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Micro content – content organization in the world of networks

Introduction

One of the slogans of the 2000s was the convergence of devices. The various forms of everyday communication tasks were served by a number of equipment and devices. The developers and producers tried to prepare their (to be) users for the future, which we, today, perceive as our natural substance, in high-sounding and spectacular ways. Mobile phones, as we call them, have become a portable device equipped with various possibilities, however, they should rather be looked at as centres elaborating and transmitting news. Owing to the investments, in Hungary the standard of the telecommunication systems has risen to the world front rank¹; mobile tools are the most favoured platforms for people when connecting to the World Wide Web^{2 3}. The prices of tablets, (smart) phones and computers are falling abruptly, the internet subscription packages offer more and more advantages, and accessing the contact channels has become a lot easier⁴.

Owing to the internet, we may feel the amount of the available data unlimited. We may spend plenty of time autotelicly browsing the websites and services that, in addition to entertainment, do not offer too much of usefulness. Although we *could have got to know* a lot of things, what is that we *have really learnt* and studied on these diverging tours of ours aiming to gain knowledge?

Considering our formal educational systems, the obstacles in front of involving mobile devices into the teaching environment are fading away. The BYOD (Bring Your Own Device) attitude has rooted in teacher training centres, as well⁵. Involving teaching-learning situations based on the internet into school life seems to be unobstructed; visiting the Web may become as convenient as taking a book off the bookshelf next to our desk.

As far as printed students' books are concerned, the expectations and the editing methods in relation to the structure and the enhancement and systemization of the knowledge to be transmitted became clear during the centuries. András Kósa⁶ starts his book with this citation: "The order of content can only exist where there is an order of form". The rules corresponding to the formal orderliness of the paper-based knowledge resources have not yet evolved in the world of internet-based materials. Writing schoolbooks is a separate branch within the science of pedagogy, while "formal order" is still evolving in the case of e-learning materials; endeavours are being made⁷. Concerning e-learning materials, the measures of learning objects (LO) are not uniform; although the amount of the information possible to be put on the screen without scrolling seems to be identical, this is in fact relative because of the various screen sizes (see e.g. the difference between a mobile phone, a tablet and a monitor) and the types of information (text, image, motion picture, short film, interactive task, hypertext etc.). The additional utilization of the educational units by the students means a further problem (copying the content is generally impeded for copyright reasons).

¹ http://www.portfolio.hu/vallalatok/it/magyarorszagon_a_harmadik_leggyorsabb_a_mobilnet_a_vilagon.236421.html

² Róbert Pintér, The spread of smart phones in Hungary („Az okostelefonok terjedése Magyarországon”)

³ Central Statistical Office of Hungary, HUNGARY 2015 („MAGYARORSZÁG, 2015”)

⁴ György Molnár, Actual Issues of New Digital Media (Az újmédia digitális, időszerű, tartalmi kérdései), OKTATÁS-INFORMATIKA VI:(2) pp. 29-39. (2014)

⁵ <http://byod.ektf.hu/hirek>

⁶ András Kósa, To the authors of schoolbooks and trade books („Tankönyvek, szakkönyvek szerzőinek”)

⁷ Péter Antal, „Interaktív elektronikus tananyagok tervezése”

Distributing the content into a knowledge structure in the digital era and in the digital scope requires a new attitude. Micro-content attitude^{8 9 10} means a step forward as compared to the traditional solutions; we intend to introduce its theoretical background and practical realization in this study.

Short definition

According to its name, *micro content*^{11 12} has an understandable function: it is to include the information¹³ to be transmitted into the smallest possible size. Text-based micro content uses a brief style sticking to the point, and it totally lacks the popular “wordiness solutions”. It is important that the cognitive burden necessary to acquire and receive a unit of knowledge is smaller than it is with other forms of transmitting information (like newspapers, novels or a radio interview).

Concerning the real size of the micro content, we cannot tell any concrete or strict values. It may depend on the time, place and conditions of application, or can be subject to the agreement made within a certain group of users. The device supporting the recording and transmission of the content exerts an impact on the size and the quality of the content.

