US-China Education Review A 1 (2011) 10-21
Earlier title: US-China Education Review, ISSN 1548-6613

Finding Support in Moodle: A Face-to-Face Chemistry Course for Engineers

Carolina Armijo de Vega, Lewis McAnally-Salas
Universidad Autónoma de Baja California, Ensenada, México

The aim of this paper was to know the students perceptions' of using online support in a chemistry course. To achieve this objective, a qualitative research was conducted over a chemistry course that was imparted in a face-to-face modality using a LMS (learning management system) for on-line support. The supports available in the LMS were forums, exercises, academic content presentations, readings and course administration activities. Focus groups were used to gather information. The total student population was 42, a non-probabilistic sample was chosen. The results showed that students had never used a learning support system such as the LMS, the platform helped reinforce the course materials and students found the forums particularly useful not only to communicate with the teacher, but also to help and solve other students' questions and share class exercises. Based on the results it is possible to recommend the use of online support for courses at any level, particularly, for those who are taught to freshmen, since in them, they find support and the safety of relying on theoretical-practical materials and the necessary communication to face the introduction to a new educational system.

Keywords: students' perceptions, online support, LMS (learning management system) use

Introduction

The incorporation of technologies into the teaching-learning process is not new, and its definition depends on the approach. Belanger and Jordan (2000) considered three ways that the technologies may be employed in organizations as they evolved through stages: (1) Technology insertion, when the organization is interested in the use of instructional technologies within the traditional classroom environment as a natural first step; (2) Partial conversion, when parts of courses is delivered online or others distance-learning technologies; and (3) Total conversion, the most extensive conversion of traditional classroom training to online or other distance-learning technologies. Meanwhile, Allen and Seaman (2005) considered the percentage of contents taught online and divided courses into four categories: (1) Traditional—Courses without online technologies, and the content is delivered in writing or orally, which means that the proportion of content delivered online is 0%; (2) Web-facilitated—Courses which use web-based technologies to facilitate what is essential for a face-to-face course using a LMS or Web pages to support the learning process, delivering online between 1% and 29% of course content; (3) Blended/Hybrid—Courses that blend online and face-to-face delivery, with substantial proportion of the content delivered online , between 30% and 79%; and (4) Online—Courses where most or all content is delivered online, 80% or more, typically with no face-to-face meeting.

As it is expected, none of the above definitions/divisions implies that one of them is better or worse than

Carolina Armijo de Vega, Ph.D., Facultad de Ingeniería Ensenada, Universidad Autónoma de Baja California.
Lewis McAnally-Salas, Ph.D., Instituto de Investigación y Desarrollo Educativo, Universidad Autónoma de Baja California.

the rest, because it is implied that is not the use of technology per se that makes the difference but the teaching skills of teachers. Kearsley (1995) indicated that technology amplifies human abilities, so it can help teachers to perform better in their courses, but will not be of much help in the absence of skills and competencies of the teacher, noting that if is to promote effective and efficient use of educational technology, one must pay special attention to items that support excellence in teachers. Currently, most researchers working with online courses, and those using other means, agree that the means by which education is provided—either through chalk and blackboard, or with modern technology, will bring not much differences in the success or failure of the course, and indicate that the predominant factor in designing a successful course is the teaching-learning method used (Clark, 1994; Hiltz, 1993, 1994; McIsaac & Gunawardena, 1996).

In the UABC (University Autonomous of Baja California) México, online education began in 1996, as in most Mexican universities at the time, the institution had no clarity on its implementation and requirements. Its evolution in the UABC has lacked a well-articulated development plan, which has resulted in online courses with very different approaches and teachers with very heterogeneous skills for teaching online. Considering this, to understand any opinions and the result of an online course in the definitions of Belanger and Jordan (2000) or Allen and Seaman (2005), it is essential to know the practices, activities and strategies used by the teacher to incorporate technologies in his/her courses and the context of students as well. This work was carried out in the Engineering Faculty of the UABC Campus Ensenada, Mexico. UABC is the biggest university in the state of Baja California, a Mexican northwestern state bordering the US that has six campuses. The six campuses of UABC together have 45,000 enrolled students, 8,215 of whom study in the Ensenada Campus.

The Engineering Faculty in the Ensenada Campus holds approximately 1,300 students, of these 560 are freshmen or first-year students. In engineering programs during the first year, drop-out is a main issue. Different authors (Abril-Valdez, Román-Pérez, Cubillas-Rodríguez, & Moreno-Celaya, 2008) suggested that the main reasons for leaving college were financial factors, low academic grades and lack of interest. Other studies mentioned that desertion took place because of the difficulty student faced to get used to the new environment that college offers. The main differences found between high school and college were: (1) They need to manage their own time; (2) They need to study more; (3) The reading load is heavier and tougher; (4) There are no reminding about deadlines and tests; (5) Help is available but students have to look for it; and (6) They need to balance work and play among others.

Tutorships at UABC are in place but the role of tutors is to help students balance their academic credits, not to thrive during the adaptation process. There is also a one-week induction course to introduce students to college environment. During this week, they learn where the main buildings and offices are, and they have a welcome speech from the university rector. It is evident that none of these activities help students cope with the list of new issues mentioned above they will face in college. Besides the above-mentioned difficulties for freshmen, one issue could play a crucial role—the use of technologies in their learning process. In UABC, all teachers could have access to a LMS, moodle or blackboard (blackboard is the official LMS) and it is up to the teachers to use it or not in their courses.

