

Massive implementation of the European Chemistry Test at University of Milan

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Introduction and motivation

Recently the Department of Chemistry of the “Università degli Studi di Milano” decided to adopt the EChemTest (<http://www.echemtest.net>) to certify the chemistry knowledge of their applicants in Master degrees in Chemistry and Industrial Chemistry.

Several issues motivated our decision. First of all, we think it is important for an independent institution to provide an external sourced examination besides the many internal ones. A widespread Chemistry examination is surely the one supplied by European Chemistry Thematic Network (ECTN, see <http://www.ectn.net>) with the EChemTest libraries suite. These include the entire European Core Chemistry program represented, among the others, by the Analytic Chemistry, Inorganic Chemistry, Organic Chemistry, and Physical Chemistry packages. We employed the Bachelor level (level 3) suite of these libraries, since it is the more appropriate for Master studies applicants. This examination will detect any possible educational bias and do allow the Department faculty members to look for future changes for improving their educational service.

Secondly, students will benefit from the EChemTest, especially if performed for all topics in Chemistry. The test results will bring students to recognize any gap in their knowledge and allow them to fill it. Moreover, they will better understand their natural inclinations and more properly value their chemistry standing.

Thirdly, if massively adopted by the ECTN associated European Universities as done at University of Milan, any institution set of results can be usefully compared with the score averaged over all tests recorded at the ECTN database results for the same library test. This will help each institution to better (and privately) locate their European and possibly National standing. Clearly, the institution can choose any subset of their student population to compare with, and obtain further information about student chemistry background.

In the remaining part of this document, we report about the logistic set-up, how the tests are carried-out and possible future outlooks of the EChemTest within our University.

Set-up

The suite of EChemTest libraries are remotely available via web and a typical set-up for an EChemTest session includes the arrangement of suitable computer laboratories and of the remote servers.

The full-equipped computer laboratories at University of Milan allow to accommodate a total of about one hundred and sixty (160) students, divided into five laboratories (each of them under the control of a supervisor). Each desktop has been remotely configured such that:

1. the internet browser is available and ready to use;
2. the browser is set at the EChemTest login page (<http://echem.unipg.it>);
3. no other websites are available;
4. all desktop programs are disabled (with the exception of the browser);
5. the typewriter keys (letters and numbers) of each keyboard are enabled, while the function keys (F1, F2, etc.), the numeric keypad (numbers organized like a calculator keypad), the insert, home, page up keys and their opposites, the up, down, left and right navigation arrow keys are all disabled;

As far as the remote server installation from the software point of view this is a Microsoft Windows Server 2003 R2 instance equipped with the ASP technology-based Perception Server software (v4.4 SP6) running on top of the Microsoft Internet Information Server (IIS v6) and the related Simple Mail Transfer Protocol (SMTP) Virtual Server (v6, used for sending service mails). In this respect, all the data (questions, assessments and graphical resources) are contained and saved on a Microsoft SQL Server (v2005).

From the hardware point of view, the server (physically located at the Department of Chemistry, Biology and Biotechnology servers room of University of Perugia) is a Dell Power Edge 2900 Xeon 5130 (2.0GHz/1333FSB) Gigabit enabled and equipped with 3 mirrored Hard Disk SAS 146GB (10.000rpm), 1 RAID Controller (PERC 5/i), 1 Tape Drive for backup (LTO3), 1 Redundant (hot plug) power supply and 4GB RAM.

Execution

The EChemTest session starts with a demonstration of a prototype test execution projected for all students view. By using an EChemTest demo-account, we illustrate how (i) to login, (ii) to choose a test, and (iii) to execute it. This last illustration is important because questions are structured in different ways. Some questions are of the “classical” multiple choices type, others foresee a java applet to be located by the mouse or to type in the numerical answer. During this demonstration we also stress the difference between using the “submit” and the “quit” command after finishing the test. We remember that if no choice is made out of the possible ones, it is equivalent to a wrong choice. The accounts are configured such that the link of each test is not available after clicking on it. In this way, the students are not allowed to repeat the test. Given this set-up, the “quit” command invalidates the possibility to perform the test, since this is automatically removed from the home. These aspects are stressed during the introductory demonstration.

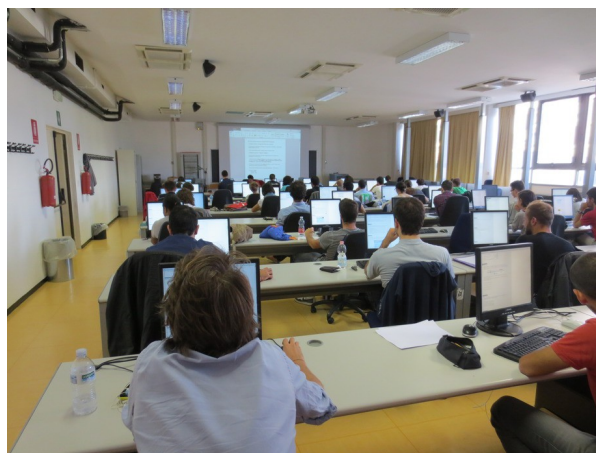
After that, personalized login and password paper strips are distributed to each student during a roll-call, by using a previously arranged list where login has been combined with the student name. At the same time, personal ID are cross-checked.

Then the students are given a total time of 5 hours to complete the four EChemTest assessments. Considering that the maximum time for each test is one hour, the students can administrate a total time

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of 60 minutes for resting between each test. Few students have taken fully advantage of this extra time. Some students are shown in the figure below while performing the tests. Each panel is for a different computer room.

At the end of the session, the ECTN supported EChemTest database is interrogated, in order to obtain the individual score per test for each student. This is conveniently done by using the Perception Enterprise Manager by the Questionmark (<http://www.questionmark.com>) at the remote server website (<http://echem.unipg.it/em4/login.asp>). After login, the Enterprise Reporter is chosen. This is a powerful tool to obtain scores, answers and statistical reports. The results can be reported in several formats. We employ the Excel spreadsheet format, where each line corresponds to a user. After filtering the today results of the group of the University of Milan from the entire database, we readily report to the Master degree Committee the individual scores, the distributions and the average of each test (i.e. AC, IC, OC, and PC) for the one by one student interview.



We are glad and quite impressed to register that none student out of the one hundred and thirty participants has complained about the questions clarity. This proves that the EChemTest is self-explanatory, easy to understand and well written.

Future outlook

For the future, our Department is willing to go beyond the present usage of the EChemTest as a student population screening tool. We are willing to include the test results into the internal credit system.

With the present report, we also invite other EU institutions to follow our example, in order to build a fully pan-European EChemTest database of results. If this is going to include many more Universities, then each single University will benefit from a fully European average. By keeping the averaged scores public, each University is free to compare and eventually publish their own results.

Conclusions

In conclusions, we believe that the EChemTest will help Chemistry teachers of any EU country to better tailor their teaching according to a European standard. Our students report enthusiastic feedbacks and to have experienced challenging and well-written questions. These are of different difficult level and from a variety of topics in Chemistry. They also reported to have learned how to better focus on their weaknesses and strengths over the entire range of topics in Chemistry and this is surely going to help them for their future studies.