



## THE CONTRIBUTION FOR DEVELOPMENT OF ICT COMPETENCIES OF CHEMISTRY TEACHERS IN CZECH REPUBLIC

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### Abstract

*The teachers in the Czech Republic seem to be not sufficiently prepared for new tasks (ICT) in we do not include teachers of informatics and partially mathematics. There is also lack of methodical materials for using information basis on the Internet. From the above mentioned reason the section of the didactic of chemistry of the chemistry department of the University of Hradec Kralove prepared for introductory testing of the distance education by means of e-learning the course Internet for chemistry teachers. In the paper are presented the structure of the course and its student's evaluation.*

**Key words:** *distance learning courses, chemistry teachers education, education by Internet.*

### Introduction

Distance learning, e-learning, the whole life education and other connected notions provide recently often topic for discussions at all levels of education systems. It also holds of education of chemistry and part of its education of future chemistry teachers at all kinds of schools (Ganajová, 1998; Kmeťová and Tomeček, 2000). University education has got its own specificity first of all in professional orientation of graduates and related width and especially depth of studied subject matter. Limited space and time capacity and usually also personal and technological and infrastructure limitation require new attitudes to the university education including future teachers education. Distance learning supported or provided by information technology seems to be one possibility of reasonable innovation of education in academic institutions.

### Distance E-education

Distance education is based on the specific attitude towards students. First of all there is stressed dependence (autonomy) and immediate feedback. The effectiveness of education is supported by activity made by students themselves, who create persistent knowledge, ability an attitude by purposeful and systematic mastering of presented knowledge. Learners can learn at the pace suitable for them and also arrange other conditions of education and make it adequate for them (Pavlíková, 2002; Turčáni, 2000).

Information technology based on the Internet is not any more domain universities only, but begin to influence the reality of high and secondary schools in the Czech Republic and form effective environment for realization of distance education. For the education of future teachers there is important the fact of rapidly increasing number of schools having quick connection to the Internet and enormous interest of very young pupils in the global network and also fact of the quick spreading of information technology over the framework of specialized subjects devoted to computers such as Informatics, Computers and similar.

The teachers in the Czech Republic seem to be not sufficiently prepared for new tasks in we do not include teachers of informatics and partially mathematics. It was mentioned on many Czech seminars and conferences. There is also lack of methodical materials for using information basis on the Internet and in various subjects teachers are insufficiently prepared in both user and creative sphere. From the above mentioned reason the section of the didactic of

chemistry of the chemistry department of the University of Hradec Kralove prepared for introductory testing of the distance education by means of e-learning the course Internet for chemistry teachers, which became a part of pre graduate and post graduate teacher education (Bílek, 2001).

### **Distance E-Course Internet for Chemistry Teachers**

The rationale of the course internet for chemistry teachers is education of both future and in service teachers with the stress of chemistry teachers but also other science in the area of user use and handling of the internet mastering principles of the internet but mainly high level of didactics use of internet sources and services with the stress of (e-mail, www).

At present the content of the course was stabilized and include five topics: The services of the Internet I (WWW), The services of the Internet II (e-mail), Chemical databases and the Internet, Metainformation in the work of chemistry teacher, Educational projects and the Internet. The structure of the topics is formed by selected activities of the following selection: Study material – “Read the following!”, Sources – “Select and explore!”, Critical evaluation of the information and its source – “Think it over!”, Seminar or practical work – “Practice!” and self test – “Verify and check up!”, Tasks – “Work out!” and other activity – “Discuss!”, “Critically assess!”, “Elaborate an essay!” and others. There are developed three versions of the educational environment that include: integrated version for presence education at the Faculty of Education University of Hradec Kralove using MSOffice standard and applications of this package (MS Explorer, MS Outlook, MS Word, MS Excel), integrated version developed in Learning Space Environment placed at the portal „TELMAE“ of Department of the Didactic of Physics at the Faculty of Mathematic and Physics of the Charles University in Prague (Lustigová, Zelenda and Hyková, 2003) for the purpose of further education of teachers of science (first graduates in 2002) and in WebCT learning environment in the OLIVA Portal of The Faculty of Informatics and Management (Mikulecká and Poulová, 2000) for the purpose of pre graduate and post graduate education of the chemistry teachers (the system is being tested at present).