In our case, moodle was used as the LMS to support the activities and learning objectives in the first semester chemistry course offered for engineers. The objective of this research was to know the students' perception of the advantages and disadvantages of using online support in their chemistry course, according to Allen and Seaman (2005), the course analyzed belonged to the Web-facilitated category.

Methodology

The Course

The chemistry course content was covered during one semester that lasted 16 weeks. The total student population of the group was 42, of which approximately 95% came from public schools and their age range was between 18 and 20 years. Ninety-five percent of the group had access to Internet at home, while 100% can access the Internet at campus where computers and Internet connection are available for all UABC students.

The theory and practice sessions were imparted face-to-face in the classroom and in the laboratory respectively. In parallel the course was also organized in a LMS, the platform used was moodle named Sistema de @ ulas-UABC. This system allows the instructor to conveniently plan the activities in a weekly fashion, thus it is easy to synchronize the weekly activities performed in the classroom with the ones in moodle.

The supports available for students in the LMS were as follows:

(1) Forums for resolution of questions: Through the forums, students can ask any questions that the instructor or any classmate can answer (see Figure 1).

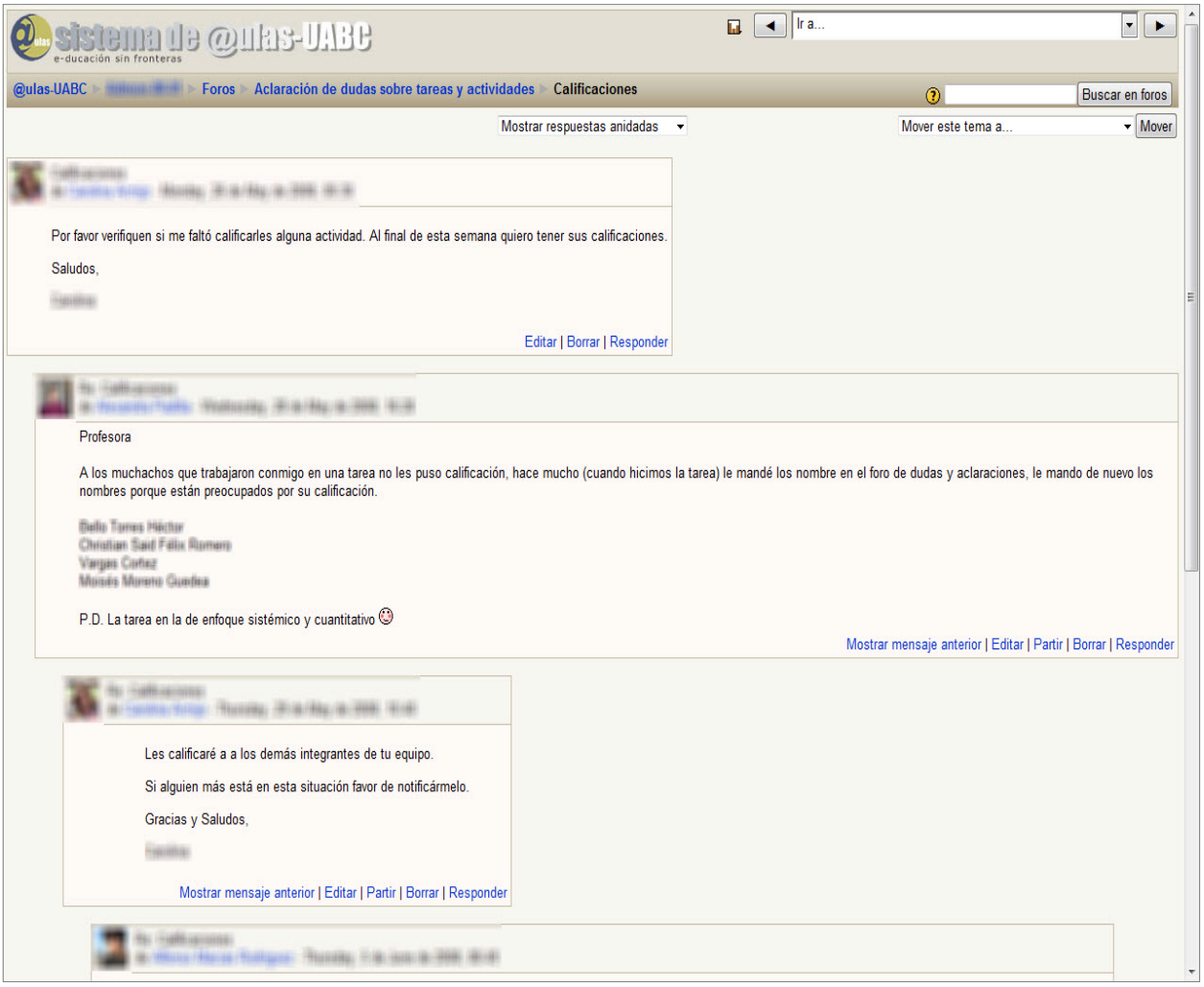

Figure 1. Forum page for resolution of questions.

(2) Exercises for reaffirmation of knowledge: Different types of exercises were used such as fill in the blanks; quizzes among others that were made in hot potatoes software (see Figures 2-5).

