Undergraduate Students Assessment on Materials Chemistry Topic using an Auto-Calibrated Online System

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Auto-Calibrated Online System

- Imposed rules in creation of the multiple-choice questions database (MCQ dB):
  - Each question has a statement or a situation (steam) and a list of five suggested solutions (options); each question had at least one and no more than four correct options;
  - Selected students add questions to MCQ dB; bonuses and penalties were applied to this activity according with the quality of work;

Assessment Methodology - General

- Test containing: thirty MCQs double randomized (selecting of questions, ordering of options);
- Evaluation period: at the end of semester, in a imposed period of time – three weeks;
- Place of evaluation: in the computers lab, in the presence of the professor;

Assessment Methodology - Students

- Security issues:
  - Computers & Gateway IP checking (only a list of computers were allowed);
  - Professor provide the password at the beginning of the evaluation;
  - Use of refresh button after beginning of the test were associated with a withdrawn;
- Student's options:
  - A student must apply for testing at least once; can apply for testing as many times as he/she desired to;
  - Withdrawn after beginning of the testing (without ending) were penalized;

Scoring Methodology – An Evaluation

- All answered questions for which there was a perfect match between correct and wrong options bring one point; thus maximum number of points was thirty; this is the points score;
- The times corresponding to the beginning and ending of test were recorded; the time difference were divided by points score; this is the time score;
- The evaluation score was given by the geometric mean of points and time scores;

Scoring Methodology – A Student

- If a student was evaluated once, the evaluation score became the student score;
- If a student was evaluated more than once, the worst evaluation score was deleted, and the rest of evaluation scores were averaged in order to became the student score;
- All student scores were used to compute the lowest and highest scores; these scores were used for all evaluations for a given student;

Scoring Methodology – Marks

- Examination mark are from ten (best of student score) to four (worst of student score); all between are fitted linear related to these two scores;
- Bonuses (for MCQs added to dB – from one to two mark points) and penalties (every withdrawn with -0.5 mark points; wrong MCQ added to dB -0.1 mark points) were applied to the examination marks;
- Exam was failed if the final examination mark was less than five;

Materials Chemistry Assessment Results

- Participants: students from Technical University of Cluj-Napoca, Materials Science and Engineering Faculty; number of: 99;
- Evaluation period: 06.Jun.06-27.Jun.06;
- Number of MCQs in dB: 861;
- Wrong questions penalties: 2;
- Withdrawn penalties: 1;
- Averaged number of evaluations per student: 2.17;

