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MULTIMEDIA GUIDE TO THE PRACTICAL TEACHING OF BIOLOGY AND GENETICS

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Abstract

This paper brings information about creation of a multimedia guide for practical education of biology and genetics. This guide includes materials containing hypertext documents, microscopic and macroscopic photographs, videos, links to internet sources, recommended literature, list of abbreviation, and control tests. The main menu includes a few items subdivided into „submenu".

The item Tasks contains practical tasks taken from „Handbook for biology and genetics practical courses". The item Photo and video includes macroscopic and microscopic photos and videos of biological objects and events. It is possible to browse the preview of the photos and then to magnify the photo of interest. Videos are streamed for faster loading and better observing. The other item Tests includes tests for testing of students' knowledge. The test is subsequently evaluated with marked correct and wrong answers. The item Links includes links to websites with animations of different biological events and other supplemental information.

This guide satisfies modern trends of education with producing electronic learning texts and providing easy and fast access of students to modern information sources. This guide is specifically designed for students of the first year of both veterinary faculties (FVL and FVHE) at VFU Brno, for present and combined study form of Master's and Bachelor's study programs. This guide will be accessible on internet with unlimited access for students of VFU Brno and also students of other universities and schools.

Key Words

Web page, tasks, microscopic object, genetics examples, photos, video, tests

Introduction

Students of both veterinary faculties (FVL - Faculty of Veterinary Medicine, FVHE - Faculty of Veterinary Hygiene and Ecology) of University of Veterinary and Pharmaceutical Sciences Brno study the basic subjects during the first year of their study. The subject Biology and genetics is focused on

cell biology and basic genetics. Students have different level of knowledge because they studied at different high schools. At our university, knowledge of students is unified and intensified to set up a certain standard.

In practical courses, students observe various biological objects and evens in microscope; realize some experiments and write their observations into protocols. The protocols are subsequently controlled by teachers and its completeness is one of the conditions to get the credit. When a student is absent in practical, he miss the possibility to observe biological objects and events. Students use handbook for practical courses and materials from lectures to prepare theoretically for practical courses and for final examination, respectively. Handbooks are printed each two years with maximally possible 500 printed copies. With each new edition, data in handbook are upgraded, completed with new diagrams, tables and pictures.

There is a trend not to use only traditional methods of learning and education, but to enhance it with new forms and learning methods, which use electronic technologies, available on the Internet. Multimedia interactive learning uses two or more media, such as text, animation, audio or video. The efficiency and usefulness of using interactive materials during the education process was verified (Aberson et al., 2002; Law et al., 2010). The advantage of multimedia learning is an increased accessibility to information, ease of distribution and ease in updating content compared to printed materials (Chu et Chan, 1998; Ward et al., 2001).

The aim of this paper is to introduce a multimedia guide designed for practical teaching of biology and genetics for students of both veterinary faculties of VFU Brno. This guide will include education materials with hypertext documents, microscopic and macroscopic photos and videos, links to internet sources, recommended literature, list of abbreviation and control tests.

Materials and Methods

The main aim of this project is to create a web page containing hypertext documents, microscopic and macroscopic photos and videos, links to internet sources, recommended literature, list of abbreviation and control tests.

The main source for the text part of the multimedia guide will be „Handbook for biology and genetics practical courses", particularly the last actual version (Bártová et al., 2005, 2010). The handbooks are divided into chapters with theoretical introduction and followed with specific tasks such as microscopic observation, biological experiments and genetics examples. The practical tasks from handbook will be converted to hypertext multimedia form.

The text part of the multimedia guide will be supplied by photos and videos. Microscopic objects and evens observed under microscope Olympus will

be converted to electronic form with the help of program quick PHOTO MICRO 2.2. Photos and videos of macroscopic biological objects will be provided by camera Canon EOS 60D. Photos will be consequently adjusted (suitable size, format, basic correction, outlook of miniaturized photos) and incorporated to multimedia in form of preview with the possibility of its enlarging. Videos will be processed and adjusted (shortened, sheared, converted to suitable format) and incorporated to multimedia with the help of streaming (the same style like YouTube).

