E-Learning and E-Evaluation

A Case Study

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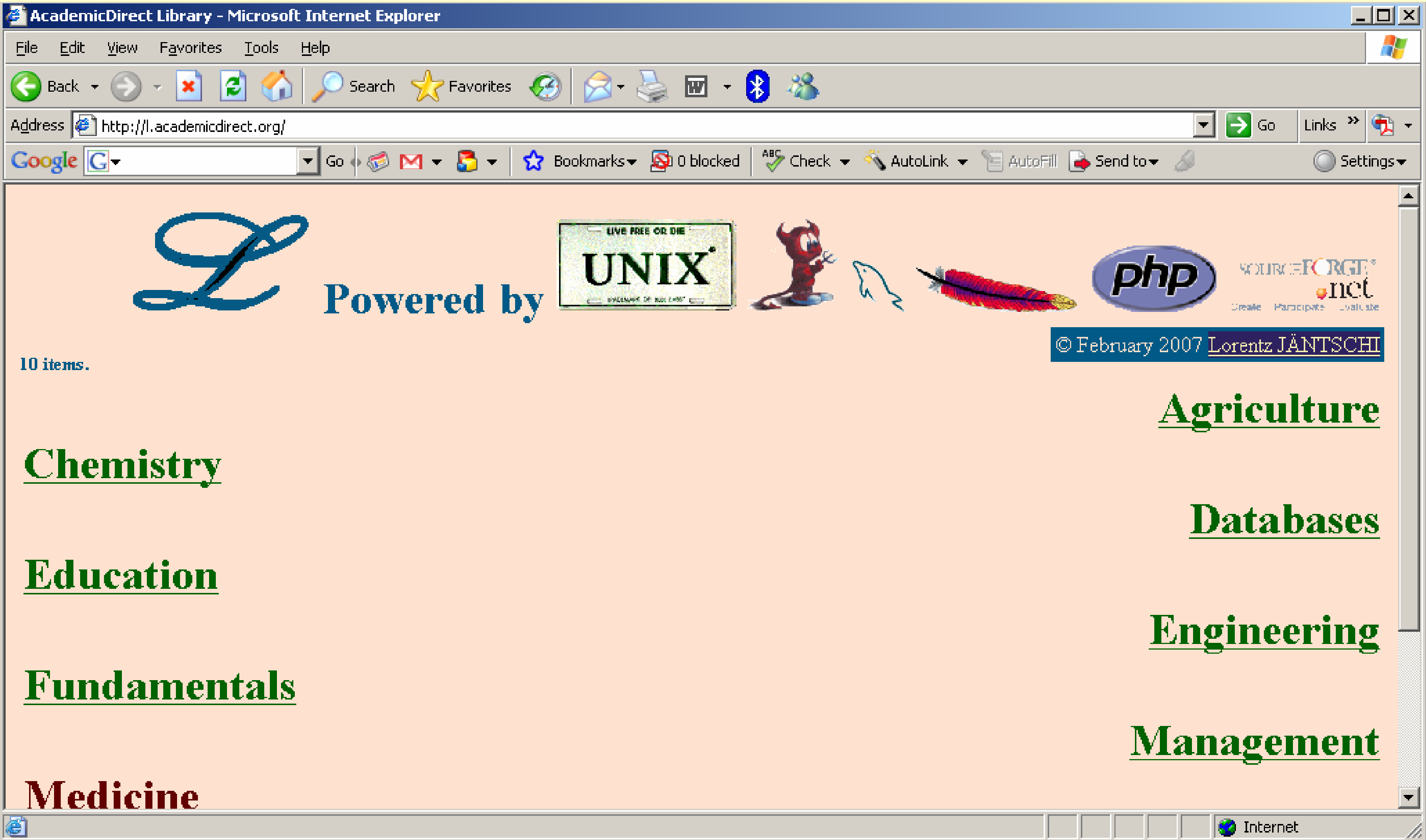
Snapshoot of the website



System contents

1	Training system - Physical chemistry, 2002	L. Jäntschi, M. Ungureşan
2	Bachelor examination management system - Bac2003, 2003	L. Jäntschi
3	Continuation studies and postuniversitary studies admission mgmt. - Admitere2003, 2003	L. Jäntschi
4	Binomial confidence intervals calculator, 2005	L. Jäntschi, S.D. Bolboacă
5	MDF-SARs, 2005	L. Jäntschi
6	Assessing system – General chemistry, 2005	H.I. Nascu, L. Jäntschi
7	Automated system for assessing students at a discipline, 2007	L. Jäntschi
8	Strings analysis (genetics), 2007	L. Jäntschi, S.D. Bolboacă
9	System for graphical representing of data, 2007	L. Jäntschi
10	Tabulated data investigator (associations), 2007	L. Jäntschi, S.D. Bolboacă
11	Critical appraised topics system (medical), 2007	L. Jäntschi, S.D. Bolboacă
12	Sistem design ghiduri practica medicala, 2007	L. Jäntschi, S.D. Bolboacă
13	Evidence based medicine training system, 2007	L. Jäntschi, S.D. Bolboacă
14	Medical terms online dictionary, 2007	L. Jäntschi, S.D. Bolboacă
15	Assessing system for confidence intervals, 2007	L. Jäntschi, S.D. Bolboacă
16	Orthogonal arrays (Taguchi method), 2007	L. Jäntschi, S.D. Bolboacă
17	Bone age assessing system (medical), 2007	L. Jäntschi, S.D. Bolboacă
18	Sistem calcul caldura incalzire, 2007	L. Jäntschi, M. Bălan, E.M. Podar
19	Solar heat monitoring system (sensors + DAqS + Data Mgmt), 2007	M. Bălan, M. Damian, L. Jäntschi
20	Mobile phase optimization (chromatography), 2007	L. Jäntschi, C. Cimpoiu, T. Hodişan
21	Medical key parameters on 2X2 contingency table, 2008	S.D. Bolboacă, L. Jäntschi
22	Assessing of solar radiation exploiting potential, 2008	L. Jäntschi, M. Bălan

Aim

- To analyze an e-learning and e-evaluation project, a framework for training, learning and evaluation.

