Abstract

With the increasing use of information technology, developing the electronic version of Prof. Katalin Sárdi’s textbook entitled „Agrochemistry: The Fundamentals of Crop Nutrition” (215 pages) was found necessary. Beforehand, a need survey had been made among students doing Agrochemistry at the Faculty which made it clear that 75% of the students would like to use such electronic materials. The CD ROM contains the contents of the book in chapters and uses hyperlinks to access the given chapter. The students are supposed to be able to identify the most common fertilizers; therefore a chapter on fertilizers was added to the electronic version. The material is being tested actually among the students. The material is to be set up in Podcast system as well so that students can use it e.g. when they are travelling. A version for the disabled students is planned to be developed in the future.

Introduction

The use of Information Technology makes the visualisation in education easier. A good example of that is the projector used instead of the OHP (overhead projector) or the interactive whiteboard instead of the traditional boards. The paper-based references are increasingly replaced by electronic versions or digital materials downloadable from the internet. That is the reason why the electronic version of Sárdi Katalin’s Faculty textbook entitled „Agrochemistry- the Fundamentals of Crop Nutrition” [5] (215 pages) [4] was developed. The textbook could be accessed either in a PDF format at the website of the Faculty or bought in the shop beforehand.
The Faculty’s IT group has significant experiences in developing electronic training materials, among which the most important ones are the following:

1. The Applications of Digital Image Processing (DIGKEP): a training CD-ROM with accompanying printed book, having had 6 editions with its 6.0 present version. It is used in the subjects Digital image processing and Basics of IT.


3. Creative Workshop 1.0, 2.0: methods and tools for developing electronic training materials in the form of an electronic course book.

The development was carried out using the experience enlisted above. Before the development a needs analysis had taken place among the students doing Agrochemistry at University of Pannonia, Georgikon Faculty of Agriculture who can be considered the potential target group in using the material.

The Questionnaire

The questionnaire contains the following questions:

- What do you use when preparing for an examination?
- Do you own a computer?
- Do you own mobile equipment capable of playing audio files?
- Do you own mobile equipment capable of playing video files?
- Do you have an internet access?
- Would you use multimedia materials for learning?
- What would you find important with a material like that?
- Would you need the personal appearance of your Professor in the audio and video files?
- Do you find it important to embed a terminological glossary?

The evaluation of the questionnaire showed us that ¾ of the students use printed course books or university notes as well as their own notes of the lecture when preparing for an examination. 71% stated that they would probably use an electronic training material. The
The questionnaire showed that 97% owns a computer and 94% has access to the internet. In a multimedia CD-ROM, they found most important text documents, which can probably be in tight connection with their paper based studying (printable). This was considered during the development and the notes were added in PDF format. The next important things were images, figures, and videos, and students found audio materials the least important. 90% supported a terminological glossary and 10% of them „probably would use” it.

The Development

FrontPage 2003 software was used for the development; the images were processed with the help of Adobe Photoshop CE. Diagrams and tables were drawn with the help of Microsoft Excel 2003. The structure of the course book was followed, thus the CD-ROM also contains chapters.

New chapters were also added like Self Evaluation and Identification of fertilizers and a Terminological glossary. From the ‘Contents’, there is a hyperlink to the given chapter. There is a separate part for self evaluation in the form of a test. A questionnaire has also been added.
to the CD-ROM, with the help of which the students can tell us their thoughts on the material thus helping the development. An entrance to the oral exam is the Identification of fertilizers, so the new part gives help in this topic.

Options in the Menu (figure 2)

*Information*

The user is given detailed info on the menu bar of the CD-ROM and its use.

*Main page*

The starting screen of the CD-ROM. As the menu is to be seen all the time, this can be done at any time. (Figure 1)

*Contents*

With the help of hyperlinks, the chapters and subchapters of the material can at once be accessed.

*Introduction-Chapter 9.*

Contains the chapters of the paper-based version keeping the original structure. Putting the cursor above the chapter number, the exact title of the chapter can be seen.

*Chapter 1.*

The establishment of the science Agrochemistry and its connection to other sciences: in this chapter you get info on how this science has developed through the centuries, how it is connected to other sciences and on the research methods used in it.

*Chapter 2.*

The characteristics and history of fertilization since the 1930s both in Hungary and Europe.

*Chapter 3.*

Mineral nutrition of plants and factors influencing it: in this chapter you will learn about nutrition through roots and leaves as well as on the main factors influencing it. Nutrient uptake dynamics and its role in nutrient management practices.

*Chapter 4.*

The chemical structure of plants and the role of nutrient elements. In this chapter the user gets info on essential nutrient elements and their significance in nutrient management, on the role of macro elements in nutrition physiology (N, P, K, Ca, Mg, S) and in yield formation. In the end of the chapter, visible symptoms of nutrient deficiencies and toxicities are presented.

*Chapter 5.*
The effects of nutrient supply on crop yield level: the chapter starts with the 'Minimum Law' of Leibig. Then, the relationship between nutrients and the quality and quantity of crop are described.

Chapter 6.
Nutrient dynamics and nutrient supply power of soils: the chapter introduces different forms of nutrients and their behaviour in soils, methods of calculating nutrient balances and the main characteristics of the most important nutrient element balances (N, P, K, Ca, Mg, S).

Chapter 7.
Principles of nutrient management in the framework of sustainable development: this chapter deals with the role of organic fertilizers, introduces principles of environmentally friendly fertilization, describes the up-to-date possibilities of nutrient supply and the system of related literature

“precision farming”. The last part of this chapter contains the regulation of nitrogen fertilization by the Nitrate Directive’ significant from aspect of environmental protection.

Chapter 8.
Fertilizers and fertilizer use: besides the general introduction, this chapter contains detailed description of the most important macro- and microelement fertilizers. Special attention is paid to the environmentally sound use of mono and combined fertilizers such as Nitrogen, Phosphorus, Potassium and others.

Chapter 9.
Methods of fertilizer recommendation. The last chapter describes the concepts in calculation of the rates of fertilizers from the 1970s up till now.

Related literature
Contains the CD-ROM and the related literature of the original university notes in alphabetical order

Downloads
Contains the paper based version in PDF format as well as the necessary Adobe Acrobat Reader

Fertilizers
Contains the images necessary for the examination in Identification of fertilizers

Questionnaire
Gives a possibility to the user to help in the development, and evaluate the CD-ROM

Impressum
Contains names and accessibility of the writers
The CD has been optimised for different browsers. It has been successfully tested using Microsoft Internet Explorer, Opera, Mozilla Firefox and Safari run on Apple systems. The electronic textbook is still being tested among the university students.

Plans for further development
In the future, we are planning to develop the material for disabled students: blind, hard of seeing and dyslexic as well as hard of hearing students. A Podcast system material had already been developed by the IT Group. As that was found successful, a Podcast version is also to be developed so that students can use it e.g. while travelling.

Related literature