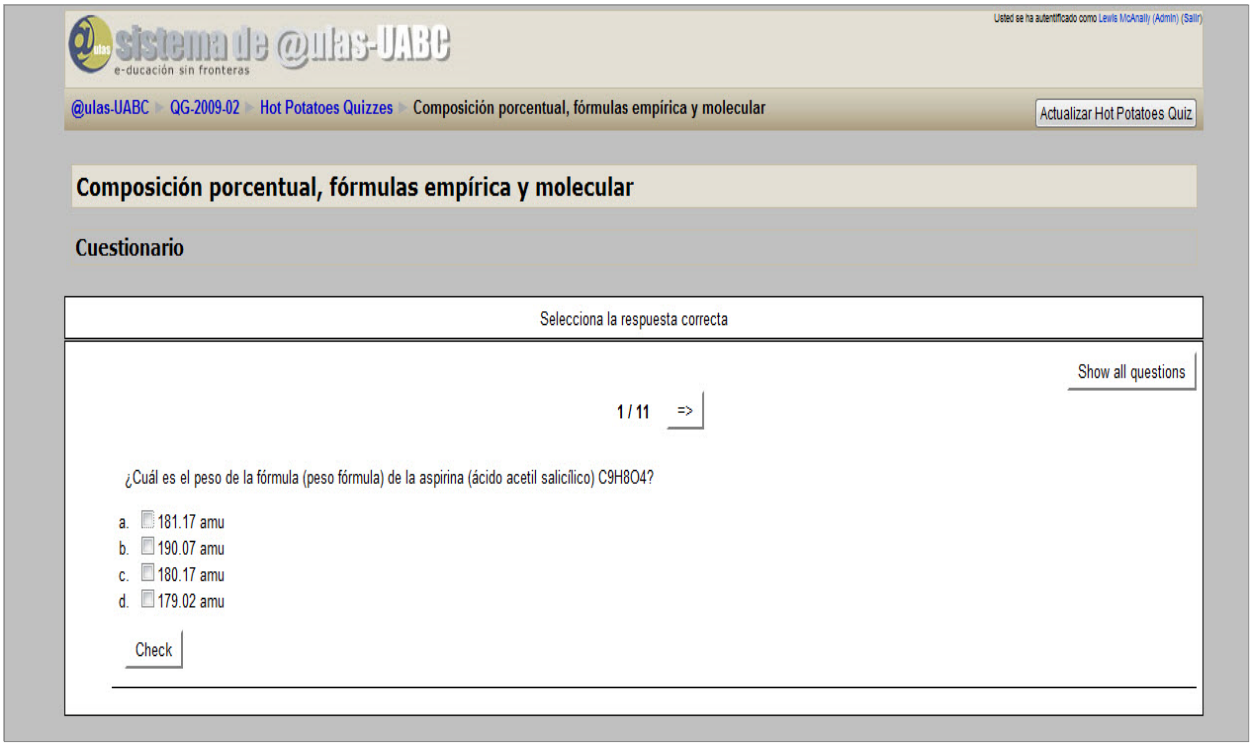

Figure 2. Example of a hot potato questionnaire.

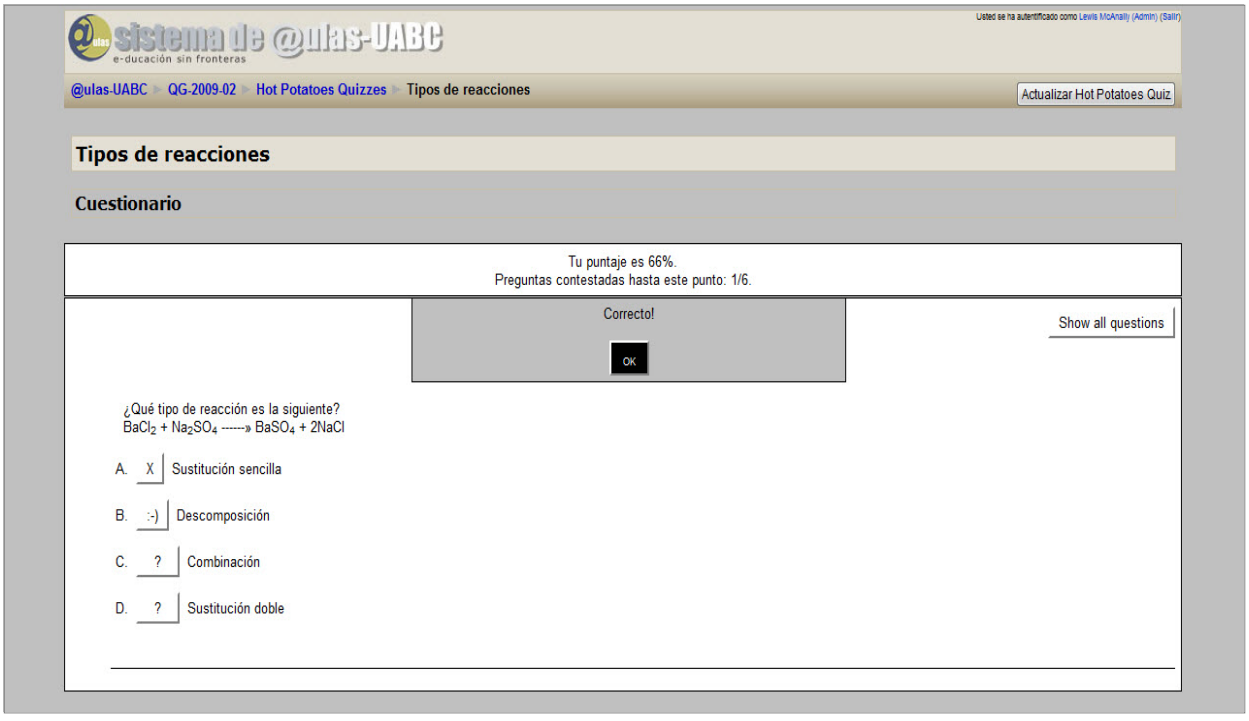

Figure 3. Example of a questionnaire showing feedback.

