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Moodle in the service of Mysterious World of Science and Technology

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Abstrakt: *Zvýšenie motivácie a záujmu študentov o stredné a vysoké školy s technickým zameraním je v súčasnej dobe jednou z najvyšších priorít vzdelávania. Nedostatok technicky kvalifikovaných odborníkov je závažným celosvetovým problémom. Cieľom tohto príspevku je prezentovať skúsenosti autorov so zvyšovaním záujmu žiakov na základných a stredných školách o svet vedy a techniky, v ktorých kľúčovú úlohu majú e-learningové projekty v Moodle. Tieto projekty sú alebo budú v krátkej dobe úplne voľne prístupné na portáli "eLearn central_open" (http://uef.fei.stuba.sk/moodleopen/).*

Klíčová slova: *e-learning, veda a technika, MOODLE*

Abstract: *To increase the motivation and interest of students attending technically oriented Middle schools and Universities is at present one of the highest priorities of education. It can affect the sufficient number of graduates and technically qualified professionals, which is a serious worldwide problem. The aim of this contribution is to show and discuss the authors' experience and solution how to increase the interest of scholars already at Elementary and Middle schools in the world of science and technology. As key roles, e-learning projects in Moodle are described. These projects are, or will be in short time fully accessible for free on "eLearn central_open" portal (http://uef.fei.stuba.sk/moodleopen/). This work was supported by the agency KEGA the Ministry of Education, Science, Research and Sport of the Slovak Republic for under Grant 020STU-4/2015.*

Keywords: *e-learning, science and technology, MOODLE*

1 Introduction

Lack of scholar's interest already at Elementary and Middle schools in the world of science and technology is in a direct contradiction with the needs for the development of society and the technological practice [1], true not only for Europe but the whole world [2]. Today Europe has a very serious problem, the difficulty of translating its knowledge base into marketable goods and services. This innovation gap has become so huge that it was labelled by a dark expression, the European "Valley of Death" [3]. The European Commission defined six Key Enabling Technologies (KETs - Advanced materials, Micro- and nanoelectronics, Nanotechnology, Industrial biotechnology, Photonics and Advanced Manufacturing Systems) for their potential impact in strengthening Europe's industrial and innovation capacity. Key Enabling Technologies represent the background of a greener economy and Europe's industrial

modernization. High quality preparation of great numbers of highly skilled Key Enabling Technologies professionals is essential for the future economic growth, competitiveness and innovation of Europe [4].

The main question can be formulated as follows: How can we expand the number of qualified people to improve Europe's position in the field of KETs in times when STEM (Science, Technology, Engineering, and Math) based technical studies are discouraging a wide number of students? How to attract youth to the KETs field?

The best solution is to introduce children the Mysterious world of Science and Technology by playful and engaging ways. Slovak University of Technology has a very big potential in this effort, since it represents a base of interesting and actual areas of research, excursions in science laboratories, group of supportive teachers and young scientists with increased interest and enthusiasm. Nowadays youth's well known, popular and an everyday source of information is the internet. It is very important to exploit all the possibilities and services of the "World Wide Web" in the popularization process of science and technology. One of these forms is e-learning, which is listed among the most effective ones.

Moodle is currently the undisputed leader in providing distance learning and online learning facilities. It provides a diversified range of disciplines and subjects including Engineering, Social Sciences, Computer Sciences, etc. for millions of students [5]. This can be very demonstrative, playful and easy way how to initiate students into a certain topic. Well known advantages of Moodle open the possibilities of its implementation in field of popularization of Mysterious World of Science and Technology.

The aim of this contribution is to show and discuss the authors' experience and solution how to increase the interest of scholars already at Elementary and Middle schools in the world of science and technology, in which e-learning projects in Moodle play a great role.

2 Portal eLearn central_open

The e-learning method is a very useful tool to enhance the quality and effectiveness of traditional teaching. This was also showed by our many years of experiences in the utilization and implementation of courses and educational materials on the portal "eLearn central" from the year 2004 [6]. The impact was clear: e-learning has a huge potential as a motivational and effective tool for acquiring knowledge in an enjoyable way. This was the main reason for our decision to adapt and to create e-learning materials for the popularization of science and technology.