### **Selected Results of the Student Evaluation of the E-Course Internet for the Chemistry Teachers**

Here there are presented selected results of the student evaluation of the course internet for the chemistry teachers. The opinions of 21 students who finished the course out of 43 originally registered students of teaching of science and in service teachers from practice (chemistry teachers prevailed). Proximately 50 percent of students finished successfully the course.

Student findings:

- Almost 80% of the students who finished the course evaluated the course as sufficient and satisfactory, about 90% of these students rated the instructions accompanying the tasks and exercises as easily understandable and the same proportion would appreciate more similarly organised courses in both pre graduate and post graduate study.
- 40% of the students who finished the course used frequently extending WWW-sources, 60% used them occasionally, there appeared no student who did not use them.
- 75% students needed an advice concerning other progress during the course, 65% out of them used mainly their colleagues advice, 25% made use mainly their tutors advice, 10% used consultation with the person different from tutor or colleague, 5% made use of specialized literature.
- More than 50% respondents worked on the tasks and problems usually once a week, 10% more then once or less then once a week and 30% used different characteristic, such as: *“As I have access to the Internet an to the computer only at the university, I decided to work out my tasks in batch and I devoted one day lets say Friday for that purpose and sat at the university since I had done the whole task. But it happened only if I had good luck. Sometimes I had to work on the tasks several times a week in case I had some free time in my schedule between my lessons....”*; *“I very much depended on the type of the task, I haven’t done my*

tasks regularly and then I regretted it bitterly, as I had many tasks at the end.”; “I worked not regularly; I usually spent day or two over one task.”; “The exception was task No 2 over that I spent more than a week.” etc.

- 80% of the respondents does not consider necessary to include other running tests in addition to exercises and tasks included in each chapter (each chapter contains not solved and not evaluated exercises and evaluated exercises which are mostly creative ones). Now we select from the answers and its option other characteristics these opinions: „I really don't know to answer this tricky question.”; “It is more profitable for me to know more than to be tested more. In case the test is intended to be only a supportive mean for education I appreciate it. But if had to prepare for test and the result of the same test could in addition to it influence my educational process from the outside of me, I wouldn't like it.”; “The samples of tasks with elaborated solutions are sufficient feedback for me about what I have really learned.”

- 60% of respondents gave negative answer to the question if they lacked direct contact education, 10% missed it, 30% gave other interesting characteristic such as: „To some way yes, as I got used to traditional way of education.”; “One must in the same way sit over it and try it himself.”; “I lacked it, as I am such type of woman who better remember things from classical lecture and exercise then from written documents. And in addition to it the immediate feedback is ideal for me as it informs me what I do badly or what exactly I should do if I don't know what to do at all. On the other hand I was delighted that I am able to think out something without somebody's advice or help. It is also not bad in the end.”

- We also obtained interested answers to the question: **Which advantages can you see in the on line form of education having successfully completed the course?** “I have clearer and more structured overview and view of the education supported by the Internet (discuss groups, selection of information, etc.). I have mastered essentials of creation of Web pages.”; „It teaches us to work independently and individually.”; “I appreciate individual attitude, individual pace, independent work, independent discovery.”; “I appreciate possibility of immediate consultation or help.”; “I didn't have to go to school (university) and I could make my tasks at home according to my possibilities and other duties.”; “Possibility to arrange my time according to my wishes at home and in better calm.”; “For me there I good now that I am not afraid to make things on PC. Earlier I was afraid that every mistake would have serious consequences.”

- And finally answers to the question: **Which are the disadvantages of on line education according to your view?** “The disadvantage is paradoxically the work with the computer and the Internet. One has to sit in front of the monitor, wait for possibility to start the connection to the Internet. Free of charge connection there is only at the university. It is clear that this my attitude implies many other negatives. Otherwise I don't see any disadvantages of the course“; „Feedback is not as perfect as by classical education“; “The problem is little contact with teacher but on the other hand e-consultation is possible“; “As a disadvantage I see that feedback is impossible and I have in addition to it another personal disadvantage that I must all the time go to school for making tasks and exercises“; “There is not disadvantage if discussion face-to-face is possible“; “If it existed only e-education with computers I would be missing social contact and fellow students”.

