



NEW METHODS IN THE DIGITAL LEARNING ENVIRONMENT: MICRO CONTENTS AND VISUAL CASE STUDIES

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Introduction

Our research has been based on the new approaches that have emerged over the latest decade to tackle the issues of using ICT applications in education to activate students. Between 2012 and 2015, we implemented several educational projects related to the development of digital learning environments where students of engineering and economics specialized in teaching were surveyed in order to collect information on the special features of the use of digital curricula and in order to increase student activity in the development project. Based on this research, our presentation focuses on an innovation in the field of didactics, tackling issues related to the learning environment (RE-imaging learning environments). This innovation is expected to play an increasing role in the modernization of secondary and tertiary education. The didactic processes related to the terms *Micro-contents* and *Visual Case Studies* may result in obvious advantages in network learning implemented in a digital environment. They may boost the motivation of students, intensify communication between participants and encourage students to participate in the development of educational contents. The application of micro-contents may be increased both in time and space by ICT support. Applying the relevant text mining methods to a sufficiently high number of texts generated by students provided the necessary empirical base for analysing collections or micro-posts from a theoretical point of view. Diversifying the generation of micro-contents in a new ICT environment (broadband, mobile, increasingly memory-independent cloud services) positions educational contents in a new media. Generating interactive image outputs for micro-contents also has potential for a new didactic innovation. This didactic innovation, currently at the experimental stage, may facilitate the recording and evaluation of computer managed texts in a new system (MEdit). This system is able to display micro-collection contents both as conventional documents and in the form of power point-like slides, at the same time.

Learning: Basic Activity

International trends show that learning has become a basic activity where applying state of the art tools and methods to acquire knowledge quickly and efficiently is important both for individuals and organizations. It is increasingly recognized by modern commercial and public benefit organizations and has radically transformed the culture of modern universities.

Teachers play an essential role in these changes and development processes, and universities have a reasonable grasp of the learning technology and the pedagogical aspects of e-learning, and have installed adequate IT systems and provided staff development to change the teaching and learning environment.

We are heading for a “threshold”, with the events of previous years pointing towards the development of a complex e-learning policy at universities where the relevant conditions have been continuously improving. The digitalization of learning content and on-line e-learning courses are also obviously successful and easily applied in new projects (technology transfer, non-formal training and vocational training). Sustainability has become an increasingly important issue in maintaining and continuously applying the results of e-learning development, in the digitalization of learning content and in the operation of the relevant framework systems. Universities have to face this challenge, particularly because the problem cannot be tackled efficiently using the current small-scale system, with individual departments and institutions making independent decisions about the question. The conservative approach of universities to new initiatives in the field of educational innovation is rooted mainly in their general attitude. We should note here that “new” institutions of higher education are much more open-minded regarding e-learning systems such as MOOC. Standard university practices include decision making procedures in the case of new experiments or international projects and co-operative initiatives related to e-learning which are fit for purpose and result in innovative solutions.

Recognising this trend, our department regularly organise training programmes for trainers addressing topics such as new (e.g. connective) learning theories, atypical learning, the LLL approach, new results in the field of ICT tools supporting learning and education, online learning, the theory and methods of e-learning and some aspects of its application in practice.

Our project on “E-teaching Culture and Digital Content Development”, implemented between 2013 and 2015, aimed at developing content, methodologies and services related to the competitiveness of higher education and the relevant structural changes and at meeting the challenges raised by knowledge-based economies. Matching the specialities of higher education, we developed methodology training programmes for complex subjects to develop the educational competences needed for designing and applying complex curriculum units in teacher training. The basic idea was to provide the basis for a new, medium-term research and development project that would aim at putting the developed methods and procedures into practice, designing and applying new e-learning curricula. The majority of these programmes have been integrated into the regular university curricula; they are continuously applied and updated every semester.

In developing vocational training concepts, a personalised approach is generally applied. Vocational training has a unique position in progressive educational systems, mostly because the duration of training programmes is much shorter than it is in non-vocational programmes. This uniqueness is manifested in the way vocational programmes prepare students for the social division of labour in the broadest sense. In this dynamic process,

currently existing progressive elements (e.g. the penetration of IT solutions and the general application of biotechnology) and highly probable new developments (e.g. changes in the energy structure) serve as mechanisms to create a modern vocational structure. Interdisciplinary approaches are increasingly acknowledged; however, we should note here that accelerating technical development results in the continuous restructuring of technical culture and educational content. These traditionally focus on information, so strong competition may be foreseen between traditional curricula focusing on quantity and new ones embodying a more complex approach. Educational institutions will only be able to resolve this conflict if they are willing to modernise their knowledge transfer systems, which are traditionally rigid and divided into subjects, and develop the didactics of a new, integrated approach.

The MOOC Effect

An important direction in international educational content and didactics development is the creation of open curricula where those actively participating in learning contribute constructively to the process of development. Another characteristic is mass access to content, supported by efficient modern online platforms. Currently, this approach is most innovatively applied in higher education (MOOC); however, the large number of students in vocational education, as well as their increasing age and the wide variety of their future professions urge the methodological adaptation of these solutions.