Moodle is a back bone of all our e-learning projects. We have designed a family of educational portals based on Moodle named as eLearn central (eLearn central old, eLearn central, eLearn central journal and eLearn central_open), as a supporting method of conventional "live" education or distant education, also to be used for lifelong learning. and for popularization of science and technology for children and youth. The latest portal "eLearn central_open" was created in 2014 and it is available on URL: *http://uef.fei.stuba.sk/moodleopen*. The access to this portal is free, the formal registration is required only for tests and inquiry.

The usage of Moodle for popularization purposes has some specifications. Very high emphasis must put on the choice of an interesting topic, on many engaging methods of navigation elements, short and very comprehensible texts, many pictures, funny images (Fig. 1), graphs, stimulating animations, review of content and context. The implementation of quality criteria with extensive testing and students' feedback is very important, nevertheless in some cases it is better to publish actualities as fast and correct as possible.

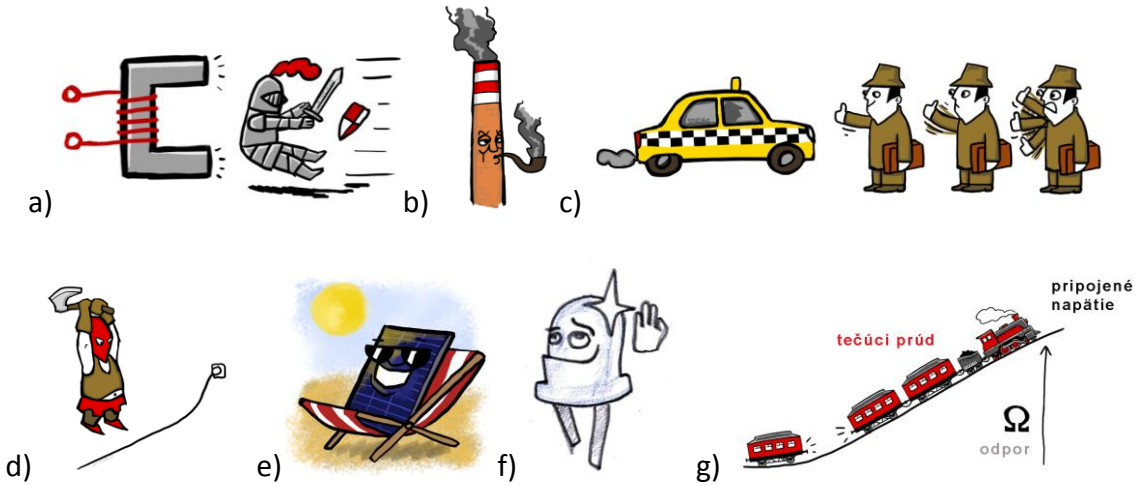

Fig. 1 The funny images in courses and dictionary for children - a) Electromagnetic contactor, b) Emissions, c) Frequency, d) Circuit breaker, e) Solar cell, f) LED and g) Electric resistance.

2.1 Updates

We have updated our original e-learning materials such as courses of Interactive flash animations and Electronic devices and circuits with the aim of a more user friendly implementation.

We started to create our animations of inner processes in semiconductor materials and devices in 2001 [6] and we are developing and updating these since then. The course Interactive animations was prepared as a source library with a list of links references on files for more effective usage (Fig. 2). The newest update (URL: http://uef.fei.stuba.sk/moodleopen/course/view.php?id=104) includes interactive previews, surveys, corrected visualization errors, animations respecting the method of effective drawing and block programming.

The second example of this update is the course Electronic devices and circuits (URL: http://uef.fei.stuba.sk/moodleopen/course/view.php?id=102). In this case the adaptation is currently in the process of realization and preparation, since its textual form is still not suitable for popularization purposes.

Another courses - education modules Photodiode and LED were created for children. We only transfered them from eLearn central old to the portal eLearn central_open.