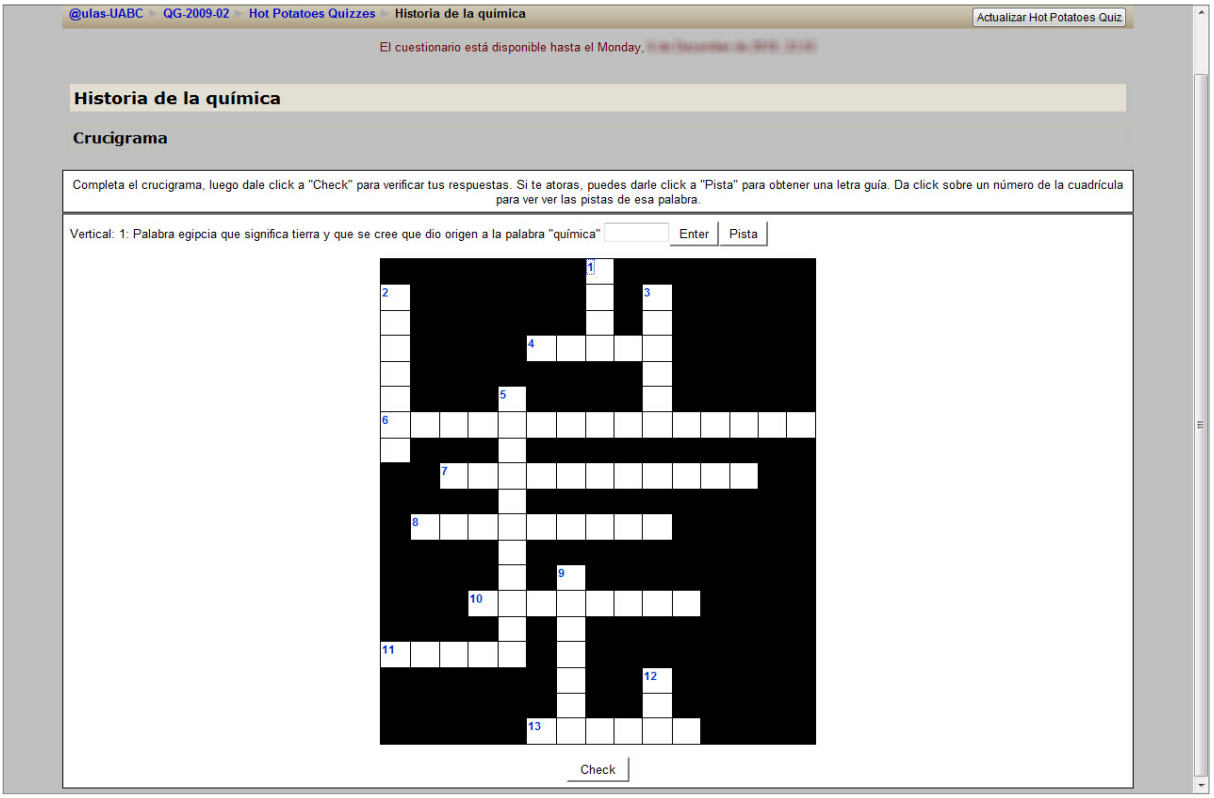

Figure 4. Example of a crossword puzzle.

