997). At this time it has not been demonstrated to what degree various environmental factors play towards the generation of presence in text-based virtual reality. One such factor may be the imposition of the spatial metaphor (Evard, 1993) which results from seeing the map, navigating the topography and interacting with objects in the environment, including other people. Whatever these factors may be, further studies are planned to assess relationships that may exist between virtual presence and learning efficacy.

The exercises discussed here were followed by increasingly difficult assignments in the MOO throughout the semester. At the end of the course the students were asked to rate on a scale of 1-5 the degree to which they agreed with the following statement; "The OMIS MOO environment did *not* help me gain any sense of what object orientation means." Nearly 75% of the students answered with a 4 or 5 which indicated that they believed the MOO had helped them gain a sense of what object orientation meant. In a similar manner the students were asked to rate the degree with which they agreed with the following statement; "I would rather attend a lecture than participate in a MOO laboratory." 65% answered with a 4-5. Only 16% answered with a 1-2 (preferred lecture) while the rest answered with a 3 (19%) and hence had no preference. This indicated most students preferred the MOO to a traditional lecture.

5. RECOMMENDATIONS

To help meet the challenge of contemporary technological change, we recommend: (1) that business students be taught the fundamental principles of object-oriented systems; (2) that business students learn and experience object orientation without having to learn a formal programming language; and (2) that these students should be allowed to experience object orientation by active participation in an immersive object-oriented environment.

6. CONCLUSION

A text-based virtual reality of the MOO type was used to study the feasibility of teaching object-oriented principles in a non-programming manner to junior- and senior-level students in the College of Business at Northern Illinois University. The student reaction to the MOO was one of surprising exuberance. After three preparatory exercises, nearly 90% of 172 students were successful in a goal-oriented exercise that required knowledge of the following principles of object-orientation: objects, methods, attributes, inheritance and encapsulation. Studies are currently underway to further assess the feasibility of using the MOO environment as a pedagogical tool in more sophisticated object-oriented tasks such as those involving polymorphism. It is concluded that the MOO-type text-based virtual reality can be used to teach object-oriented concepts in an active-learning environment and that the students found the MOO experience worthwhile and preferred it to a traditional lecture mode.

7. REFERENCES

Fingar, P., 1996, The Blueprint for Business Objects. New York, NY: SIGS Books and Multimedia.

Curtis, P., 1992, "Mudding: Social phenomena in text-based virtual realities." Proceedings of the 1992 Conference on Directions and Implications of Advanced Computing, Berkeley, CA.

Papert, S., 1991, "Situating Constructionism," Constructionism, eds. Idit Harel, and Seymour Papert. Norwood, NJ: Ablex Publishing.

Haynes, C., and Jan-Rune Holmevik, 1998, High wired: On the design, use, and theory of educational MOOs, Ann Arbor, MI ,University of Michigan Press.

Sproull, L., and Sara Kiesler, 1991, Connections: New ways of working in the networked organization, Cambridge, MA, MIT Press.

Towell, J., and Elizabeth Towell, 1995 "Internet conferencing with networked virtual environments." Internet Research 5(3), pp. 15-22.

Towell, J., and Elizabeth Towell, 1997 "Presence in text-based networked virtual environments or "MUDS,"" Presence, 6(5) pp. 590-595.

Evard, R., 1993, "Collaborative networked communication: MUDS as systems tools." Proceedings of the Seventh Systems Administration Conference (LISA VII), November, pp. 1-8, Monterey, CA.

AUTHOR BIOGRAPHY

Dr. John Towell is an assistant professor of computer science at Carroll College. Dr. Towell received his BA from the University of Colorado and his Ph.D. from Colorado State University. His research interests are in the effects of virtual presence on learning, communication, and knowledge creation.

STATEMENT OF PEER REVIEW INTEGRITY

All papers published in the Journal of Information Systems Education have undergone rigorous peer review. This includes an initial editor screening and double-blind refereeing by three or more expert referees.

ISSN 1055-3096