Micro content in a historical perspective

In case we accept the statement saying that the device limits the amount of the recordable content, we will find various forms of micro content if looking from the past towards the present in historical time.

The paintings on the cave walls of ancient times were short messages since the few people able to draw the pictures could use a limited amount of available paint. Preparing the antique wall engravings needed huge physical power. Clay tablets, owing to their size, limited the size of the texts. The Middle Ages were the time for the spread of book format in which the number of the sheets could be increased according to the needs – here, the surface of the sheets can be considered a kind of a weak limit, and until today, we have not yet seen a really good example of the objective manifestation of this type of micro content. In the new era, with the spread of postal services, it is the surface of the postcards that has determined the frameworks, and in the case of newspapers, it is the publication fee corresponding to the length of the advertisements that limits the text.

Nowadays, the message size transmittable by the still popular SMS is 160 characters. We may think that at the time of the standardization of the GSM phone system, in the 1980s, technology was able to provide this size, however, in case we can believe the news^{14 15}, it was much rather the decision of just one person. Twitter, which is labelled as the service provider of up-to-date SMSs, at first allowed 140 characters for the users to form their messages, but this has basically changed by today¹⁶; in

⁸ HORVÁTH CZ., János „Micro-content Generation Framework as a Learning Innovation” In: Benedek András, Veszelszki Ágnes (szerk.), In the Beginning was the Image: The Omnipresence of Pictures: Time, Truth, Tradition. 190 p., Frankfurt am Main: Peter Lang GmbH, Internationaler Verlag der Wissenschaften, 2016. pp. 171-181., (Series Visual Learning; 6.), (ISBN:978-3-631-67860-2)

⁹ BENEDEK, András; HORVÁTH CZ., János „New methods in the digital learning environment: micro contents and visual case studies”, In: António Moreira Teixeira, András Szűcs, Ildikó Mázár (szerk.), Re-Imaging Learning Environments: Proceedings of the European Distance and E-Learning Network 2016 Annual Conference. 802 p., Konferencia helye, ideje: Budapest, Magyarország, 2016.06.14-2016.06.17. Budapest: European Distance and E-Learning Network (EDEN), 2016. pp. 27-34., (ISBN:978-615-5511-10-3)

¹⁰ BENEDEK, András; HORVÁTH CZ., János „Case Studies in Teaching Systems Thinking” In: Mikuláš Huba, Anthony Rossiter (szerk.), Preprints of the 11th IFAC Symposium on Advances in Control Education. Pozsony: IFAC, Prague, 2016. pp. 286-290.

¹¹ Martin Lindner, Theo Hug (2006): Human-centered Design for 'Casual' Information and Learning in Micromedia Environments, Austrian Computer Society (OCG) – Work Group HCI&UE – 2nd Symposium.

¹² Martin Lindner (2007): What Is Microlearning?, Proceedings of the 3rd International Microlearning 2007 Conference.

¹³ Kristóf Nyíri (2010): Mobile world – The new experiences of connection and community (Mobilvilág – A kapcsolat és közösség új élményei), Magyar Telekom, Budapest.

¹⁴ <http://beolog.blog.beol.hu/2009/05/06/miert-pont-160-karakter-egy-sms/>

¹⁵ <http://latimesblogs.latimes.com/technology/2009/05/invented-text-messaging.html>

¹⁶ <https://blog.twitter.com/2015/removing-the-140-character-limit-from-direct-messages>

addition to limitless text size, images can be sent, as well. This meant the end of one of the representatives of micro content quality. It is not only the number of the written characters that can make a message a micro content. The service called Snapchat allows the receiver to view the transmitted image or video for a maximum of 10 seconds, and there is no possibility to repeat. In this situation, the aim is to form a concise message that can be understood and comprehended in this short time.

The *Hungarian Virtual Encyclopaedia* (ENC) was prepared in a micro-content attitude¹⁷, under the direction of Kristóf Nyíri. The one and a half thousand entries were all written by renowned experts, in a size of app. 1400 characters. The entries were densely furnished with references pointing to each other. The texts are brief, still effective in providing information for the reader on various fields of scientific results (e.g. law, environmental care, EU, learning, health etc.).