## Conclusions

What are our first experiences i.e. experiences of teachers tutors? They might be summoned up in accordance with the views of a row of other authors into two points (Lustigová, Zelenda and Hyková, 2003; Mikulecká and Poulková, 2000; Turčáni, 2000):

1. The teacher can in on line education gain mainly: more time to thing things over, time for making archives and documentation of education (possibility to simplify analysis and results of education process), more time for systematic thinking over aims, plans, ways of control, development of communication ability etc.

2. The teacher can loose free time, immediate feedback, possibility to use his/her favourite teaching styles (mainly verbal ones), watch symptoms and demonstration of students etc.

Positive experiences motivate us for other activity in the area. They confirm the truth of reasonable attitude avoiding of extremes– i.e. application of blended learning

## References

- Bílek, M. (2001). Internet jako obsah a forma dalšího vzdělávání učitelů chemie. In.: Sedláček, J., Bílek, M. (eds.): *Kybernetické modely ve vzdělávání a v mezilidské komunikaci*. Sborník s přílohou CD ROM, Hradec Králové: Gaudemus, s. 252–255.
- Ganajová, M. (1998). *Sprievodca po Internete pre učiteľov chemie*. Prešov: MC.
- Kmeťová, J., Tomeček, O. (2000). Informačné a komunikačné zdroje učiva chémie na gymnáziách. In.: *Acta Universitatis Mathei Bel*, Ser. Chem. 4, Banská Bystrica: FPV UMB, s. 131–135.
- Lustigová, Z., Zelenda, S., Hyková, G. (2003). Vzdělávací portál TELMAE. In: *POŠKOLE 2003 – sborník příspěvků konference s mezinárodní účastí o počítačích ve škole*. Sedmihorky: Poškole.
- Mikulecká, J., Poullová, P. (2002). Our e-Learning Journey: A Case Study. In.: *Research and Policy in Open and Distance Learning*. Hildesheim: University of Hildesheim, pp. 76–78.
- Pavlíková, A. (2002). Problematika didaktických východísk tvorby výučbových prostředí v podmínkách dištančného vzdelávania. In.: *eLearn – Žilina, Žilina: EDIS – vydavateľstvo Žilinskej univerzity*, s. 89–94.
- Turčáni, M. (2000). Informačné a komunikačné technológie vo výučbe prírodovedných predmetov. *Technológia vzdelávania*, 9/2000, ročník VIII, s. 5–8.

Santrauka

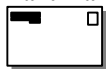
## PAGALBA CHEMIJOS MOKYTOJAMS PLĖTOJANT INFORMACINIUS IR TECHNOLOGINIUS GEBĖJIMUS ČEKIJOS RESPUBLIKOJE Martin Bílek, Antonín Slabý

Straipsnyje nagrinėjamos aktualios informacinių-kompiuterinių technologijų taikymo problemos Čekijos Respublikoje. Aptariama pagalba chemijos mokytojams plėtojant jų IKT gebėjimus. Hradec Kralove universiteto Chemijos katedros specialistai parengė nuotolinio mokymosi kursų naudojant internetą. Akcentuojama, kad informacinės-kompiuterinės technologijos panaudojant interneto teikiamas galimybes nebėra vien tik universitetų veiklos sfera. Tuo vis labiau domisi įvairios (įvairių tipų) bendrojo lavinimo mokyklos.

Taip pat teigiama, kad mokytojų pasirengimas naudotis IKT yra nepakankamas. Siūlomo mokymosi kurso turinys sudarytas iš penkių pagrindinių dalių: interneto paslaugos 1 (www); interneto paslaugos 2 (el. paštas); chemijos duomenų bazės ir internetas; metainformacija chemijos mokytojų darbe; ugdymo (švietimo) projektai ir internetas.

Daugiau kaip 50% respondentų naudojami internetu dažniausiai kartą per savaitę, 10% daugiau nei kartą per savaitę ir 30% išreiškė kitas įvairias nuomones. Beveik 80% respondentų, baigusiu organizuotus IKT kursus, teigė, kad jie buvo geri bei informatyvūs. Chemijos mokytojai skatinami kuo plačiau taikyti IKT. IKT panaudojamos ne tik mokymui(-si), bet ir grįžtamajai informacijai gauti, organizuoti būtinų konsultacijų teikimui.

**Raktiniai žodžiai:** nuotolinio mokymosi kursai, chemijos mokytojų rengimas, švietimas internetu.



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