The multimedia guide will also contain links to interesting web pages showing animations of biological events and bringing some supplemental information.

Another part of multimedia will be control tests with different difficulties that can be used by students to test their knowledge. A set of questions with the correct answers will be prepared for each topic. The questions will be randomly generated with the subsequent evaluation of the answers.

Results and Discussion

A multimedia guide for practical education of biology and genetics was created. The main page of this guide contains the main menu with several items, which are subdivided to submenu (Figure 1).

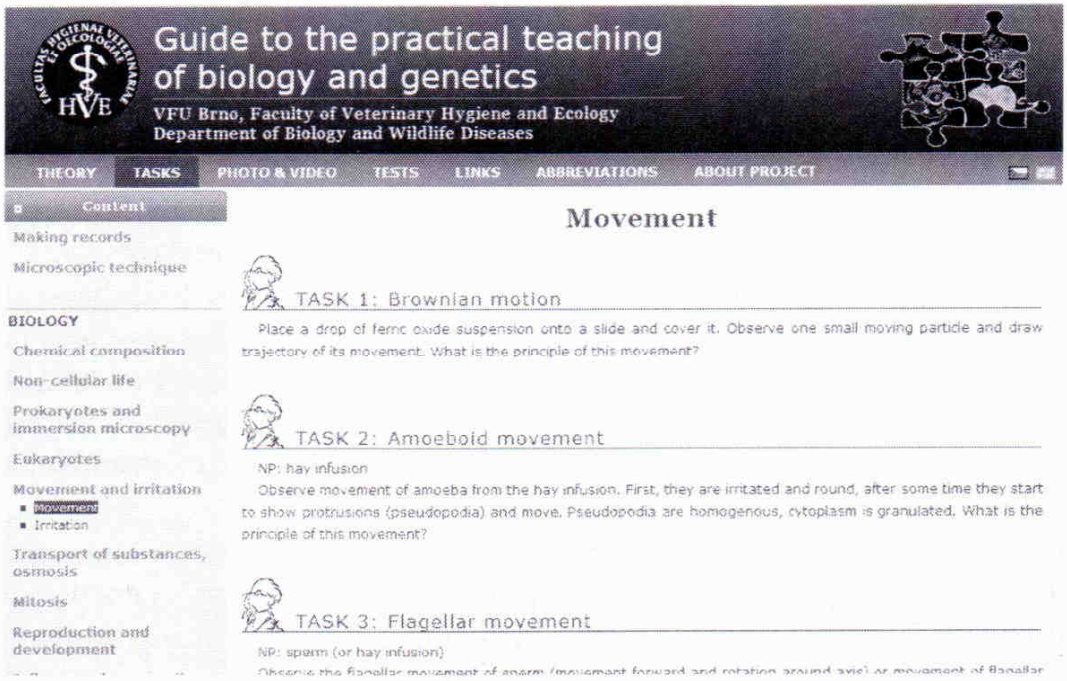

Figure 1: Example of page with tasks from movement

The item Tasks is divided based on different topic e.g. microscopes, Procaryotes, Eucaryotes, chemical compounds, movement and irritation, reproduction, genetics etc. The main menu is divided into submenu e.g. genetics is divided into cytogenetics, monohybridisms, gene interaction, population genetics etc. Individual topics contain different tasks for

microsccopical observation, biological experiment or calculation of genetics examples.

The item Photo and video contains photos and videos of macroscopic and microscopic objects and evens divided into same topics as the item tasks. There are photos of tools and equipment, microscopic preparations and photos of working students (Figure 2). There are small preview of photos that can be enlarged. Video shows different types of cell movement, procedure for preparing native preparations, procedure and result of biological experiments and working students. Video is streamed for better loading and observations.