In the Visual Learning Lab (VLL) at the Budapest University of Technology and Economics (BME), under the leadership of Kristóf Nyíri and András Benedek, researches are conducted in the field of the up-to-date usage of various forms of image representation, with special respect to the everyday teaching processes in higher education. These include forms of micro content, as well.

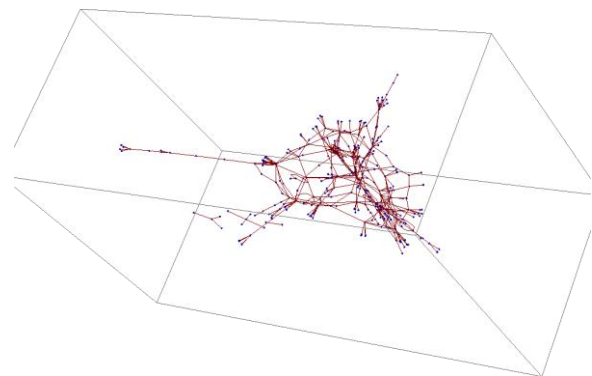
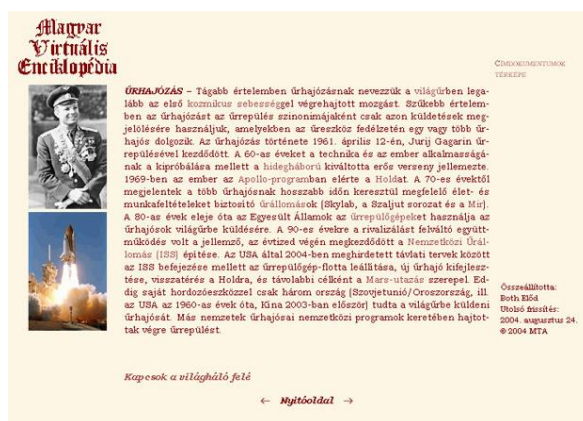


Figure 1: An entry of the ENC and the network of the entry references pointing to each other

Another good example of applying micro content principles is the *Sysbook* developed under the direction of Tibor Vámos; currently, the *Sysbook* contains 140 content units in screen size. Although the content elements follow each other in a serial order, one content unit involves six levels of interpretation (image representation, text, mathematical examples, everyday life examples, theory and education). These levels of interpretation can be visualized next to each other and compared on the screen.

¹⁷ <http://www.enc.hu/>

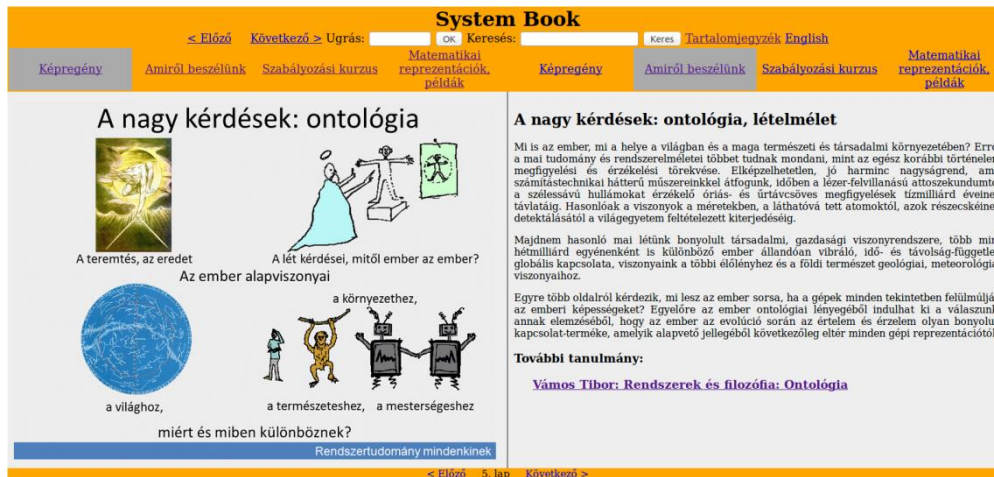


Figure 2: A SysBook unit

Pieces of content organized into a system

We started dealing with the transformation of micro content into tasks that can realistically be fulfilled by students and pupils in the educational environment quite early, at the beginning of the 2010s. Initially, we had the possibility of directing hundreds of students within the frames of the subject called Digital pedagogy hosted by the Department for Technical Pedagogy of the BME. At that time, the participants created their brief works in a previously provided HTML template (Figure 3).