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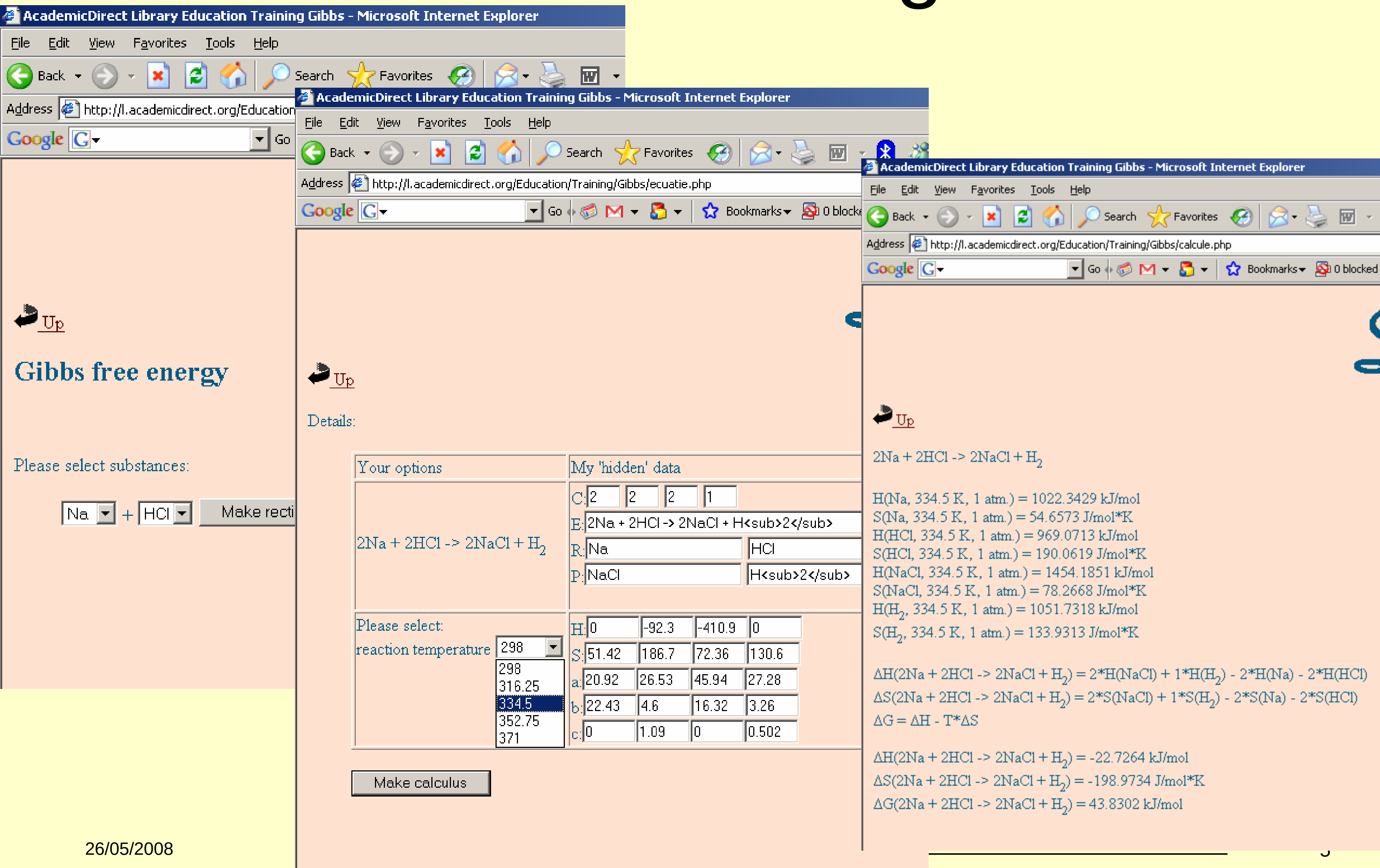