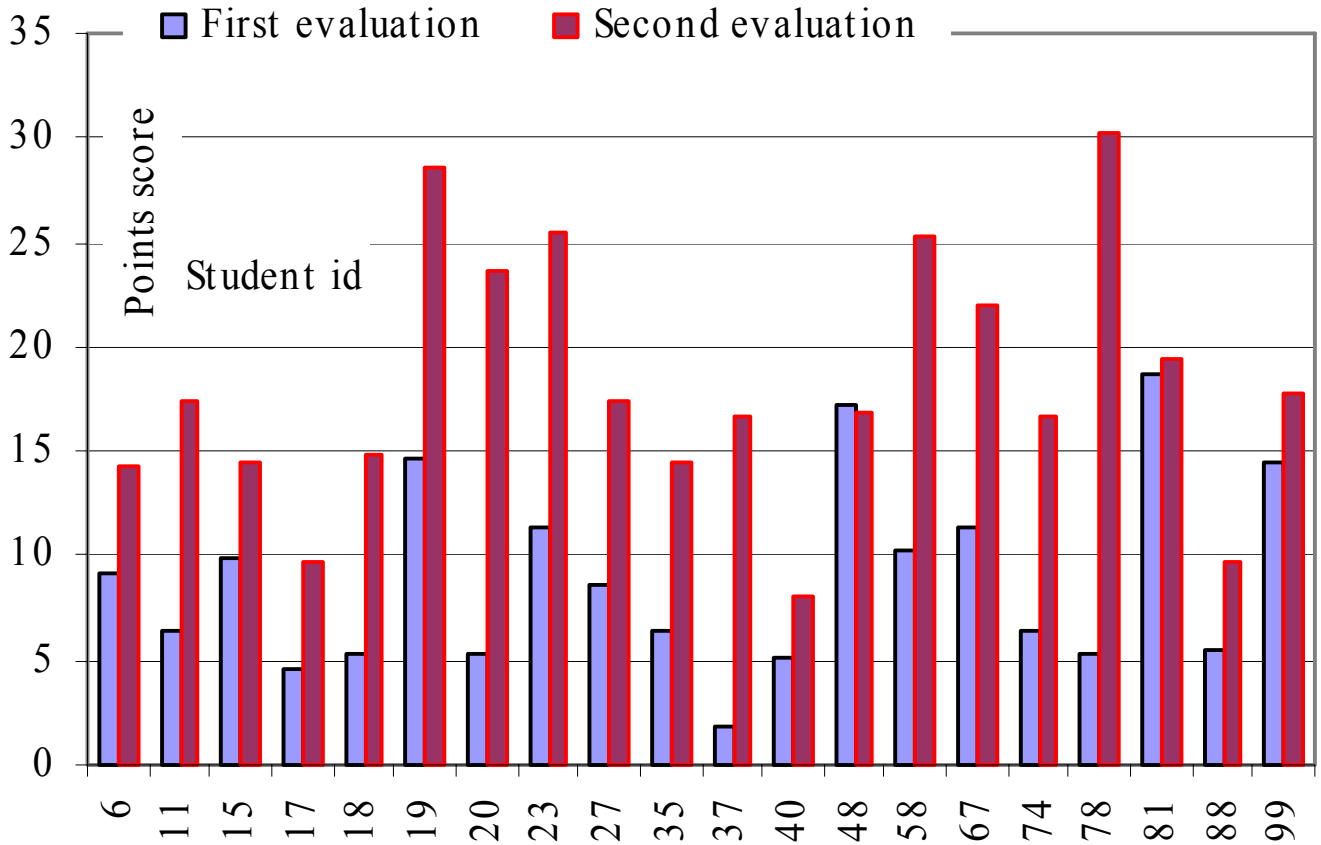
Selection from Statistics of Results

- Number of evaluations per student

Number of evaluations	Students		
	Number	95% Confidence Interval	Frequency [%]
One	12	[6 , 20]	12.12
Two	55	[45 , 65]	55.56
Three	20	[13 , 29]	20.20
Four	9	[4 , 16]	09.09
Five	1	[0 , 5]	01.01
Six	1	[0 , 5]	01.01
Seven	1	[0 , 5]	01.01
Total	99	[95,99]	100.0