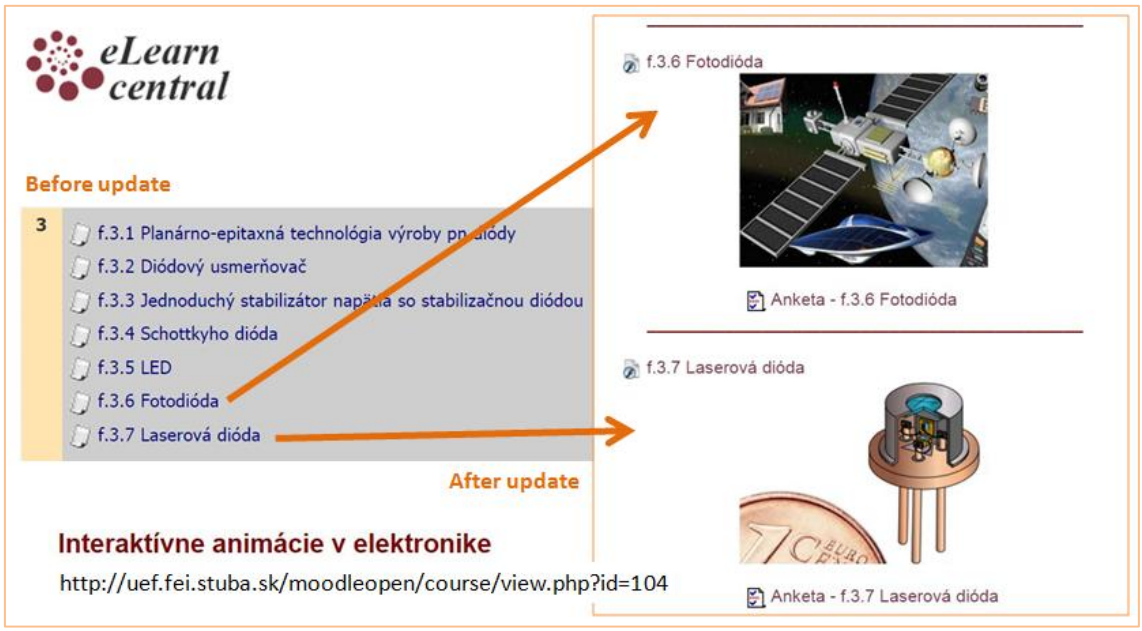

Fig. 2 The course Interactive flash animations before and after update for user friendly implementation.

2.2 Development and creation

In connection with our actual development process, we should also mention two of our most interesting projects: the Power engineering dictionary [7] and the offline project Mystery world of Energy [8]. The dictionary was the first attempt to create a source of assessed basic terms about the topic “energy”. Power engineering dictionary was created as a dictionary activity module of the open source e-learning platform Moodle. It allows participants to create and maintain a list of definitions, like a dictionary with a full match lookup possibility. It allows the user a unique potential to quickly look up related terms and definitions. There are more than 800 terms with illustrations, explanations and pictures. The offline project The Mysterious world of Energy was also created on the platform Moodle and the virtual server Server2Go. Children can use this project without internet connection. There are 5 chapters included interactive educational games and dictionary.

Currently we are preparing e-learning modules in a popularized form about basic terms and topics in electronics: by simple and easily understandable forms we try to introduce Passive elements, Introduction to Semiconductors, Semiconductor diodes, Stabilization diodes, Bipolar Transistors, Unipolar Transistors and Operational amplifiers. We are also preparing a glossary of terms for young electronicians and for children with the perspective to use the technology of mobile learning.

2.3 Feedback

All the discussed modules and courses were introduced to children and young students at various occasions not only at our university but at various popularization events and open days. The feedback was remarkable positive, and several developed and freely

available animations and educational materials were provided and have become part of the educational process at many secondary schools.

We concluded, that a not only a proper design and the development is very important, but also the activity and effort to propagate these among children and the general public. We could observe that the existence of these materials is unknown and uncommon among these students, which gave us the challenge to ensure and establish a more effective information and popularization activity not only face to face but also by popular ways of information transfer such as social media. So far the face to face method was proven to be positive but unfortunately with a low action radius.

3 Conclusion

We live in the age full of amazing discoveries when the virtual border between science-fiction and reality vanishes step by step. But we also live in a frustrating age when lack of youths' interest in the Mysterious World of Science and Technology generates a very serious problem.

We have used e-learning as one of the effective tools to increase students motivation for popularization of science and technology. We have designed a new portal of the eLearn central family named “eLearn central open”. We updated our original e-learning materials, the courses Interactive flash animations and Electronics devices and circuits in a more user friendly way. We have developed new e-learning materials assigned for children and youth, as are education modules: Power engineering dictionary, Photodiode, Electronics around us and other. The access to this portal is entirely free. All these activities were possible to carry out thanks to Moodle.

With Moodle, there are opportunities for universities and institutions to materialize their dream of addressing a large number of online students, while providing information and knowledge that satisfies their needs, and at the same time developing and increasing the motivation and interest of students at technically focused Middle schools and Universities. At the same time there is a new challenge before us - to organize the best dissemination of our results among children and youth.

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