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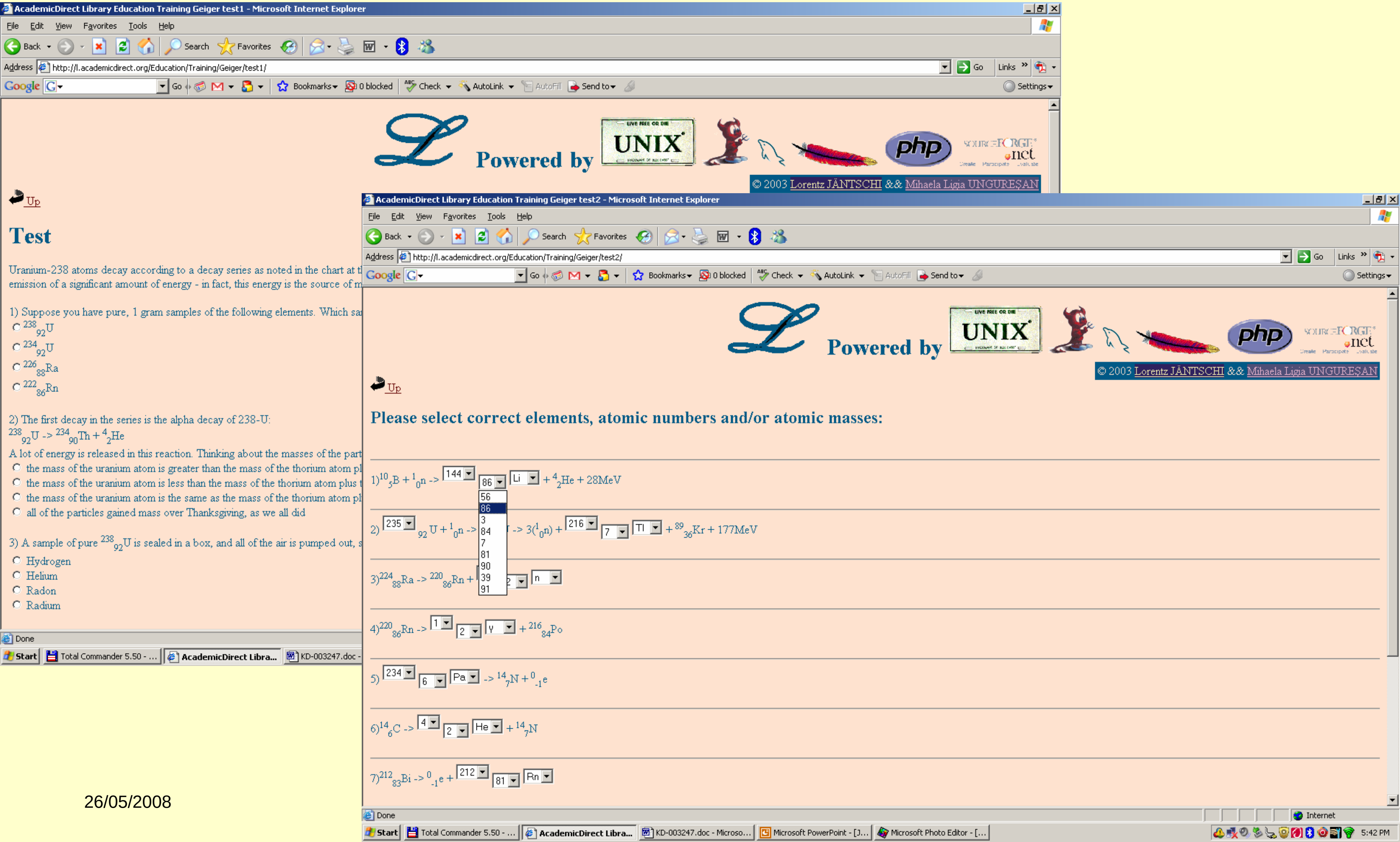

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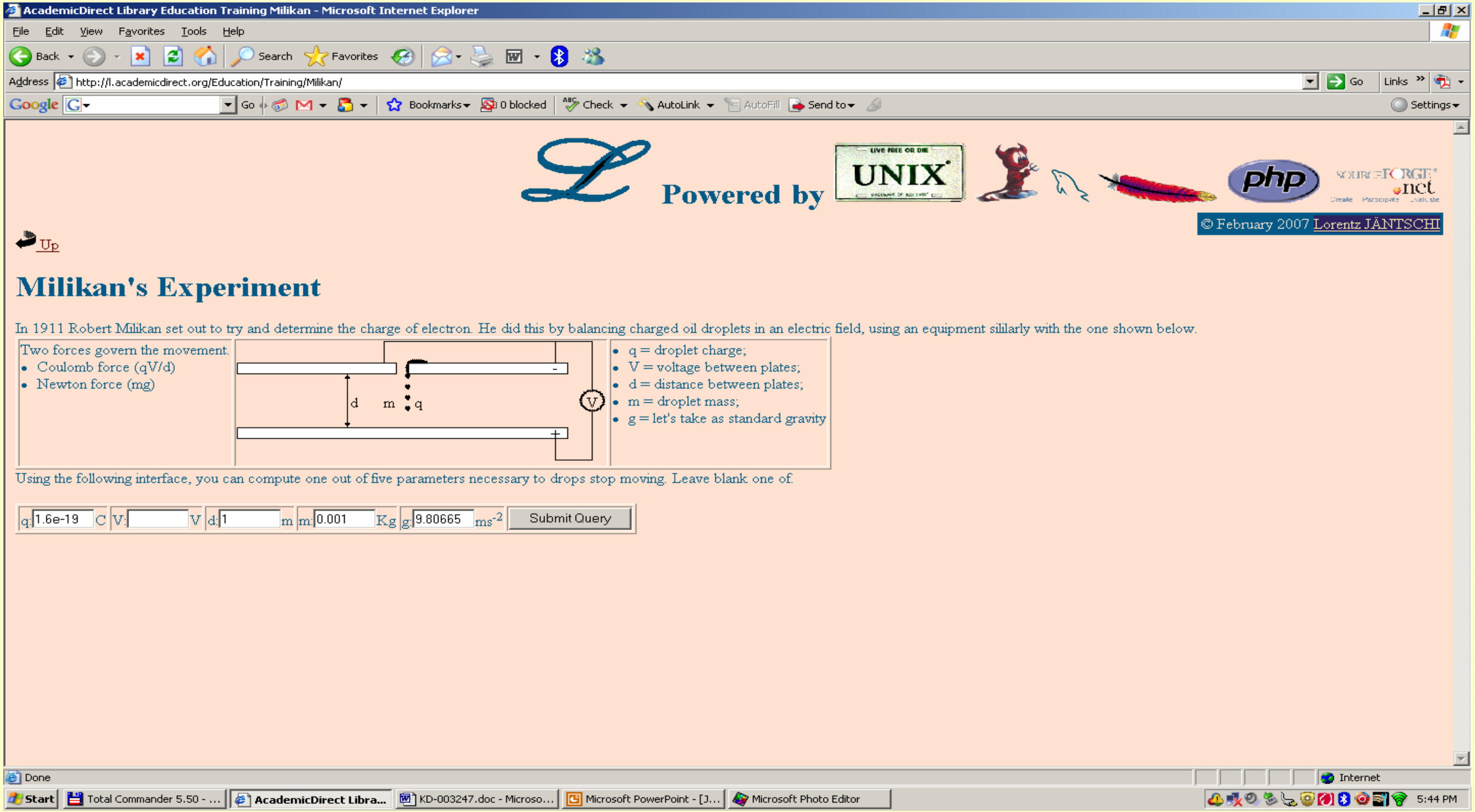