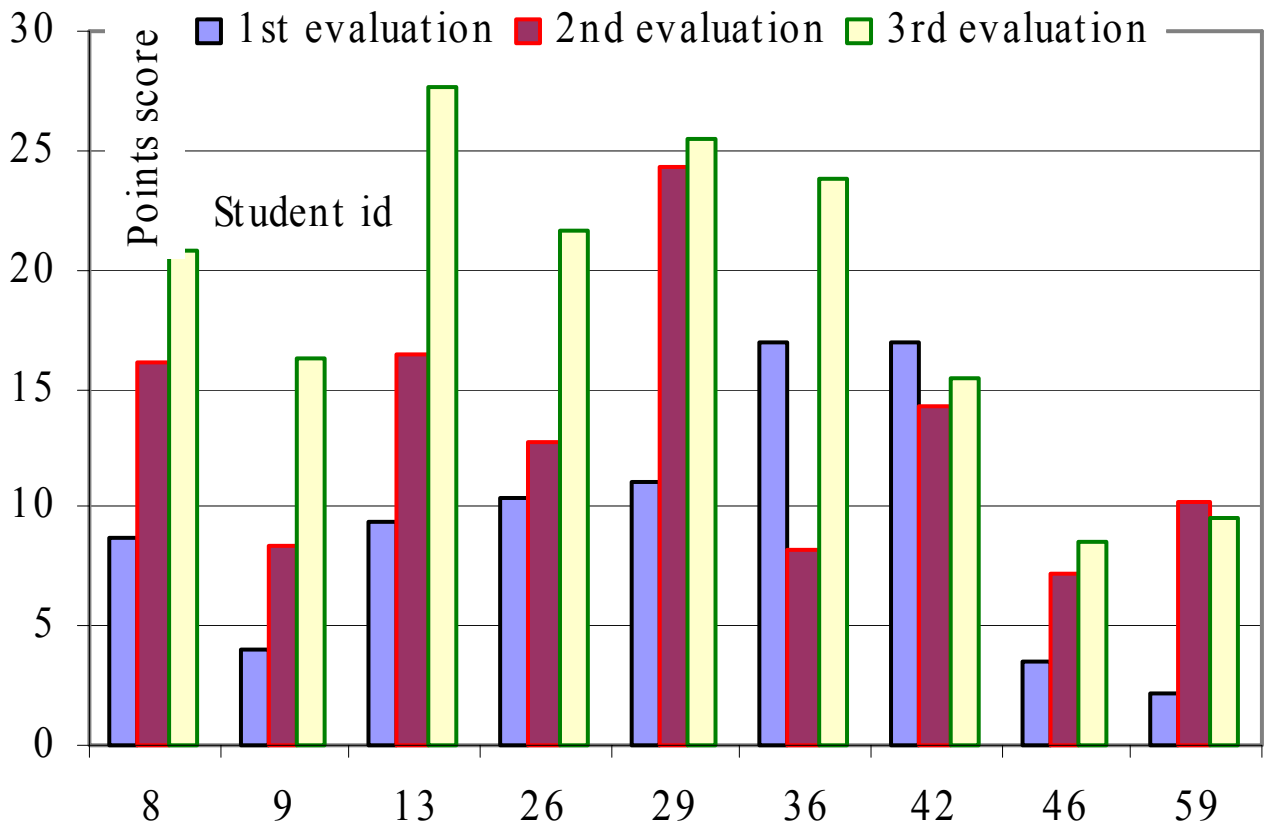
Selection from Statistics of Results

- № of correct answers: students evaluated three times



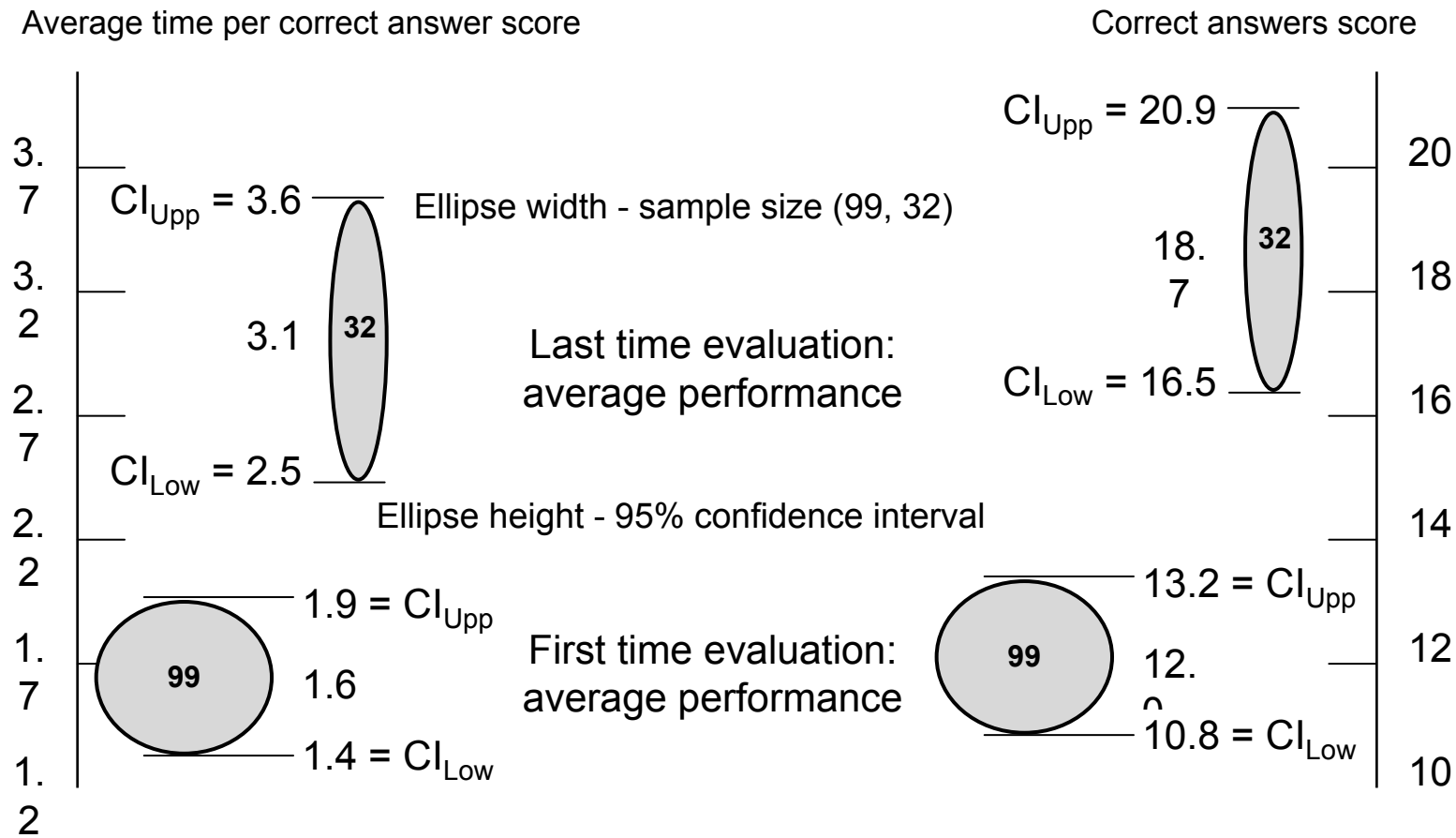
Selection from Statistics of Results

•№ of correct answers: students evaluated four times



Selection from Statistics of Results

- № of correct answers: students evaluated four times



Conclusions

- The proposed auto-calibrated online evaluation system proved to offer a stable and valid evaluation environment of undergraduate students' knowledge assessment on materials chemistry topic.
- Students' performances in terms of evaluation points and of average time per correct answer revealed to be improved at final evaluation comparing with first evaluation, showing an improvement in acquired materials chemistry knowledge.

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*Online:

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Thank you for your attention!

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