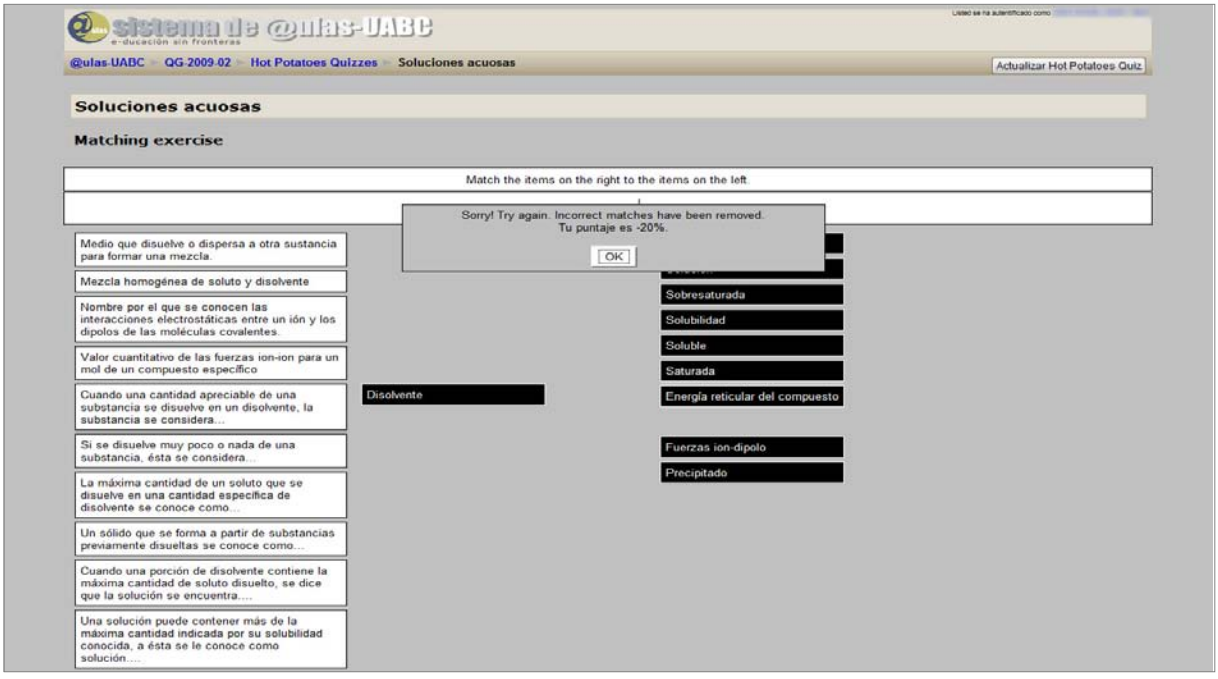

Figure 5. Example of a matching exercise showing feedback.

(3) Academic content presentations seen in class—Each theory class had a PP (power point) presentation that covered the content of that day, and these presentations were uploaded to the LMS for the students to

review (see Figure 6).

Figure 6. Page showing hyperlink to open a PP presentation.

(4) Readings—All theory readings were also available in the LMS for the students to download or review online (see Figure 7).

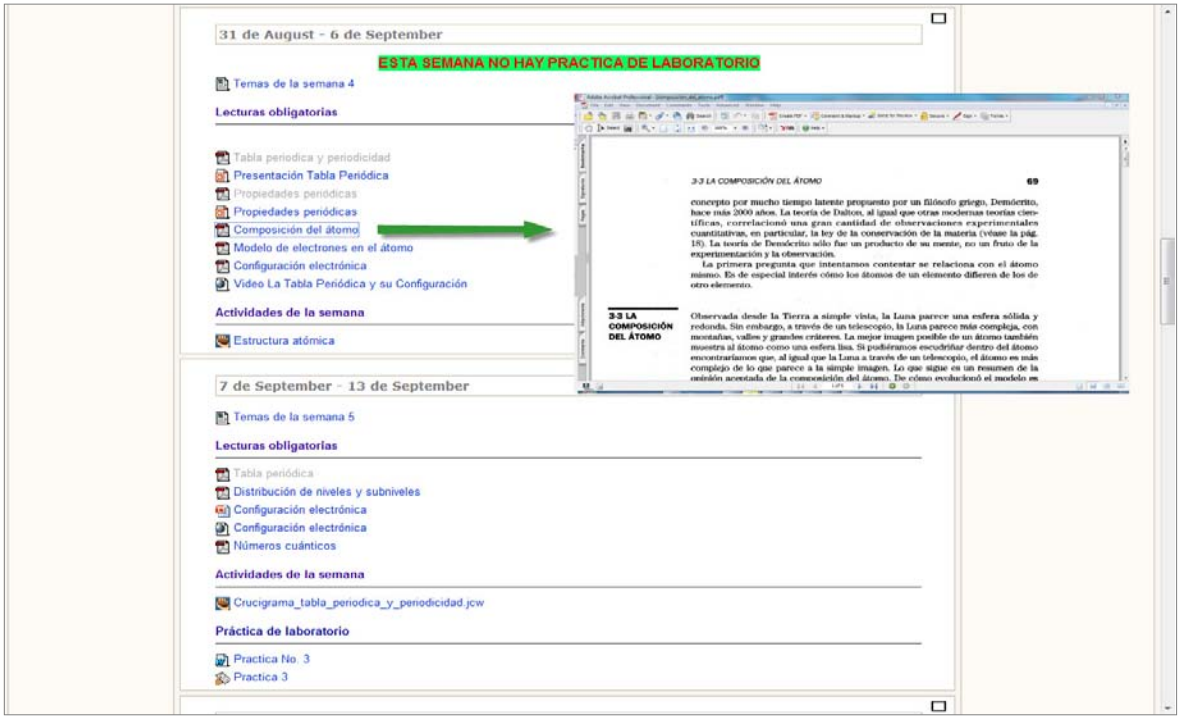

Figure 7. Page showing an Acrobat file related with the course content.

(5) Course administration activities—These included delivery of grades; push information posted in forums to their e-mail about new materials in the system; deadlines for homework and tests dates among others.

Two way communication by the way of forums or the instant message module: Students can communicate with the professor or any other classmate in a more private way. Moodle allows seeing who is online with the possibility to interact in real time. This allows shy students to solve doubts or communicate any other issue they do not feel comfortable in front of the class.

All the activities mentioned above and the communication modules were available during the semester. In this way, whatever was missing in class could be solved in the LMS, if a student was absent in one or more classes he/she could know and study the themes covered in those days. All important dates, deadlines and activities were also available. The students had all the materials and lab practices in advance so they could prepare and read before the theory and lab sessions. The students were told that they have to upload their homework through the LMS and that the hot potatoes exercises were part of their grades. In UABC, it is mandatory to have at least two partial tests during one course, which were performed in classroom, but the grades and feedback about the results were uploaded in the LMS. In this way, students could be informed and be certain about their advancement in the course.

Students Records Analysis

To get an idea of the intensity of use of online content and activities, the records of the actions taken by students were analyzed as a whole without seeking an individual or analysis per student. Although these records include all activities undertaken by students in the LMS, in spite of its relevance to their learning, it allows identifying the intensity of the use of different resources and activities available.

