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USING THE *MOODLE* LEARNING MANAGEMENT SYSTEM AND *GREWPTOOL* COLLABORATIVE TOOL FOR TEACHING A PROGRAMMING LANGUAGE

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Abstract :- This paper describes an experimental study which has been carried out at the Near East University using the Moodle Learning Management System (LMS) together with two types of Web-Based Collaborative Tools (CTs): Standard CT and Advanced CT to create a virtual learning environment to teach programming languages. The aim of this study was to find out the student opinions when using an *advanced collaborative tool* and a *standard collaborative tool*. The results show that the use of a collaborative tool together with an LMS in a web-based environment increases the learning ability of students.

Keywords: **Moodle, learning management systems(LMS), tech programming languages, collaborative tool, web-based collaborative tools.**

1. INTRODUCTION

A learning management system (LMS) provides the platform for the web-based learning environment by enabling the management, delivery, and tracking of learning. LMS are often viewed as being the starting point of any web-based learning program. Some of the important issues when evaluating a learning management system are [1]: high availability, scalability, usability, interoperability, stability, and the security. A good LMS should be 100 percent web-deployable, requiring no additional client applications. It is also important that the LMS should support various sources from different manufacturers and it should be based on open industry standards for web deployments, and supports the various learning standards.

Some of the best known commercially available LMS systems are *Blackboard*, *WebCT*, and *Desire2Learn*. There are also many open-source and free LMS systems, such as *Moodle*, *Segue*, *Interact*, *CourseWork*, *Atutor*, *KEWL* and several others. Open source usually means that users have access to the source code of the software. Anyone can download and use the open source code, and more importantly users can write new features, fix bugs, improve performance, or learn how a particular problem has been solved by others.

Collaborative learning is one of the important topics in web-based education. There are several benefits to giving students assignments that they can work on collaboratively. The benefits of collaborative programming has been known and used in industry for some years [2]. Roschelle [3] and Chi et al. [4] report that students can undertake more complicated problems and gain a better understanding of the material when the work is done collaboratively. Although in general the benefits of collaborative work have been recognized there are still many open questions about it. Some typical questions are, is it better to pair a novice with an expert or pair two novices, or perhaps pair two experts ? Are individuals better at learning a programming language than pairs?

There are basically two types of web-based collaborative tools: *standard collaborative tool*, and *advanced collaborative tool*. The main difference between the two is that the advanced tool enables students to compile, save and run their programs inside the collaborative tool, making the learning process more enjoyable and more user-friendly, especially during the teaching of programming language. The advanced tool also enables the instructor and students to see each others screens during a session.

In recent years the development of collaborative tools has led to an increasing interest in web-based education. In this paper, a highly interactive and collaborative teaching environment has been created by supporting Moodle LMS with the web-based collaborative learning tool *GREWPtool* [5], named as NEU-VLE (Near East University Virtual Learning Environment). Moodle enables the students to follow the course notes on the web, to carry out quizzes and surveys, and to provide communication outside the classroom by means of chat tools. Web-based Collaborative tool supports the LMS based learning activity by providing a high level of collaboration amongst students. Students and the instructor can meet and exchange information using the collaborative tool.

2. THE RESEARCH STUDY

2.1 The Aim

The goal of the present experimental study was to find out the student opinions when using an *advanced collaborative tool* and a *standard collaborative tool* to learn a programming language in web-based education.

In order to reach this aim the authors have sought answers to the following questions:

1. Are there differences between the opinions of students using the advance collaborative tool and the standard collaborative tool?
2. How are the learning styles of the students using the advanced collaborative tool and the standard collaborative tool?
3. Is there a significant correlation between the learning styles of students using the advanced collaborative tool and the standard collaborative tool?

2.2 Setting

This pilot study has been carried out at the Near East University at the Department of Computer Information Systems during the 2004/05 spring semester using an LMS together with a collaborative tool. The developed web-based education system (NEU-VLE) has enabled the students to follow the lessons in their own places of study, using their own computers. It was sufficient just to use the Internet Explorer to access the NEU-VLE system.

2.3 Subjects

The GCPA (General Cumulative Point Average) grades of the students have been calculated and sorted in a descending list. Then, 18 students in odd numbers of the list were grouped to use the advanced collaborative tool, and 18 students in even numbers of the list were grouped to use the standard collaborative tool.