Figure 3: An early micro-content editing system

In order to stick to quality requirements, the students had to organize content units amongst fixed limits (with a maximum width of 300 pixels as for images and 1024 characters for text blocs) on a platform accessible through a browser.

The application called *MEdit* also offered the possibility of inputting micro content through a browser. We took the possibility that the certain tasks be viewed by anyone as a highlighted requirement. In *MEdit*, it was possible to create image- and text-based units (see Figure 4), and the computer environment had the formal rules strictly kept. The micro content units were given title-like names, and were possible to be furnished with labels. This way, in addition to text-based search, label-based search became possible, as well.

We aimed to achieve easy and rapid usability; we intended to keep the so called cognitive burden going with application at a low level both in the process of making the content and receiving it.

Figure 5 shows the preview of the micro content units uploaded into the *MEdit* system. By clicking on the compressions, real content can be viewed. The image-based compressions were given thumbnail like previews, but concerning text-based ones, we created individual combinations of colours with a special procedure supporting by this their distinction.

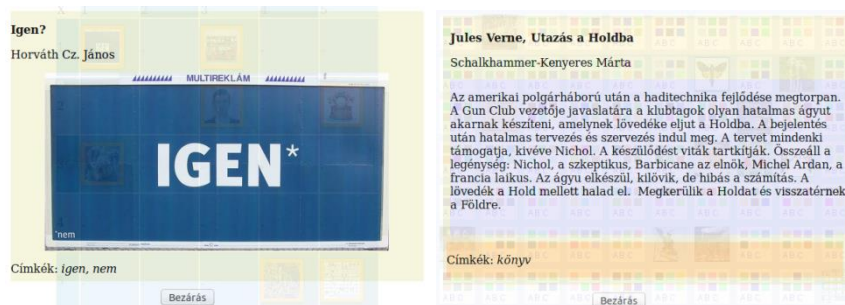


Figure 4: An example of image- and text-based micro content in the ME system

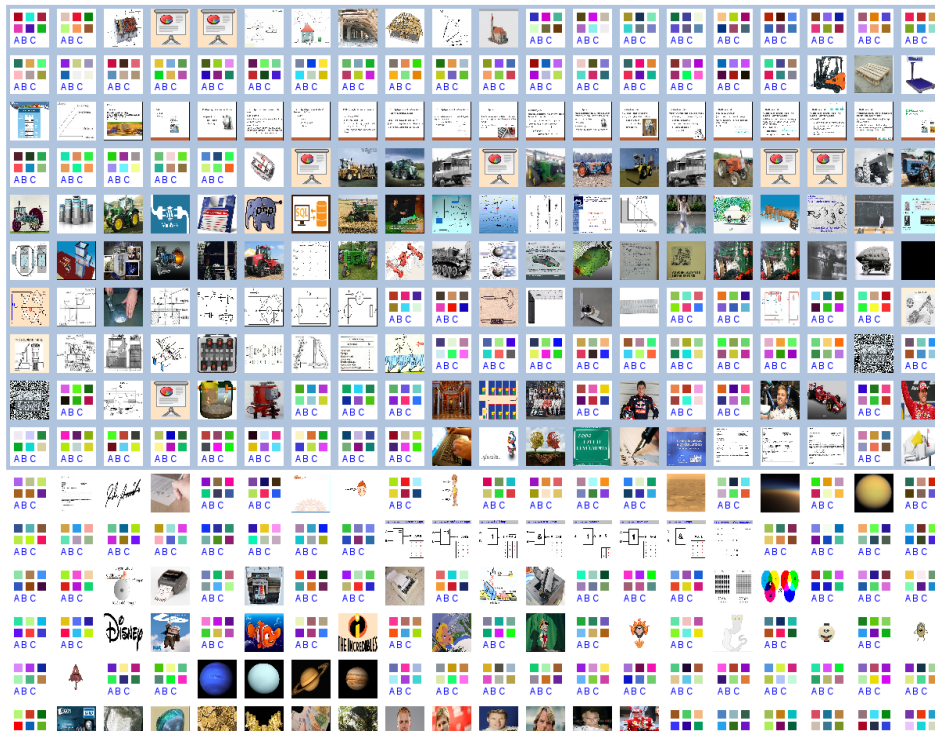


Figure 5: Mass preview of micro content elements

The mass production of micro content is not a problem any more, however, the demand for search options has arisen. Introducing the term and practice of the so called thematic collections means a partial solution to this. Each user can create their own thematic collections into which they can pack their own compressions in an optional order. These collections, too, can be named and labelled and shared with the members of the participants' circle. Figure 6 shows an example of this application.

