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**Interaktivní flexibilní program – Chemie síry  
a jeho vliv na efektivitu osvojování učiva**

**Interactive flexible program – Sulfur chemistry  
and its impact to acquiring of curriculum**

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**Souhrn disertační práce**

**Summary of PhD. Thesis**

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## KEYWORDS

Interactive flexible program; electronic materials; digital textbook; education software; effectiveness; process of acquiring curriculum; key competencies; chemistry experiments, personal computer; technology.

## INTRODUCTION

We live in an era of information technology where the revolutionary way of acquiring new information is available. The new information deepen and widen acknowledge in individual branches of science. Most of the new information contradicts the validity of the existing data. Huge increase and still rising difficulty of the new information require the fundamental changes in the organization of process of acquiring curriculum. But the existing education tools specified for self-studying pupils do not reflect these needs. The rigid education utilities are in substance still the same for many years and do not reflect the new requirements, e. g. quick searching of information, possibility to modify the substantiality of curriculum, possibility of usage more senses in perception of curriculum etc. Also the attractiveness of these educations tools is very low and pupils use them only in case of emergency. For the stated rigidity and the low attractiveness the education tools losing its importance. That is why I suppose that it is necessary as the base of curriculum to choose an education tool which will be more attractive for pupils and which will:

- allow flexible modification of content of teaching;

- intermediate the science system of chemistry as empiric-theoretical sciences;
- regulate the activity of pupils in solution of themes;
- facilitate the active approach to education and information;
- respect aspiration aims of pupils, etc.

As the proper education tool I have projected the Interactive Flexible Program (IFP) which should be the foundation of future electronical textbook of chemistry.

## HYPOTHESES OF DISSERTATION WORK

**“In case of suitable didactical and technological elaboration of proposed education programs will be possible to replace classical textbooks at our schools. The replacement of classical textbooks will be not only friendly to pupils and help teachers to modify substantiality of curriculum according to educational school programs, but it will provide the better results in process of acquiring curriculum.”**

## AIMS OF DISSERTATION

The aims of dissertation reflect defined research hypothesis. I have divided the aims according to the importance into:

### 1) **Main aims**

- to create an interactive flexible program;
- to provide a comparison of the created flexible program and of the classical; textbook and the influence of process of acquiring curriculum;

### 2) **Partial aims**

- to carry out an analysis of education tools and electronical textbooks in the Czech Republic;
- to identify an interest and possibilities of using IFP;
- to elaborate the literature retrieval and the overall review of information about chemistry of sulfur;
- to elaborate the pedagogic-psychology framework of the work;
- to choose a proper technology for creation of the interactive program;
- to compile the sulfur chemistry curriculum;
- to find out the permanency of learned knowledge in a certain time interval.

## THEORETICAL PART

### **Pedagogic documents**

First of all, I believe it is necessary to give some information on the actual mandatory curricular documents in actual conformity. In my work I stemmed from:

- *National program of the education development* (Kotásek, 2001);
- *Pre-school, basic, high, college and other education law*;
- *Framework educational programs* (RVP, 2007);
- *chosen Educational school programs*.

The other document taken into account in thesis is the *Test requirements for the leaving examinations catalogue – Chemistry*.

### **Pedagogical and psychology bases of work**

In this part I featured some of important terms and ideas of using education tools in educational process from various view and from various authors. I feature for example educational tools, teachware, education technique, using ICT in education etc. This part was very important because I needed to know which kind of educational tool I will create, which status in education the creating IFP will have and which requirements must the IFP fulfill to be the efficient educational tool (Geschwinder, Růžička, Růžičková, 1995). The next stages of this part treat of the theories of education and self education for example meaningful learning programmed learning, sense perception, learning with ICT etc. (Bílek, 2005; Čáp, Mareš, 2001; Dostál 2007; Kouba, 1992).

## EXPERIMENTAL PART

### **Questionnaires**

The first necessary step was to find out which opinions teachers and pupils have about using ICT in education. The object of questionnaire research was to find out:

- what is the value of personal computer in education process;
- if there is an interest about in new educational tools;
- which kind of education tool do they use;
- what is the main source of information for pupils and teachers;
- opinions on presented interactive flexible program.

The questionnaire research filled in 43 teachers and 88 pupils of high schools. The results show that the using of computers in education is common as well as they are interested in new electronic materials.

## **Used technology**

Before I started with programming IFP I was looking for an available technology. I had advantage that in my diploma work I created something of that kind – interactive program Chemistry of manganese. I introduced this program to the teachers and I discussed with them about new model of program, incoming soon. For better analyzing the opinion I used questionnaire research too. The questionnaires filled in 33 teachers of chemistry during the year 2006. The gained information showed that I can use the HTML technology for my new program. At least 50 % of teachers are able to work with this technology.

## **Interactive flexible program**

When I was choosing the curriculum for the program of sulfur chemistry I used actual mandatory curricular document (Framework educational programs, Test requirements for the leaving examinations catalogue – Chemistry, chosen Educational school programs), experience of teachers and also I use various chemistry textbook. It was very important to find out the contents of high textbooks in order to have the following implemented research of effectiveness objective. With reference to this fact I have determinate the following chapters: Introduction, Symbol of element, Position in Periodic Table of Elements, Electron Configuration, The most common oxidation state, Incidence in Nature, Sulfur and its compound, Video experiments of chemistry experiments, Usage of the chosen compounds, Theme conclusion and Exercises (Greenwood, Earshaw, 1993).

Created program integrates an array of didactic tools – e.g.: traditional textbook, video sequences of chemical experiments, check tasks with different level of difficulty (having a selfregulating function), chemical hypertext dictionary, tools for managing learning process, motivational factors etc. This program additionally enables its users to change basic structural elements at random. Research in practice has showed that this program, texts or some of their parts can be successfully used in the regular forms of chemistry learning - at basic, high schools and universities as well as for self- educated and distance learning students (Dvořák, 2007).

## **Effectiveness of interactive flexible program in acquiring curriculum**

The purpose of this research was the assessment of the acquiring curriculum rate of the sulfur chemistry accordingly learning from IFP or from classical textbooks. The exploratory sample was the group of 300 pupils of high schools – gymnasiums. Pupils wrote during 3 months 3 very similar tests (Chráska, 1999). The results of these 3 tests (preliminary, testing, outgoing) were analyzed by statistic methods and evaluated (Hanousek, Charamza, 1992; Howitt, Cramer, 2000).

## SUMMARY

At the end I have found out that all the main and partial goals identified at the beginning of the work have been fulfilled and the stated hypothesis has been confirmed.

The results of the educational material analysis show that **there is no any satisfactory complex educational program** on the market. The questionnaire investigation between teachers and pupils acknowledged the present trend of using computers in education. It was explicitly demonstrated the interest at the both side of the utilization in education system. The most of teachers appreciate the possibility to edit the Program according to the current needs.

**The chosen technology DHTML** allows any user with the basic computer literacy and at least elementary knowledge of HTML to modify and adjust the Program in compliance with the actual conditions.

On the basis of the facts established by enquiry I have created the **Interactive Flexible Program “Chemistry of Sulfur”** in order to all requirements on the modern didactic instrument specified for self-study. I have verified the created IFP during the study on some secondary schools in the Czech Republic. **The results proofed the main research hypothesis** of this work that the self-study with IFP contributes to the better results within learning of chemistry. I only did not succeed in the validation of the fact that these results are longer-range than within learning without IFP.