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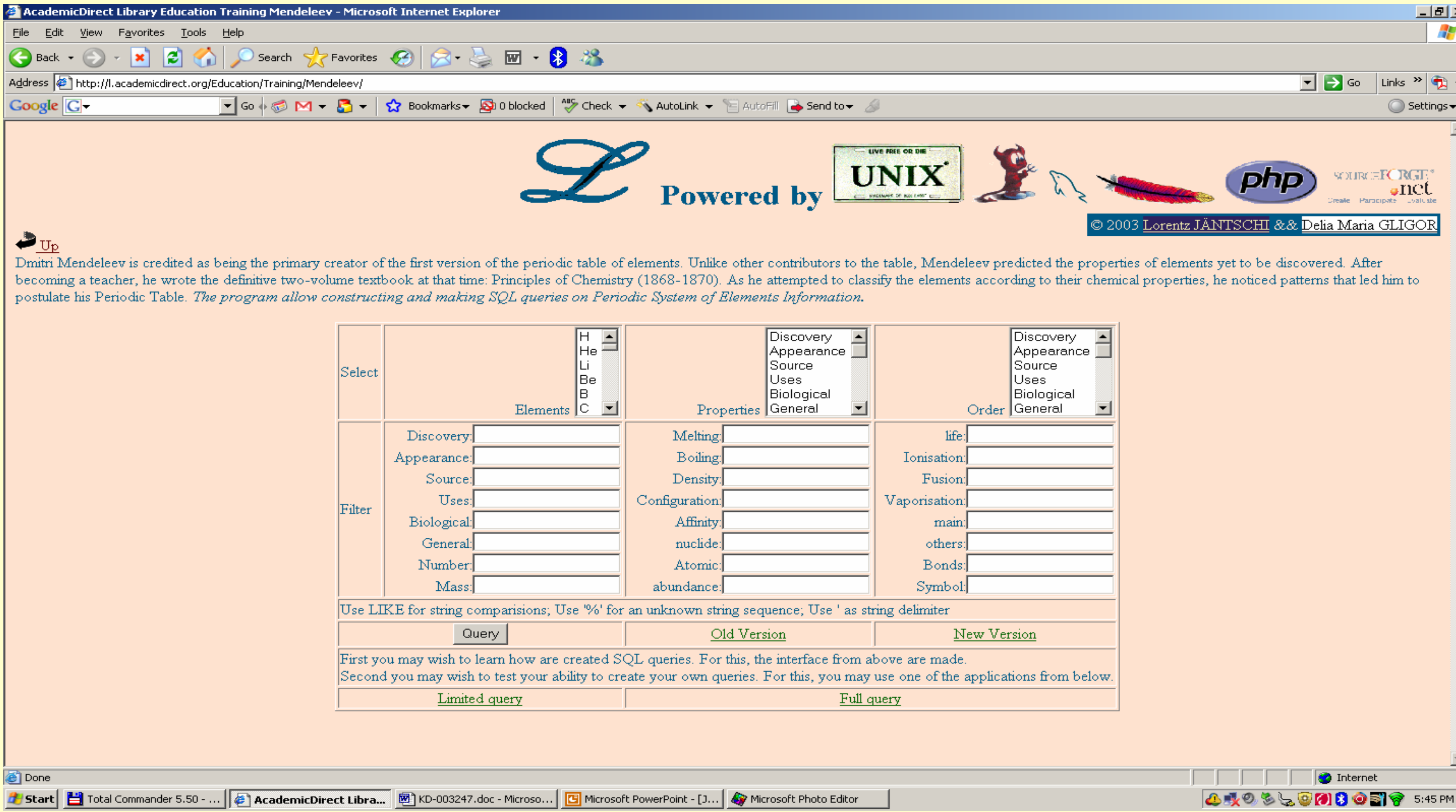