For the activities analysis, the types of actions were divided into three categories depending on their nature: course information, interaction and course activities. Course information included syllabus, grades and actions related with course information. Interaction included a forum for questions and assignments and a forum for social interaction. Course activities included actions related with contents such as presentations, readings, exercises, online hot potatoes quizzes and homework.

Interviews

We used focus groups to gather information about the students' attitudes towards the use of LMS as a learning support tool. According to Fontana and Frey (2000) and Madriz (2000), focus groups are a powerful means to evaluate services or test new ideas. Basically, focus groups are interviews of 6-10 people at the same time in the same group. It is possible to get a great deal of information during a focus group session.

The researchers chose a non-probabilistic sample with three strata, each stratum composed by eight students of high (group A), average (group B) and under performance students (group C) respectively based on the students final grades. We interviewed a total of 24 students and used an interview guide, and each group was interviewed separately. To avoid intimidation, none of the interviews were carried out by the chemistry professor but by experienced postgraduate students. Seven questions were asked in an informal and interactive group setting where participants were free to talk with other group members. The interviews were recorded; afterwards all comments were transcribed and analyzed.

The questions used to guide the interviews were as follows:

(1) What is your view that the teacher used a Website to support the chemistry course? Were the dynamics and contents of the classroom articulated with the content and activities on the site?

(2) Did the use of the LMS influence (positively or negatively) your academic performance?

(3) What were the main advantages and disadvantages of using a LMS in the chemistry course?

(4) How many times a day, week or month did you log on the course site? What is the reason of the frequency?

(5) What would you like to change or add to the site to facilitate or encourage a more efficient learning process?

(6) Were there any difficulties to use the site? What are they?

(7) What was it that you like most and least of the activities or contents that the teacher put on the site?

The interviews took place at the end of the semester just one week after completing the final requirements of the chemistry course.

Results

Record Analysis

After 16 weeks, the course accumulated 108 actions in the three categories (containing eight different sub-categories) with a total of 10,919 records as shown in Table 1. The category under the name of "course activities" had the majority of actions in the course and naturally most of the records. Although "interaction" category had only two types of actions (two forums), this category accounts for the second largest number of records. It seems that "course information" was not as popular comparatively with the other categories.

Table 1

Categories and Types of Actions With Their Corresponding Number of Records Found Along the Course

Category	Type of actions	Number of actions	Action per category	Records	Records per category	Mean
Course information	Syllabus	12	16	180	510	15
	Grades	4		330		82.5
Interaction	Forum about questions about assignment	2	3	746	5,190	373
	Forum for social interaction	1		4,444		4,444
Course activities	Presentations and readings	55	103	1,433	5,319	26.05
	Exercises	8		264		33
	* Online hot potatoes quizzes	12		2,314		192.83
	* Homework	14		1,208		86.29
Total		108		10,919		

Note. * Mandatory activities by the course design.

As we can see, presentations and readings alone account for half of the activities in the course, and the access to such resources accounts for 1,433 records, only below to the 2,314 records in online hot potatoes quizzes in the category, which was an activity expected to be superior, because it is related with grades. The relative high value in homework activities is also related with the online delivery (see Table 1).

As shown in Table 1, the use of forums was the most popular activity, especially the one related with

social interaction with 4,444 records.

In Figure 8, we can appreciate the differences between the three categories considering all the records, with “course activities” as the most important of the three, flowed by “interaction” and “course information”.

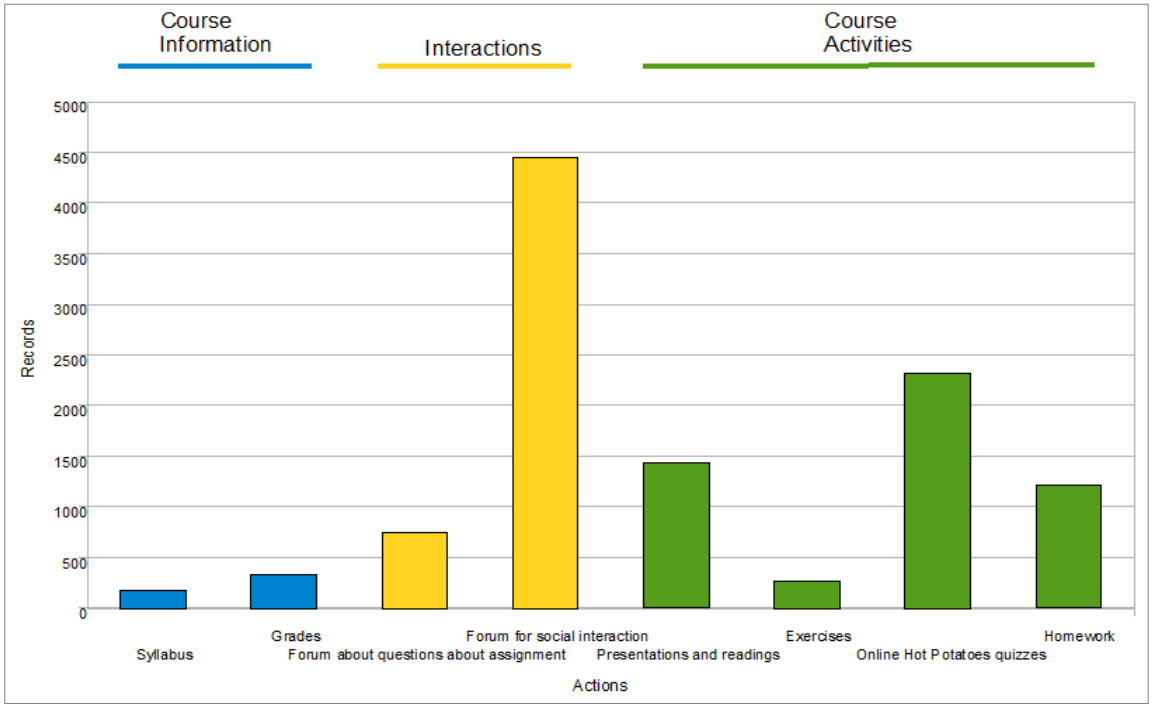

Figure 8. Number of records for each action in the three categories: course information, interactions and course activities.