The students having participated in the test needed some time to prepare, however, they got used to the user interface rapidly, and they also recognized the usefulness of the system. After the first well edited micro content units were made, on the basis of the good examples, most of the students started creating their own compressions and then their thematic collections. Most of them elaborated their latest reading, and this way the content of a longer book became available in 5-10 micro content units, which was a perfect help to decide whether that publication was worth reading it or not. There were special content collections made in relation to someone's own profession, like boilers as parts of home heating systems or the introduction of raw materials providing the base for wood procession. The topics of spare time activities appeared, as well, like various Hungarian types of dogs, fish possible to be angled or the description of students' own settlements. All in all, a really multicolour and valuable set of data was compiled during the examined period.



Figure 6: Compilation of thematic collection from micro content units

After having the experiences collected and analysed, we decided to develop a new-generation micro content managing program built on a Web2.0 base. With the application named *MC Hungle*, we took into consideration the changes having taken place in content accessing habits during the latest period. We made the interface more expedient and easier to use. We heeded that by the vivid colours and forms the system maintain the users' attention and the set tasks be possible to be fulfilled within a short time.

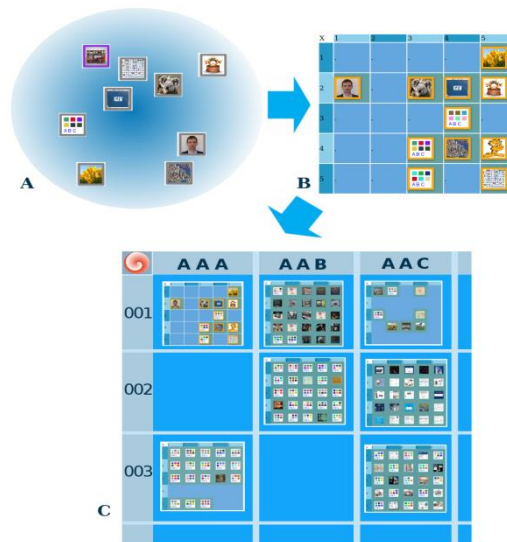


Figure 7: A higher level compilation system of content elements

Owing to the students' work even exceeding the previous stage, several thousand micro contents were made in this framework system. To organize the content, we introduced the model shown by Figure 7. The order 'micro content – thematic unit – thematic collection' promises that the three levels of the thematic distribution offer sufficient help for the users to retrieve and find the information searched.

