THIRD HUMBOLDT CONFERENCE ON COMPUTATIONAL CHEMISTRY

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Computer-Based Testing in Physical Chemistry Topic

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Purpose: Computer-based testing is use all over the world in many academic fields being considered an efficient and effective end-of-course evaluation methods comparing with classical written examination. The aim of the research was to develop and implement a computer-based testing methodology and to evaluate its effectiveness on the academic performance of third year student at Technical University of Cluj-Napoca.

Methods: The information discussed at courses and laboratory classes were transposing into multiple-choice questions and were included into an MqSQL database. The interface of the computer-based testing was created by the use of PHP programming language by integration of the multiple-choice questionnaire with the score methodology. The testing methodology includes: the place of the exam (at the test center, room C414), the type of examination (tutor assisted; thirty multiple-choice questions choused randomly from a total number of three hundred; checking out a radio-button correspondent to the correct answer), the impossibility of giving up after the test begin, and the score methodology (the correct answer coefficient - \(C_a\), the coefficient of time - \(C_t\), and the testing score - \(10^*\sqrt{C_t*C_a}\)) and was assess on a sample of forty-two students. The students had the possibility to use the testing environment as many times as they consider being opportune.

Results: The number of testing varies from one (seventeen students, almost 40%) to seven (one student). The coefficients obtained to each testing were included into the computing of the final mark. The average of the mean of correct answers coefficients was 1.16 - 95% CI [1.01, 1.32] - for the whole sample, 1.13 - 95% CI [0.83, 1.43] - for female students and 1.17 - 95% CI [0.98, 1.36] for male students. The average of the mean of the coefficient of time was 1.34 - 95% CI [1.14, 1.53] - for the whole sample. No significant differences between the performances of male and female students on testing coefficients or testing scores were observed (p > 0.05).

Conclusion: This study demonstrates that the proposed computer-based testing methodology can be a real solution in end-of-course evaluation in Physical Chemistry, providing a less subjective and a less time consuming assessment method.
In universities, the cardinal premise of the end-of-course examination is to assess as objective as possible the students' knowledge and skills acquired on the courses, practical activities and seminars. Development of communication and information technologies [1] provide the opportunity of creation of interactive computer-assisted environments used in all domains including in chemistry training and evaluation [2].

Starting from the experiences obtained from creation of the multiple choice examination system for general chemistry topic [3], the aim of the research was to develop and implement a computer-based automated testing methodology for physical chemistry topic and to evaluate its effectiveness by applying it on third year students at the Faculty of Materials Science and Engineering, the Technical University of Cluj-Napoca.

In universities, the cardinal premise of the end-of-course examination is to assess as objective as possible the students' knowledge and skills acquired on the courses, practical activities and seminars. Development of communication and information technologies [1] provide the opportunity of creation of interactive computer-assisted environments used in all domains including in chemistry training and evaluation [2].

The automated computer-assisted evaluation system for student knowledge evaluation was developed and has been implemented at the Faculty of Materials Science and Engineering, Technical University of Cluj-Napoca. The system is available for students' end-of-course examination on physical chemistry topic. Instruction on use of the evaluation system is provided by the teacher which developed the system. The methodology, implementation, and evaluation of the system are reported.

Results

The student's evaluation, the coefficients and the final mark were computed for each student and were analyzed on the whole sample (see table 3). The results of testing the hypothesis that there were no differences between parameters obtained by female and the parameters obtained by male, for each parameter, indicate that in all cases the null hypothesis was accepted (p > 0.05). The distribution of final marks obtained by the students is in figure 2.

Comparing the automated multiple choice computer-assisted evaluation with a classical examination type (as it is an essay) at least three advantages are obviously: the evaluation cover each subject from the curriculum, the assessment is more objective (the teacher could not be accused that was subjective in the evaluation). Comparing the automated multiple choice computer-assisted evaluation with a classical examination type (as it is an essay) at least three advantages are obviously: the evaluation cover each subject from the curriculum, the assessment is more objective (the teacher could not be accused that was subjective in the evaluation).

Conclusions

The proposed computer-based testing methodology and its implementation can be a real solution in end-of-course evaluation in Physical Chemistry, providing a less subjective and a less time consuming assessment method.

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References