2.4 Materials and Procedure

The material is the NEU-VLE system organized by the authors. The Learning Management System MOODLE (www.moodle.org) has been used together with the collaborative tool GREWPtool (http://groupscheme.sourceforge.net/grewpedit) in an integrated manner. Both of these are Open-Source software products. Various utilities such as interactive course tool, self-test, assignments, resources which can be downloaded, chat, quiz, and internal mail have been offered to the students independently whenever they wanted. Students met their instructors twice a week using synchronous collaborative tool, where each session lasted for an hour. Collaborative tool has been used to deliver the lessons to the students, and to develop sample programs interactively in cooperation with the students. In addition, students had the chance of communication and exchanging information with each other synchronously, whenever they wanted, using the collaborative tool.

2.5 The Syllabus of Courses

Students using the online NEU-VLE access the system from their places of study at their choice of time, and a typical session is as follows:

- Student enters the system by linking to the web site: http://cis.neu.edu.tr.
- Student registers on the NEU-VLE system using the username and password assigned to them.
- The course notes are prepared in a weekly format and can be accessed by the students interactively at any time and from any place. The lecture notes are prepared interactively in SCORM (Sharable Content Object Reference Model) standards.
- After studying the course material students attempt to solve the self-test quizzes. Instructors can create timed assessments that help students to try quizzes multiple times. The system automatically scores multiple choices, true/false and short answer type questions and can display instructor created feedback, explanations and links to relevant course material. Although we have only used text, questions can contain images, video, and other multimedia files. The instructor can randomize the questions in a test so that alternative questions can be presented to the students.
- One of the innovative elements of the NEU-VLE system is that students and the instructor can meet at pre-specified times using the collaborative tool (twice a week, with each session lasting an hour). This feature has provided a highly interactive learning environment where the students could ask questions to the instructor in an interactive manner while all the students could participate in this interactive session. With the addition of the collaborative learning environment students felt more like in a traditional class-room.

NEU-VLE system has given the opportunity to the instructor to analyze the progress of each individual student in detail. The students are given the opportunity

to see their own activity and progress reports so that they can assess their status within the class. A typical Moodle screen layout is shown in Fig. 1. Lecture notes were largely in text format with audio enhancements at appropriate places. Students normally follow the lecture notes in the order shown on their screens which has been prepared carefully by the instructor. Sections of the lecture notes can be repeated as many times as required until the student is comfortable with the contents. It is recommended that the students attempt to solve the quizzes at the end of each section and a high grade is a requirement.

3. CONCLUSION

The findings of this study have shown that students using the standard and the advanced collaborative tool tend to be interested in, and willing to try to use collaborative tool. This is similar to the findings of Mackie and Romanow [6]. Mackie produced an experiment in which students were given the opportunity to use many different collaborative tools. The results showed students' willingness to use collaborative tools. Most effective strategies found were building of knowledge through increased practice and learning with online and web-based collaborative tools. In addition, with the ease of designing collaborative learning in virtual learning environments and with the presence of continual teacher support, learners overcome learning difficulties, and become more satisfied with their learning.

The experimental application carried out indicated that the opinions of subjects using the advanced collaborative tool were different in many respects to those using the standard collaborative tool. We can say that this is as a result of the enhanced features of the advanced collaborative tool. Specially, the compile/run option of the advanced collaborative tool has helped students a lot during the teaching of a programming language. Similarly, advanced collaborative tool offers every member of the group the ability to see each other's screen. This point has been a major advantage of the advanced collaborative tool.

It is an important result that the students using the advanced collaborative tool have shown statistically significant opinions towards the use of tools such as asking questions to each other, making discussions, sending messages to each and so on. Although the common properties between the advanced collaborative tool and the standard collaborative tool, such as the ability to communicate with the instructor, sending messages between each other, the presence of an editor are very important properties, they are not sufficient for the teaching of a programming language in web-based environment. We can say that compiler/run feature and the ability of the instructor and students to see each others' screens have added learning richness and effectiveness to advanced collaborative tool. This should be considered as a superiority of the advanced collaborative tool, especially in relation to teaching programming languages. This result is similar to the results reported by Booz [7]. The study "The Teacher Technology Leaders" provided faculty teams with access to an in-house developed online collaboration tool, the Virtual Curriculum Laboratory, where team members could collaborate on their semester-long team project.

According to authors' experiences, it is not sufficient to use only the tools such as chat, discussion forums, or whiteboard in web-based teaching of programming languages. If either the program or the output from the program/compiler can be sent to the instructor, or if better the instructor and the student can see each others' screens and work on the same program collaboratively, then a more efficient study environment can be established.

Another data collection instrument used during this study was the learning strategies of students. The aim here was to determine the learning strategies of subjects in two different groups. The learning strategies of subjects in both groups are at acceptable and high levels. The statistical analysis carried out has shown that there are no significant differences between the learning strategies of both groups. This means that the subjects which took part in the research study had similar learning strategies.