In Hungary, public education and vocational training were transformed between 2011 and 2013 and the education of teachers took a new turn. A general expectation regarding teacher education is that qualified teachers should be well prepared and able to cope with the following tasks:

- tasks of public education as defined by the National Curriculum according to development fields and educational objectives; transfer of the values and content of education; knowledge building; development of core competencies and the ability to make use of them;
- providing teaching services in public education institutions in accordance with their professional qualifications, in the phases of formal education defined by the Act on Public Education and in the framework of approved curricula based on the National Curriculum; providing teaching services in non-formal education and adult education; performing educational activities in the workplace;
- creative participation in educational development programmes relying on their knowledge and experiences.

Thus, our research on didactics essentially focused on the differentiated control of the class work done by vocational teachers and the application of efficient educational methods and processes. From the point of view of this research, the general criteria for preparing teachers were partly traditional, manifested in knowledge, abilities and attitudes, and partly related to expected teacher competencies, broken down according to the following broad areas:

- knowledge related to didactics and the given subject;
- support, organization and control of learning.

Another specific feature of the activity of vocational teachers is that they are allowed to teach not only at schools but also in non-formal vocational training. Hence, they have to be well prepared to teach age groups well beyond the 14-18 range when providing vocational training for young adults and adults or learners with special needs. Training teachers to teach trade groups or use vocational contents related to particular sectors is hindered by the almost complete lack of textbooks that could support the teaching of professional subjects at vocational secondary schools. Thus, teachers can only rely on the actual course requirements within framework curricula for vocational education and training. This justifies the demand to put content development for specific subjects and thus the development of a new didactics into the focus of educational development, facilitating both the training of vocational teachers and the learning of professions at school.

The World of Micro-contents

Micro-contents cannot be strictly defined according to their size alone, as size may depend on time, location and application or on the relevant agreement within a group of users. The tools used to transfer content also influence size and quality. Conventional postcards, for example, could only convey messages limited in size, representing an early form of micro-contents.

The Short Message Service, still popular today, restricts messages to 160 characters. We might think that this limit was due to technological limitations at the time when the GSM telephone system was being standardised in the 1980s but actually, if the information provided by the press can be trusted, it was rather based on a decision by a single person (<http://latimesblogs.latimes.com/technology/2009/05/invented-text-messaging.html>). Twitter was originally supposed to be the short message supplier of the Internet, initially allowing 140 characters for a user message. However, Twitter policy has radically changed: messages of unlimited size can now be accompanied even by pictures (<https://blog.twitter.com/2015/removing-the-140-character-limit-from-direct-messages>). Hence, this representative of micro-contents has ceased to exist.

A message can not only be defined as a micro-content on the basis of the number of written characters it contains. Snapchat allows maximum of 10 seconds for viewing an image or video sent by a user, and you cannot ask for a replay. This means that users must phrase straightforward messages that can be taken in and understood in the given time frame.

At our Department, we had already conducted experiments examining how we could manage and control large numbers of students in creating micro-contents while complying with the methodological rules of editing and developing content. According to the own definition, micro-content is a text, a picture or a media-based information package which carries public agreement, and is of screen size (e.g. a text contains c. 1,000-2,000 characters). The *cognitive*

pressure put on the reader of the micro-content is not high, which means that the content package can be understood and remembered at first reading.

Micro-content conforms to current media consumption habits, which mean that the available mobile tool constantly swamps the user with a permanent flood of information, and the user's main task is in fact to select the items that are really important for him/her and to coolly ignore the rest. The size and structure of micro-contents are ideal to minimize the feeling of "wasted time": the reader can rapidly decide whether the information package is really necessary for him/her or not.

We created a micro-content managing system named MEdit. In this system students can create any number of micro-contents. These contents are available to readers in a summarizing data flow which thus shows a colourful mixture of the contents uploaded. At the next level, the students can arrange the micro-contents into so-called thematic collections in which, besides their own work, they can also place the knowledge packages made by others.