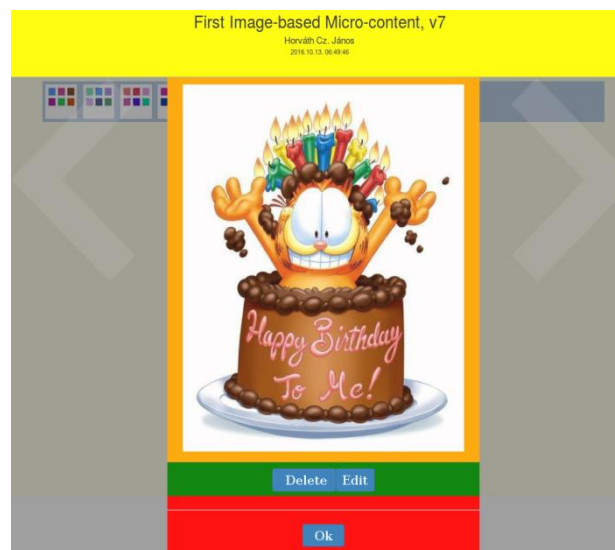


Figure 8: Viewing an image-based micro content in the Hungle system

Cases and practices

In the fall semester of 2016, within the frames of the subject titled 'I shall be an engineer' taught at the Institute for Applied Pedagogy and Psychology of the BME, students were asked to submit their works on a micro content base. The subject aims to give an orientation to first grade engineers and to give a foundation to their engagement towards their profession. A number of topics related to engineering but not connected to just one narrow field are highlighted with the participation of several lecturers. In the case of such a heterogeneous curriculum, the methods adopted in other subjects to charge tasks cannot be used, and in addition, in the case of almost 1000 participating students, the elaboration of any task would need complicated logistics in the traditional case.

We developed the concept of micro content-based task submission with the responsible lecturer of the subject. As a result of the considerable extension of the Hungle system, the so called 'article-based' type of micro content was introduced. This in fact meant the blending of already existing text and image based content elements. On the editing interface, this type of micro content is accomplished by an image and a text bloc of limited size. Of course, this must be named and labelled, as well.

The framework system offers two pieces of "prepared" content units to each student – in practice this meant titles determined in advance. The titles covered the historical events of the university, the sights of its geographical environment and the biographies of renowned former students. Owing to the accidental distribution of titles, each student gained an individual pair of headings. They had to fill in the text and image bloc and the labels of the micro units by the deadline. Their work was assessed by the teacher on a separate controlling interface where the author was given a mark on a five-grade scale according to four aspects (relevance of content, coherence of text, preciseness of labels and technical implementation (see Figure 9).



Figure 9: Evaluating student's work

Students were also involved in the process of evaluation. They were given access to the works prepared, in order to read and take looks on them. Everyone could save three works into their own collections, the three they evaluated as the best (Figure 10). This way, there was an order evolving between the micro contents considered valuable by others the authors of which were rewarded.



Figure 10: Community evaluation of students' work

All in all, this type of tasks was welcomed by our students. On one hand, they performed it relatively quickly, so accomplishment meant less time and fewer burdens for them. On the other hand, the fixed project titles had direct contacts with their university life, so they proved to be interesting. Third, the possibility of the feedback towards the students' community is a newish moment not having been typical of university tasks so far. We are analysing the experiences gained during the semester, and will offer even more interesting undertakings for the next grade.

Although the framework system (Hungle) of the presented case was accessible through the regular Moodle framework system, in many cases we experienced demands for tasks implemented only in the Moodle and organized according to micro content principles. This problem can be solved with the own applications of Moodle, owing to the so called 'database' element. Here, we have

established the necessary framework with the help of electronic forms, and have created 5 types of micro content (see Figure 11).



Figure 11: Micro contents with Moodle applications

The content units are collected within an educational sheet. In this arrangement, there is no possibility to compare the micro contents of the various educational sheets, but we are currently working on the data transfer complement by which these contents can totally be moved to the Hungle system.

The issues of restricting content

The measure of the raw data expansion of the World Wide Web exceeds the perceivable and usual domains.¹⁸ The growth rate of the edited data structures may be similar to this, so creating a single system organizing all the knowledge of the world (or just the World Wide Web) seems to be an impossible mission. As Kristóf Nyíri thinks and used to say¹⁹: "...the rapidly *augmenting* contents of knowledge burst the idea of the uniform knowledge of human race".