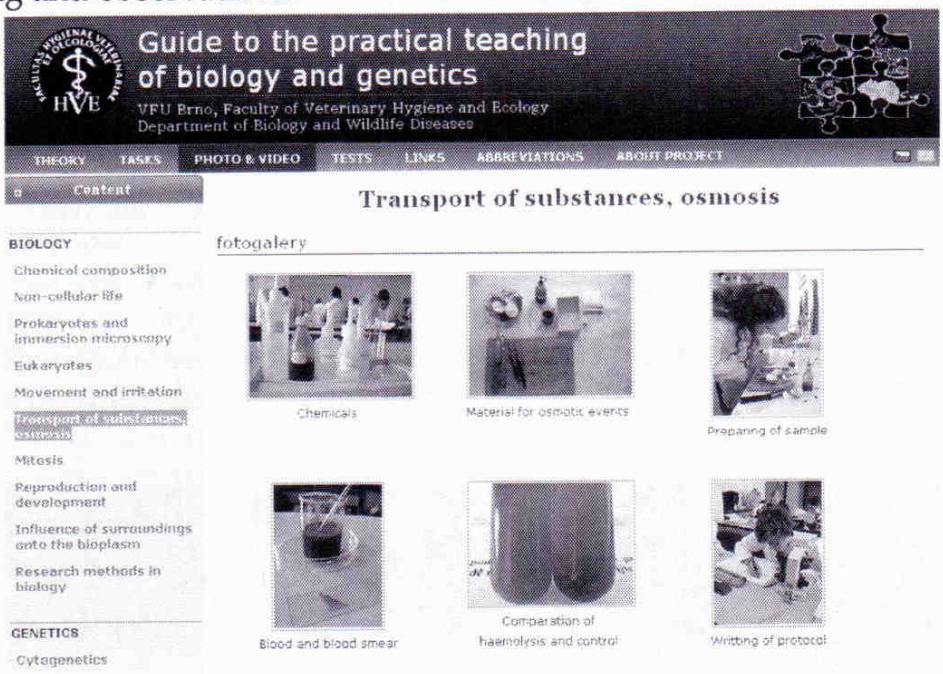

Figure 2: Example of page with photos from methods of molecular biology

The item Tests contains tests with different difficulty and time limit. The tests are subsequently evaluated with marked correct and wrong answers. The item Links contain links to interesting web pages with more information, recommended literature and animation of biological effects such as mitosis, meiosis, PCR etc. The other item Abbreviation contains list of abbreviation used in this guide and sorted alphabetically.

On the Internet, it is possible to find different web pages with e-learning materials used for study of biology or genetics at Universities, e.g. "Genomics in Medicine" created by Institute of Biology and Department of Medical Genetics 1st Faculty of Medicine, Charles University, Prague and General Teaching Hospital (http://biol.lf1.cuni.cz/extensions/Genomika_v_Medicine/default.html) or "Virtual word of genetics" at the page of Mendel University in Brno (http://user.mendelu.cz/urban/vsg3/). The education materials on their web pages contain text, video, source of literature, links to interesting pages, and also audio lectures. Our multimedia guide was designed specifically

for students of both veterinary faculties of VFU Brno for practical teaching of biology and genetics. Compared to above mentioned web pages, our guide contains also text, video, source of literatures, links to interesting pages, but also photos from practical courses and tests to control students' knowledge.

Conclusion

This paper brings information about creation of a multimedia guide for practical education of biology and genetics. This guide includes education materials with hypertext documents, microscopic and macroscopic photos and videos, links to internet sources, recommended literature, list of abbreviation and control tests.

The students can use this guide to prepare yourself theoretically for practical courses, to test their knowledge by help of control tests and to observe microscopical photos and videos from practical courses in case they were absent or want to see them again.

This guide follows the long-term plan of VFU Brno focused on the modernization of education system, creation of electronic learning texts and easy access of students to modern information resources.

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