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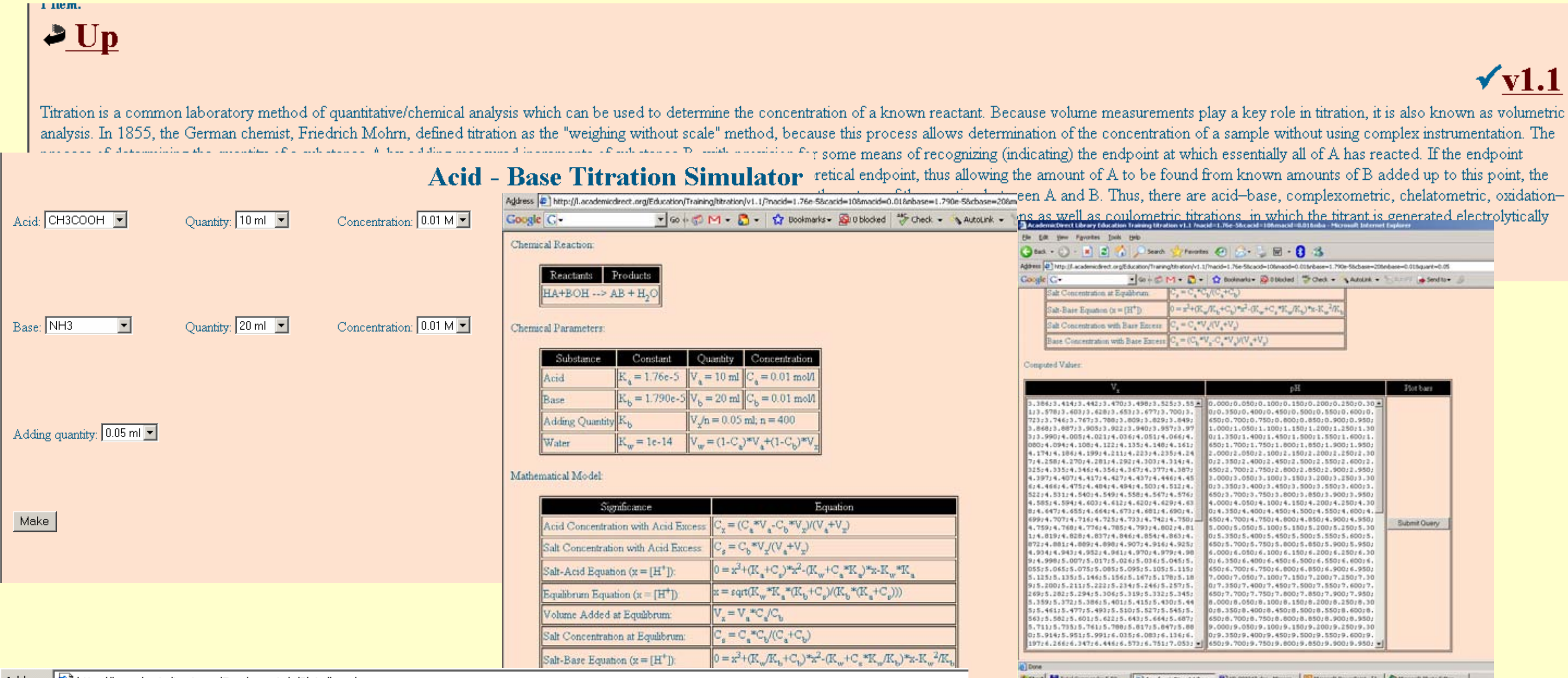