Everyday practice shows that the knowledge found, learned or recorded by a person does not make a uniform knowledge, either; we may refer here to the results of the surveys made concerning students' learning performances. The IT and internet world transports innumerable quantity of information to everyone. However, these pieces of knowledge are credible, up-to-date and important at differing rates; there are not many who undertake to assess these aspects. Wikipedia is perhaps one of the exclusions where voluntary groups and the readers' feedbacks help the quality based selection of the entries, although this is not at all sufficient²⁰. How much of the information read, seen or heard can we remember after a day, a week or a year has passed? Or does anything remind us of *the existence of the knowledge worth remembering* at all? The bookmarks of the browser programs are only able to register the websites; in case the quantity of the items exceeds a certain number limit, they become a confused agglomeration. And this is a technology only helping us to retrieve the documents of the WWW; we have not even raised the question of a similar registration of the printed documents and images of the "old world" by individuals!

How could it be possible to create and maintain organized knowledge at the personal level in our accelerating world? Supposing that the knowledge of the suitable and personally tailored learning methodologies is at disposal, the task can be narrowed to the question of the supporting environment. It is presumable that in case the participants are given digital support that offers not

¹⁸ http://old.sztaki.hu/alkalmazasok/szakmai_beszelgetesek/adatbanyaszok_tudnak_rolad_mindent_ronyai_lajos/

¹⁹ The Hungarian version of the lecture held at the conference titled "Information Society, Interdisciplinarity, and the Future of the Humanities" and organized on 4th November 2000, the Day of Science by the Institute for Philosophy of the Hungarian Academy of Sciences. Published in issue 2001/7-9 of the review *Világosság*.

²⁰ <https://www.dailydot.com/news/wikipedia-bicholim-conflict-hoax-deleted>

only the possibility to record knowledge and content important for themselves but can compare it to and get to know others' as well as present their own, *learning communities*²¹ may evolve.

The base of a learning community is provided by the creation and long-term maintenance of the personal learning environment of the individuals. The production and dissemination of the knowledge organized into a system requires time, energy and financial resources, independent of the fact whether it is published in print or electronically. There are many companies in the field of placing knowledge transmission on business grounds (like Google, Microsoft, Facebook, Amazon etc.); these try to develop new methods and have them accepted by the users in the hope of profit. But the creation of the up-to-date model of personal learning environment should be independent of all business impacts, and so it could gain support within the reach of the nation states or the EU.

According to the literature^{22 23}, *Personal Learning Environment* (PLE) is an agent supporting both informal or natural (voluntary, curiosity led) learning and directed (formal, classroom) learning. The model presupposes the existence and active usage of the mainly digital channels and the application of the toolkit built on these. All the elements by which the students can record their learning objectives, organize their learning process, create and share collections of digital materials according to their own needs and can exchange their ideas with others in a community network are considered as parts of the group of digital tools. Andrea Kárpáti's statement, according to which the youngsters of our era only get rich experiences about the methods of orientation in the digital scope, but they do not know what to do with this skill of theirs, should be given an increasing attention.

Despite its possibilities, the NEPTUN system, which is widespread in higher education, is only used for administrative tasks. The Moodle content and learning supporting framework system, which is widely known in Hungary, is now accepted not only in higher education, but at the level of public education, as well; it is generally used to arrange the triple of student – teacher – learning material within the frames of school life. Owing to their genre, teachers' websites and blogs highlight the possibility of information transmission by the author. None of the mentioned systems meet the PLE requirements described above fully, however, this gap can perfectly be filled by the *Hungle* micro content management system.

Surfing on the sites of the WWW, we may come across information of various sizes, from posts of some lines to several-hour videos. The average time of the procession of the knowledge placed (according to the principles) in a storage of micro content is well assessable and plannable. All created micro contents belong inalienably to their original author, and copyrights prevail. The content units we have made can richly be furnished with metadata and labels, and then these can be offered for sharing; through sharing, our being authors may come under judgement, as well, since the number of shares is of an indicative value. Comments can be added to each content unit, which will reach the original author as well as the group of those participating in sharing the unit. We have already mentioned the possibility of organizing the micro contents into thematic collections or thematic domains – we may establish our own library and also share it according to the demands. The participants and students elaborating similar contents form a special, looser or tighter, community network; this can arise from voluntary will, can happen by chance or for the successful

²¹ Magdolna Benke Magdolna, Learning cities, learning communities („Tanuló városok, tanuló közösségek”), *Educatio*, 2016/2, ISSN: 1216–3384