Considering only optional actions (not mandatory by the course design) and directly related with the course dynamics, it is evident that “social interactions” played a major role on students along with presentations and readings. On the other hand, “syllabus”, “grades” and “exercises” played a marginal role.

Interviews

The opinions and statements expressed in the three focus groups (A, B and C) showed no marked differences between them. Students of the three groups agreed that the LMS was very useful for them. The main advantages mentioned (in their own words) were:

> It was very practical since I could re-affirm the themes seen in class;
>
> It was easier to follow the professor’s explanations since I did not have to take notes; the PP presentation was in the course site;
>
> If I forgot an activity of the course, I could go to the site and review the calendar of activities;
>
> Lots of support materials and examples;
>
> The class was less monotonous using the course Website;
>
> It was possible to correct the exercises and (through the feedback) see what I have done wrong;
>
> It was good to know in advance what we will do in the laboratory sessions. We could prepare and read;
>
> We knew exactly how our performance was progressing because we had our grades and feedback from the professor;
>
> Every day we check our personal e-mails, so it was easy to make a routine on going to the site of the chemistry course;
>
> It was easier to study because all the materials needed were there;
>
> It was like being in Face book.

Only groups B and C mentioned some disadvantages on the use of the LMS, the disadvantages mentioned were:

> At the beginning, it was difficult to register into the site;
> Sometimes I did not pay attention in class, because I knew the professor would upload the presentation to the site;
> In occasions, some exercises did not show in Firefox but they did in Explorer, thus we had to change browser;
> It was easy to cheat the exercises, because you could ask for clues and then solve the entire exercise.

The three groups found articulation between the themes seen in classroom and the exercises, readings and games covered in the LMS. The three groups also agreed in that the use of the LMS helped them cope with the newness of the university environment because they felt supported all the time. They mentioned that they had the feeling that "somebody" (the chemistry professor) was there for them all the time even though he/she was virtually there.

Groups A and B mentioned that they logged on in the course every day, while group C mentioned that they logged on only twice a week or when the professor ask for a special homework.

The three groups agreed that the LMS was very useful not only for the chemistry course but also for other courses as well. They used the forums for delivering information and readings from other courses and for social activities. They even mentioned that they would really like to have a site like this in all the other courses they had.

In general, the three groups mentioned that the LMS helped them to stay attuned in the course or other courses. The three groups also agreed that the chemistry course was their first experience using a LMS.

Discussion and Conclusions

From the earliest years of the 1990s, it has been documented that the predominant factor in designing a successful course is the teaching-learning method used (Hiltz, 1993, 1994; Clark, 1994; McIsaac & Gunawardena, 1996), so that the use of technology per se is not the most important factor, but the importance not only considering the tools used but also the teacher practices. For these reasons, the definitions of blended courses are usually so general and broad that they only help us identify if the course is intended for replacement for face-to-face instruction or as an enhancement of the face-to-face learning experience. The relevant aspect here is the practices that enrich the blended course.

A review of Table 1 allows us to state that the course is not only a space with static information, but also a course with strategies that encourages student-to-student, student-to-teacher and student-to-content interactions. Based on the number of interaction records, it is clear that the level of student-to-student and student-to-teacher communication (mainly student-to-student) promotes positive perceptions towards the course and the teacher. At the same time, this leads to decreasing the transactional distance as proposed by Moore (1997). He argued that distance was determined by the amount of dialogue between actors and the level of course structure, with higher transactional distance in very structured courses with little dialogue, which did not apply in this course. Along this same line of argument, Saba and Shearer (1994) argued that transactional distance decreased when the students felt in control of their actions in the course.

Based on feedback gathered through focus groups, it is possible to say that the use of LMS in the chemistry course was very useful not only for course activities but also as a source of support and interaction for freshmen. This is evidenced by the number of records mainly in the social forums and, according to what students mentioned, the site was also used to send jobs and messages from other courses in addition to the social interaction that occurred to them. These results reflect the desire to have this type of support tools in other courses.

The opinions expressed by students about the benefits and advantages of participating and the will to continue participating in a course with the characteristics presented in this study are consistent with authors such as Horton and American Society for Training and Development (2001), Palloff and Pratt (2003), McGill and Hobbs (2008) and Dunlap et al. (2008) among others who mentioned that if students were satisfied with their online course, they were more likely to stick with this modality. Other factors that reinforce the positive perception of the course was the extensive use of forums for interaction and the teacher support perceived by students (Clulow & Brace-Govan, 2000; Harasim et al., 1995; Hiltz, 1993, 1995, 1997; Abbey, 2000).

Another result that matches with the interviews is the number of records in activities such as hot potatoes. Students mentioned that they liked these exercises. This is positive because each exercise was solved individually using the LMS system and students received feedback in case they needed help. This is not always possible in the classroom either by the shyness of some students or because of the size of the group or class time.