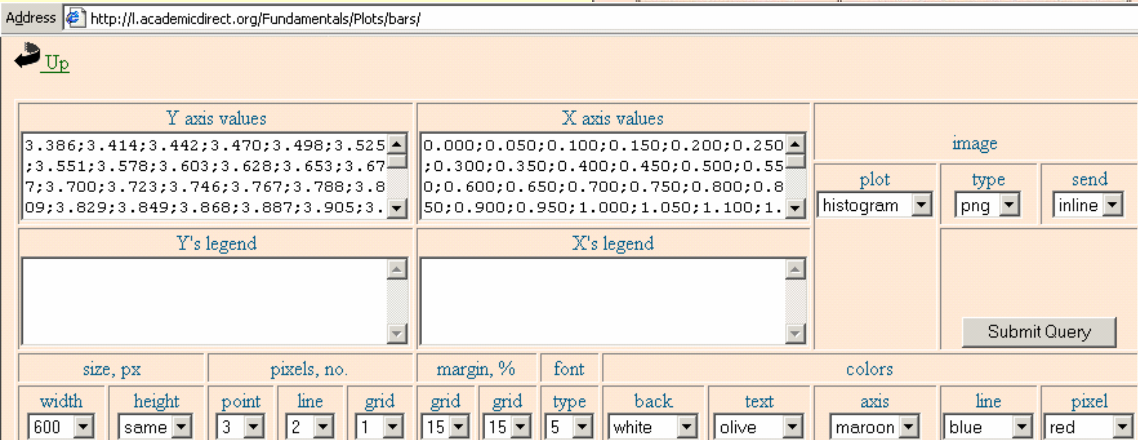

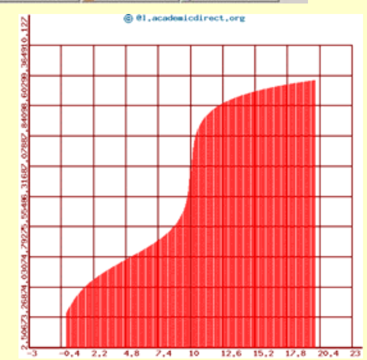

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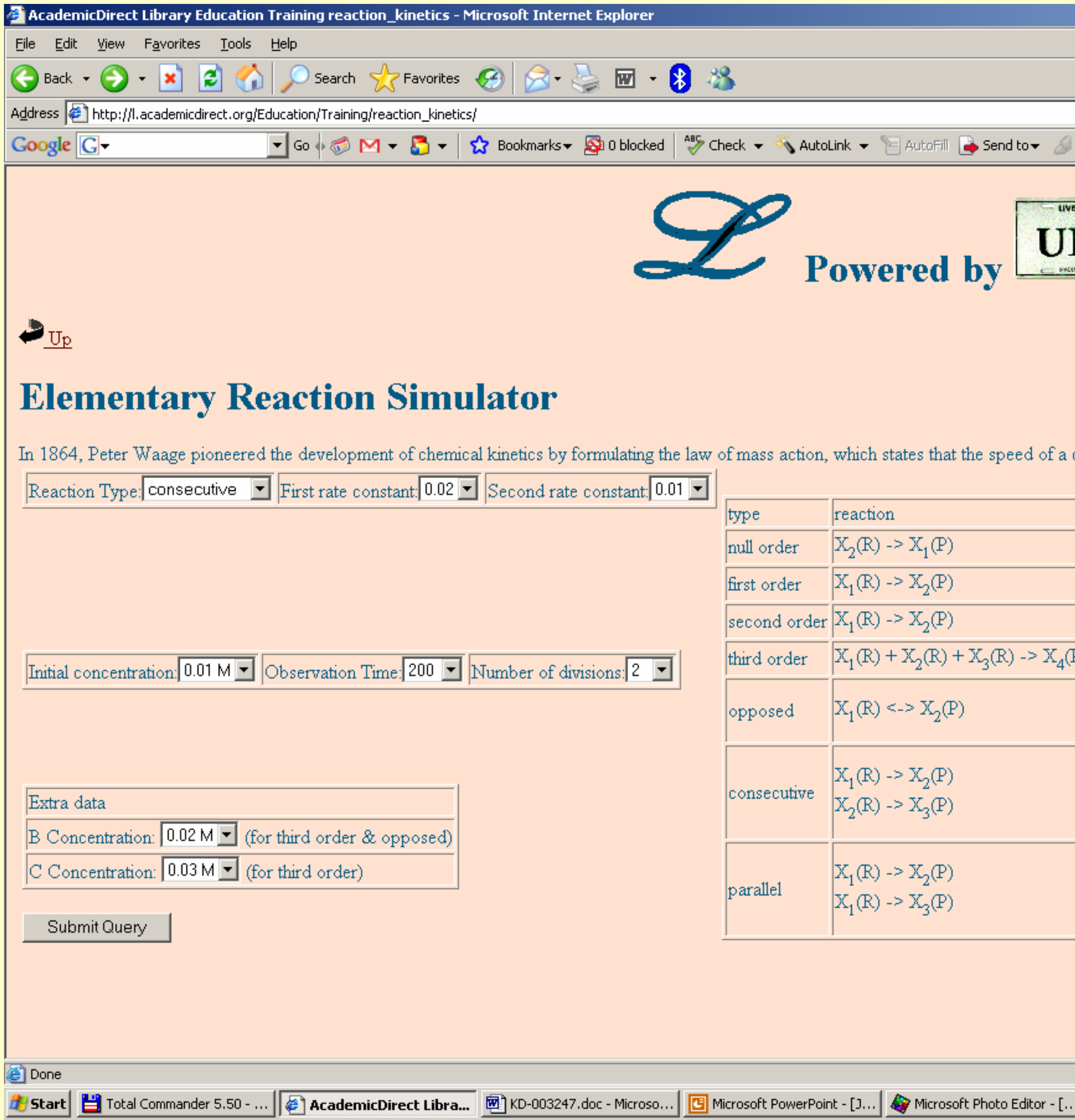
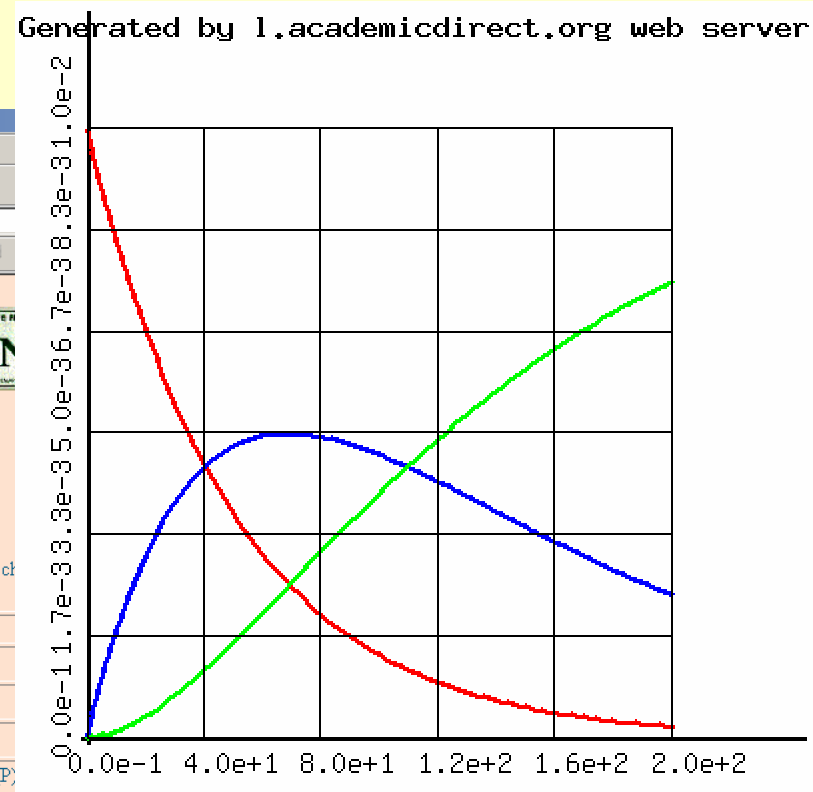