This experimental study has shown that significant differences found while using the standard collaborative tool are not as a result of students' learning strategies. It is almost certain that the differences have emerged as a result of the main properties of the advanced collaborative tool. Sarmiento [8] preliminary findings show positive outcomes and point to areas where additional research and development is required to investigate the effectiveness of online environments in support of learning.

The findings of the study help add empirical data to the relevant research, and are expected to help online administrators, instructional designers, instructional and technical support staff, and tool developers with developing better tools, offering appropriate workshops, and providing corresponding support.

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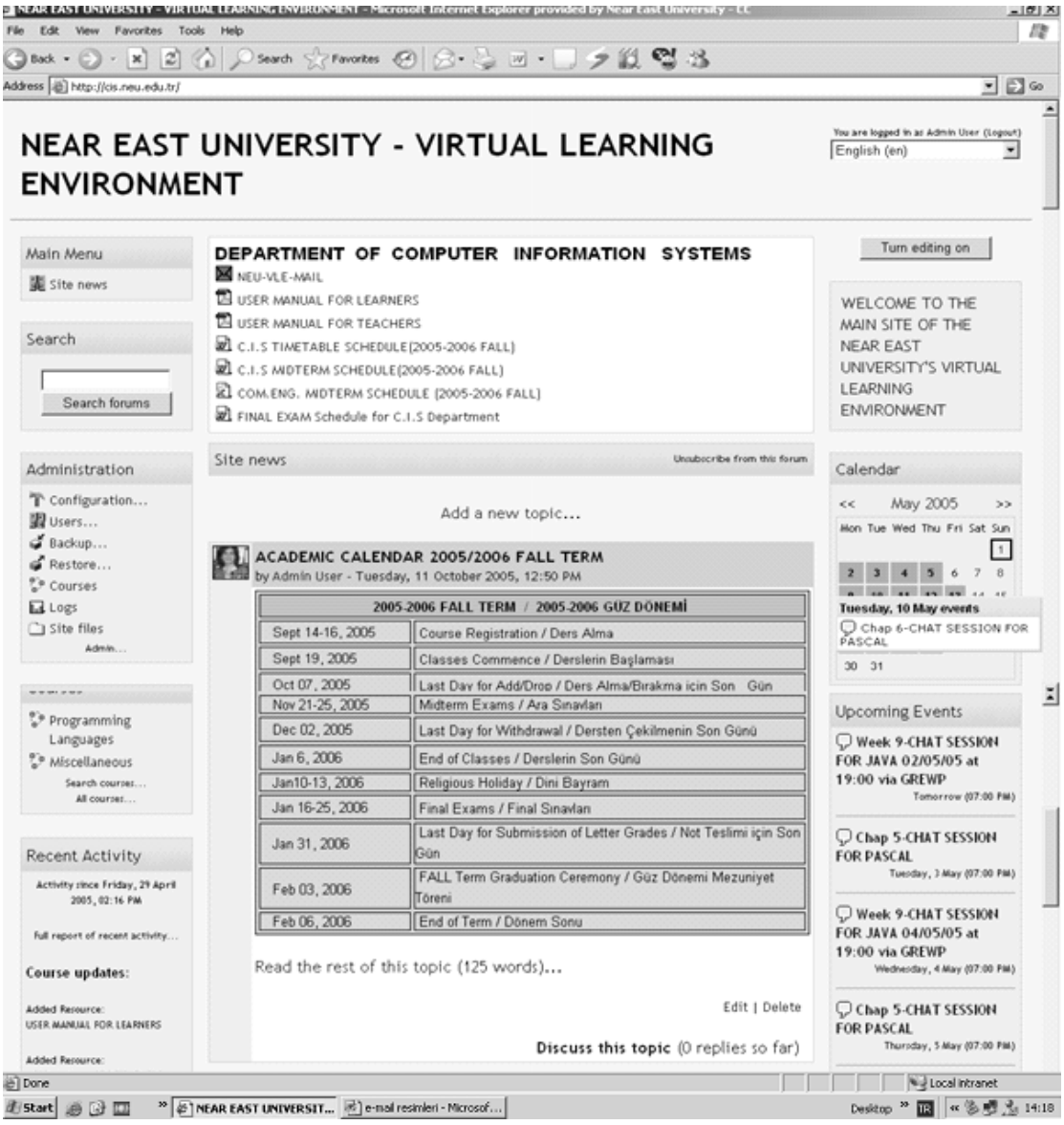

Fig. 1 A typical Moodle session