²² Adrienn Papp-Danka, Examination of the learning methodology of the educational forms supported by online learning environment („Az online tanulási környezettel támogatott oktatási formák tanulásmódszertanának vizsgálata”), ISBN 978-963-284-565-4, p. 40., 2014

²³ Andre Kárpáti, Gyöngyvér Molnár, Péter Tóth, attila László Főző, The school of the 21st century („A 21. század iskolája”), ISBN 9631966097, p. 155., 2008

participation in some kind of formal education. One of the former sections presented the way a deeper harmony between a Moodle system and a micro content management system can be created. The mass of the momentary knowledge of the learners' community created on this base can be well assessed by the micro contents created, shared, searched and placed into collections, i.e. the digital projections of the knowledge recorded in the human brains.

Outlook

Owing to the appearance of mass micro contents, it is exactly great quantities that may result in new situations of usage. The search functions and aspects known from the internet support us find the adequate units: searching for full and partial word forms, selection by labels, searching in the texts of the comments added to the micro contents or offering order by time, evaluation aspects or number of shares. In case we would like to have an overview of the quality of the knowledge compiled in the system, we will have to apply text and data mining solutions.

Micro contents for the moment are text- and image-based. The third type, introduced as article, is a special alloy of the previous two. The introduction of new types is obstructed by nothing! Sound, video, database or various electronic forms are all possible to be recorded. The opportunity to embed these micro contents into the pages of the websites with the adequate codes, like YouTube videos, will be a result of further endeavours.

It is interesting to contemplate on what relation micro content (and its various collection levels) has to the traditional concept of documents. Figure 12 uses the concept of image pyramids²⁴. In computer-based mapping, it is a general practice to complete the high resolution and detailed image of a certain territory with several, more and more reduced resolutions. By doing so, the digital data stock available in connection with the same geographical area becomes bigger and bigger (or smaller and smaller – depending on the perspective). This is how Google Maps service works: when magnifying into the the initially comprehensive map, images of better quality are downloaded to our computer, and so we do not have to work with one enormous data set. Micro content, thematic collection, thematic domain and documents are connected similarly to this, supposing that a certain topic can be elaborated in just one micro content, and then several micro contents written about the same topic can be compiled into a thematic collection, and thematic collections about the same topic can be included into thematic domains that will cover each information part of the original document. In case we do the building process well, the topic will be available at least at these four content density levels, according to the current user demand. Of course, the logical connection of the content units, which is in accordance with the logical structure of the original document, must be indicated in the collections.

²⁴ R. C. Gonzales, R. E. Woods, Digital Image Processing, Pearson Education, Inc., 3rd ed., ISBN-13: 978-0-13-505267-9, p. 954. 2008.

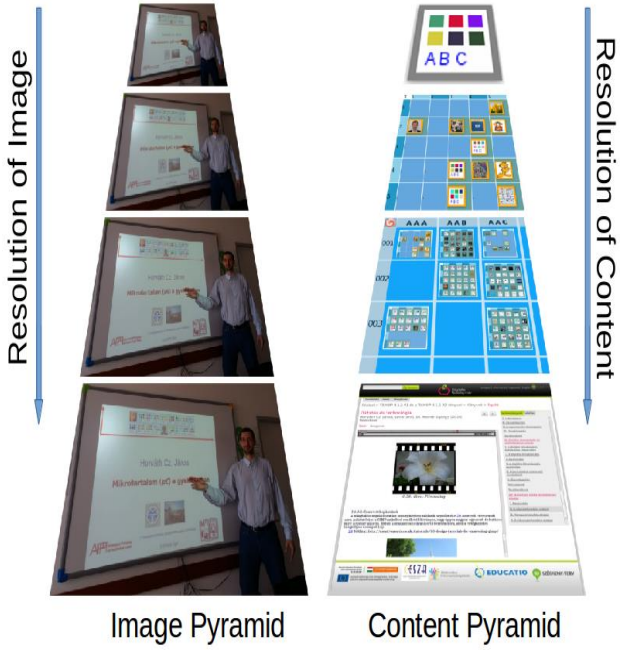


Figure 12: Image and content pyramids