e-Evaluation (1/4)

- Security
  - Running: HTTP_X_FORWARDED_FOR, HTTP_VIA, REMOTE_ADDR, SERVER_ADDR
  - Actions (limited on resources depending on moment): global variables per discipline T/F: time_for_view time_for_update, time_for_test
  - Authentification: both professor’s and student passwords (encripted MD5)

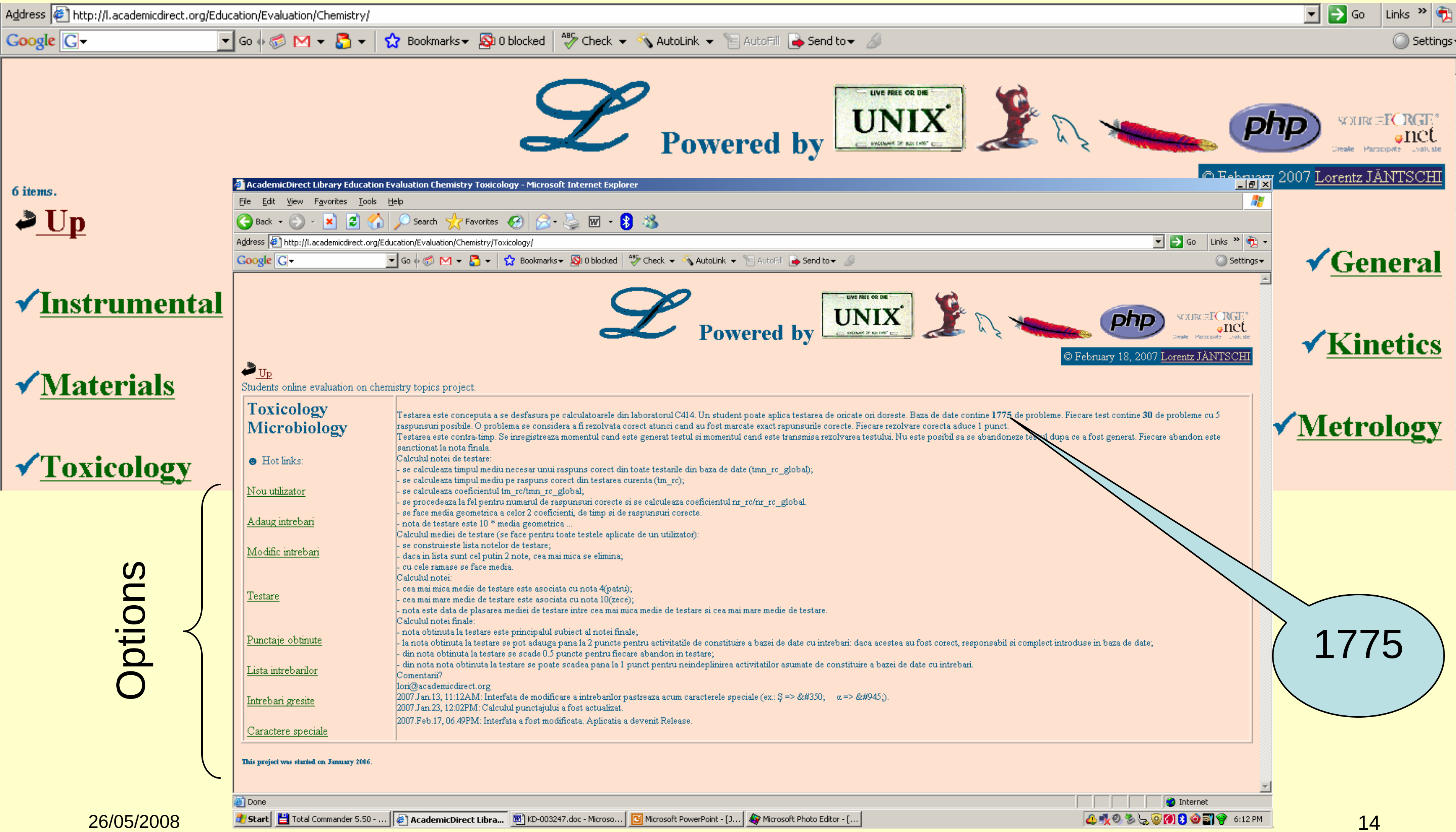
e-Evaluation (2/4)