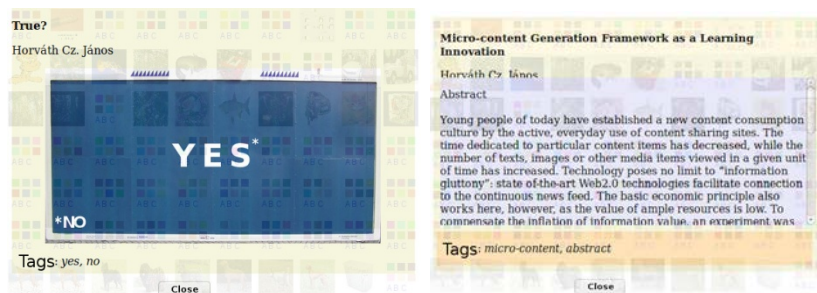


Figure 1. Examples of image and text based micro-contents in the MEdit system

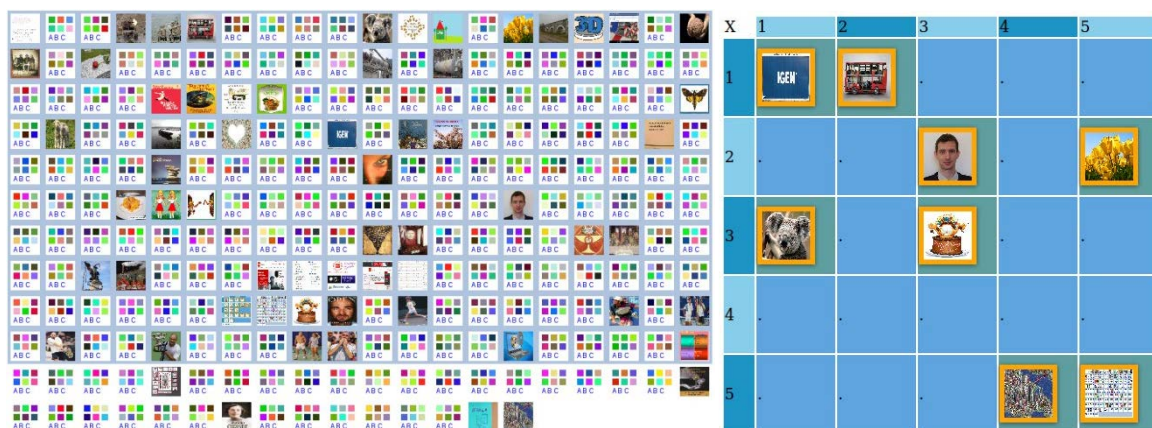


Figure 2. Massive quantities of micro-contents and a thematic collection

Micro-content units may be organised into thematic collections as illustrated in Figure 2. In this case, users may organise their own compact units in a table, using its cells. Compact units may be moved between cells or deleted.

Students who piloted MEdit needed some time to get used to the interface and to learn to appreciate the system. Once the first, well edited micro-content units had been uploaded, the majority followed the good example and started to develop their own compact units and then organise them into thematic collections. Most students processed their latest reading

experiences, organising the contents of rather long books into 5 to 10 micro-content units, thus enabling others to decide whether a particular book was worth reading or not. Some students prepared collections in their own professional fields, processing contents related to topics such as boilers for domestic heating systems or raw materials for manufacturing wood products. Topics related to recreation and hobbies were also represented (e.g. Hungarian dog breeds, fish species for angling, descriptions of one's home town, etc.). All in all, a very diverse and valuable set of data was generated during the trial period.

Towards Visual Case Studies

Our efforts to include more visual elements in the content of training indicated that creative tasks and the possibility of the complex use of visual elements match the ideas of students about e-learning content. This new curriculum, where verbal and visual elements are presented in a one-to-one ratio, and where knowledge elements are organized into a network, would be scale-independent and structured as a graph. It would also be supported by a mathematical representation to enhance both its theoretical and practical aspects, and users would be allowed to extend it by means of case studies and practical examples.

A new e-learning textbook was created in the autumn semester in 2015 by the curriculum developers (subject: Systems in Vocational Education) with the SysBook platform assisting those who were interested. We asked the students to make *case studies* as micro-contents, with the compulsory inclusion of visual elements. These case studies had to be optimised for a screen (laptop, smartphone, etc.) according to the rules applying to micro-contents, include visual content that described the operation of the system and, if possible, they also had to include a mathematical formula for the same purpose.



Figure 3. Illustration from SysBook – Probability frequency
(<http://sysbook.sztaki.hu/sysbook6.php?page=19&left=intro&right=intro>)

The SysBook offers the students a special structure. Each one of the almost 140 sections is customised for digital screens and each one is constructed to represent six levels of interpretation (Comics – Description – Maths – Example – Theoretical – Education). The content is presented in quantified units which the reader can read linearly but, because of the levels of interpretation mentioned above, each unit offers a range of possible ways to become familiar with a particular topic and examine it from various points of view. As a result of its structural features, SysBook takes the middle ground between modern hypertexts and traditional books.

The post-graduate students completing this task proved to be extremely creative. As an illustration, we have selected the picture explaining free fall, a perfect example of how well such a relatively complex phenomenon can be illustrated, explained and understood in this way.



Figure 4. Freefall – Example of student work where a photo is edited with a maths formula to illustrate the effects

Summary

Learning activities are becoming general and permanent – and the necessary tools for this are provided by info-communication technologies (ICT). However, methods that will enable the creation of sufficient educational resources still need to be researched because there might be radical changes in content usage habits. Among the several possible directions, our SysBook project provides a good example of how traditionally text-based learning resources can be enriched with images and complementary information as well as levels of interpretation. The corpus elaborated by experts can expediently be completed by students, making the learning resource more personal. Another trend is represented by the MEdit micro-content managing system, the core of which consists of contents which have been created by extracting the essence, and which are numerous but easy to grasp. The experiences of collective content development, communication and feedback help with the elaboration of micro-contents, while the ways in which they are created and used suit the ways in which the younger generations habitually obtain information. Both methods provided us with useful experience, so in the next phase we will process and share further pieces of traditional learning resources.

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