Having the class materials and presentations at any time was an advantage mentioned by the three groups analyzed, and this was confirmed by the number of records in the sub-category of presentations and lectures. The availability of this information in the LMS avoided visits to the library which would have involved more time dedicated to this course.

Today, the use of technology in education is not questioned. It is increasingly common to use it at the different educational levels, but in Mexico, the use of technology for learning in higher education is not the usual practice, thus it is not surprising that none of the students in the course analyzed has had previous experience in the use of LMS. However, since students are familiar with the Internet and other networks of social interaction, using the course site is not difficult for them. In the specific case of UABC, it would be more appropriate that more professors use LMS to support their courses, because besides helping their students (as is discussed above), it helps to improve their teaching practices, organize class materials and better distribute in time the different themes and activities.

It can be concluded that LMS is an essential resource for students, especially for freshmen, in large part because of the communication opportunities and the support they have in a new environment. These benefits include learning about the college, classes and study skills. In addition, students build important relationships with professors and peers.

Learning technologies are being used to enhance students' opportunities and provide flexibility and learners' choices. The authors, therefore, emphasize blended approaches that combine face-to-face and technology-supported learning. It must be highlighted however that using a LMS for the first time for teaching can be time-consuming and requires a degree of commitment on the part of the lecturer.

The approach followed in this work brings a new look to the learning tools most preferred by students and discusses the advantages and disadvantages they found in a LMS in order to improve the class support system. The results could be useful for freshmen teachers and researchers who want to improve group performance using online activities. Using a LMS such a moodle allows performing a more in depth analysis to find relationships between the number of registers per student and grades. This would bring more insights into the results presented here.

References

Abbey, B. (2000). *Instructional and cognitive impacts of Web-based education.* Hershey, P. A.: Idea Group Publishing.

Abril-Valdez, E., Román-Pérez, R., Cubillas-Rodríguez, M., & Moreno-Celaya, I. (2008). Desertion or self-exclusion? An analysis of the causes for school dropping showed by high school students in Sonora, Mexico. *Revista Electrónica de Investigación Educativa, 10*(1), 1-16.

Allen, I., & Seaman, J. (2005). *Growing by degrees: Online education in the United States, 2005*. Needham, M. A.: The Sloan Consortium.

Belanger, F., & Jordan, D. H. (2000). *Evaluation and implementation of distance learning: Technologies, tools and techniques*. Hershey, P. A.: Idea Group Pub.

Clark, R. (1994). Media will never influence learning. *Educational Technology Research and Development, 42*(2), 21-29.

Clulow, V., & Brace-Govan, J. (2000). Course planning and design: Does a distance education model apply to online course planning and design. In G. C. J. Conrad (Ed.), Proceedings of the *Moving Online Conference* (pp. 41-49). Retrieved from http://www.scu.edu.au/schools/sawd/moconf

Dunlap, J., Dobrovolny, J., & Young, D. (2008). Preparing e-learning designers using Kolb's model of experiential learning. *Innovate, 4*(4).

Fontana, A., & Frey, J. H. (2000). The interview: From structured questions to negotiated text. In *Handbook of qualitative research* (pp. 645-672). Thousand Oaks, Calif: Sage Publications.

Hanna, D. E., Glowacki-Dudka, M., & Conceição-Runlee, S. (2000). *147 practical tips for teaching online groups essentials of Web-based education*. Madison, Wis: Atwood Pub.

Harasim, L. M., Hiltz, R., Teles, L., & Turoff, M. (1995). *Learning networks a field guide to teaching and learning online*. Cambridge, Mass: MIT Press.

Hiltz, S. R. (1993). Correlates if learning in a virtual classroom. *International Journal of Man-Machine Studies, 39*, 71-98.

Hiltz, S. R. (1994). Education, innovation, and technology. In *The virtual classroom: Learning without limits via computer Networks* (pp. 19-29). Norwood, N. J.: Ablex Publishing Co..

Hiltz, S. R. (1995). Teaching in a virtual classroom. In *1995 International Conference on Computer Assisted Instruction*. Hsinchu, Taiwan: National Chiao Tung University.

Hiltz, S. R. (1997). Impacts of college-level courses via asynchronous learning networks: Some preliminary results. *Journal of Asynchronous Learning Networks*. Retrieved from http://web.njit.edu/~hiltz/workingpapers/philly/philly.htm

Horton, W., & American Society for Training and Development. (2001). *Evaluating e-learning*. Alexandria, V.A.: American Society for Training & Development.

Kearsley, G. (1995). The nature and value of interaction in distance learning. Presented at *the Third Distance Education Research Synposium*.

Madriz, E. (2000). Focus groups in femenist research. In *Handbook of qualitative research* (pp. 835-850). Thousand Oaks, Calif: Sage Publications.

McGill, T., & Hobbs, V. (2008). How students and instructors using a virtual learning environment perceive the fit between technology and task. *Journal of Computer Assisted Learning, 24*(3), 191-202.

McIsaac, M., & Gunawardena, C. (1996). Distance education. In *Handbook of research for educational communications and technology* (pp. 403-437). New York: Simon & Schuster-Macmillan.

Moore, M. G. (1997). Theory of transactional distance. In *Theoretical principles of distance education* (pp. 22-38). Routledge.

Palloff, R. M., & Pratt, K. (2003). *The virtual student: A profile and guide to working with online learners* (1st ed.). Jossey-Bass.

Saba, F., & Shearer, R. L. (1994). Verifying key theoretical concepts in a dynamic model of distance education. *The American Journal of Distance Education, 8*(1).