- Flexibility
  - To allow defining the number of questions that a test will contain.
  - To allow defining the Questions & Answers table name, and the name of the discipline.
  - To allow defining the end of the evaluation - date and time.
  - To allow questions with five possible answers, with one to four correct answers.

e-Evaluation (3/4)

- Features
  - The students are involved in the task of creating and adding questions to the database, a task that is voluntary;
  - The student's work is rewarded through supplementary points added to the final mark.
  - The bonus points for this task are given according to the quality of work. This is an imposed rule, related with the calculation bonus method: the number of correct answers for all inserted questions must have a uniform distribution. The highest bonus can give a plus of 1/5 to the final mark.

e-Evaluation (4/4)



Results (1/3)

Discipline		Instrum	Kinetic	Mater	Polluta	Toxicol
Answers	Total	654 (%	232 (%	863 (%	439 (%	767 (%
As is in dB (from 0 to 5 possibilities)	1	331 (50	146 (63	297 (35	154 (35	419 (55
	2	155 (24	45 (19	201 (23	101 (23	147 (19
	3	105 (16	22 (10	181 (21	100 (23	116 (15
	4	63 (10	19 (8	184 (21	84 (19	85 (11
students who inserted quest. (2005-2007)		23 (32	11 (46	30 (30	19 (49	28 (44

Results (2/3)

Year	2005-2006			2006-2007			Total		
Discipline	Tests	Studs	%	Tests	Studs	%	Tests	Studs	%
Instrumental	86	42	205	47	30	157	133	72	185
Kinetic	n.a.	n.a.	-	35	24	146	35	24	146
Materials	236	99	238	n.a.	n.a.	-	236	99	238
Pollutants	n.a.	n.a.	-	69	39	177	69	39	177
Toxicology	80	37	216	55	27	204	135	64	211
Total	402	178	226	206	120	172	608	298	204

Percentual tests by student (95% confidence): 193±17 %

Results (3/3)

- Table 3a: Parameters of evaluations: Instrumental Analysis
- Table 3b: Parameters of evaluations: Toxicology
- Table 3c: Parameters of evaluations: Kinetics
- Table 3d: Parameters of evaluations: Pollutant
- Table 3e: Parameters of evaluations: Materials

Param	***Correct answ***		***Time /corr.answ(s)***		***Bonus (from 10)***	
Year	2006	2007	2006	2007	2006	2007
n_{valid}	50	35	50	35	12	16
μ	15.94	11.8	40.7	61.8	0.7	1.1
SD	6.62	5.7	40.0	57.3	0.5	0.5
Me	16	13	32.7	46.7	0.5	1.1
Min	2	3	7.6	10.5	0.2	0.3
Max	29	24	273.5	290	1.7	1.9

Year = of evaluation; n_{valid} = sample size; μ = arithmetic mean;

SD = standard deviation; Me = median; **TABLE 3B**

Analysis (1/3)

- Mean of correct answers obtained by students that took the Instrumental Analysis test in the academic year 2005-2006 was significantly lower (up to eight correct answers, $p < 1$ ‰) compared with the students that took the test in the academic year 2006-2007
- The difference was inverse for the students that took the Toxicology test (up to four correct answers, $p < 1\%$)

Analysis (2/3)

- Average time per correct answer was significantly higher ($p = 0.002$ ‰) for the students that took the Instrumental Analysis test in the academic year 2005-2006 (almost 83s, Tab.3A) compared with those that took the test in the academic year 2006-2007.
- The students who performed the examination in the academic year 2006-2007 obtained better performances due to the previously interaction with the evaluation system. They performed previously two similar examinations, being familiarized with the system and its components.

Analysis (3/3)

- The students that took the Materials Chemistry test obtained the lowest value for time per correct answer (avg=21.86s) and highest value for correct answers (~22/30).
- Pearson correlation coefficient on time vs. number of correct answers obtained by these students give a value of -0.72 ($p < 0.05$: time significantly related with number of correct anwers; $r^2 \approx 52$: number of correct answers relates with time per correct answer with about 52%).

Discussion (1/2)

- Many online-training and evaluation systems are available today for different domains of interest.
- The impact (of the proposed system) on teaching and learning can be evaluated in statistics terms.
- The examination using multiple choice questions is seen by the students as an easily exam comparing with other forms of examination (both passing rates and student’s opininons).
- The students that used previously the system learn that it is necessary to have knowledge on the subject tested in order to pass the exam (number of fails at first contact)
- Those of students which used the system for the third time had better results compared with other students.

Discussion (2/2)

- Time is one of the factors included into the evaluation for two reasons. First, any decision is limited in time, especially in engineering domain. Second, the time was used for discouraging the cheating (communication between students on the time of evaluation, the use of the forbidden materials as courses and books).
- The e-evaluation environment was constructed as a training and evaluation instrument. The active involvement of the students in the creation of multiple-choice banks introduces a new method of learning. This activity motivates students to ask questions and to find answers, thus involving them into an active learning process and an active interaction with the teacher, which are useful for their development.

Remarks

- The time needed to evaluate each test is considerably low (from 5 to 10 min. for a good student => an advantage when testing large classes);
- The evaluation is as objective as it could be;
- The idea of cheating by looking for the correct answer (the marking depends on the number of correct answers as well as by the time needed to give the correct answer) or by asking a colleague are discouraged.
- Basic computer skills are necessary in order to use the system.

References

- Leonardo El J Pract Technol 9:179-92;2006.
- Proc 10 WMSCI 1:97-101;2006.