Journal of Education and Future, year: 2013, issue: 4, 65 - 75

Evaluation and Analysis of the Multimedia Course Books and Their Didactic Parts

Jan Krotký [*] **Jarmila Honzíková** [**]

Abstract

Development of new teaching methods corresponding with current findings and modern didactic means initiated emergence of new forms of the educational materials. Multimedia course book is one of the materials mentioned which encompasses wide range of interactive, multimedia and hypermedia components. In Czech Republic, many multimedia course books are being introduced to market and the teacher must decide which one to choose. Many various aspects must be taken into account in process of choosing a course book, e.g. technical parameters, didactic equipment, control or quality of its individual parts. In case of common paper course books, approved evaluation tools are known. Can these tools be used for electronic course books as well? If yes, under what conditions? Should not we approach the multimedia course books as common pedagogic software? The authors have been dealing with possibilities of evaluating the multimedia course books in practice as well as in theory and they present some of possible solutions.

Keywords: Multimedia course book, textbook, interactive textbook, teaching equipment, multimedia instruction, teachers' development.

[*] Assist. Prof. Dr., University of West Bohemia, Faculty of Education, Department of Mathematics, Physics and Technical Education, Pilsen, Czech Republic. E-mail: conor@kmt.zcu.cz

[**] Assoc. Prof. Dr., University of West Bohemia, Faculty of Education, Department of Mathematics, Physics and Technical Education, Pilsen, Czech Republic. E-mail: jhonziko@kmt.zcu.cz

INTRODUCTION

Multimedia course book is a relatively complicated and complex material. When developing this kind of material, we must be able to perform wide range of knowledge and competences from fields of development, programming, multimedia and also commerce. As well, the author must be competent in the field for which the course book is needed; he/she must be a pedagogic as well as didactic. We can conclude that authors of the multimedia course books are collectives of authors with clearly defined areas of interest. Quality, availability, professional accuracy and purpose of the book are directly influenced by structure of the collective of authors.

Realization teams of authors of the multimedia course books and materials can be divided according to from which sectors the authors come [1]:

- state institutions and foundations,
- private commercial sector,
- teachers and their teams,
- students.

In past, production and distribution of the multimedia course books were limited by type and character of the transfer media. Today in era of the high-speed internet and advanced SW and HW platforms, it is possible to connect to the multimedia and interactive content also from the transfer devices and from the whole world. Interactions between other various databases or advanced functions and possibilities are available as well. More and more often the multimedia materials work as signposts equipped with basic pack of information and methodology with links to various on-line services, e.g. Wiki documents, Google, Google Maps, YouTube video, dictionaries, galleries etc.

Evaluation and Analysis of the Course Books

Evaluation of the course books provides us with general and complex idea of quality, structure, difficulty level or technical characteristics of the learning material. Results of such analyses enable us to compare the course books mutually and disclose possible obstacles in learning.

Many Czech as well as world scholars (among others Průcha, Gavora, Pluskal, Mikk) have been dealing with comparison of the standard course books, especially those which are used at the elementary schools. Various methods of different accuracy have been developed for determining characteristics of the course books [2]. Assessing difficulty level of the text itself is one of the basic characteristics. Apart from the methods used by W. Pisarek and J. Mistrík, K. Nestlerová developed method most frequently used for evaluation of a didactic text (adjusted by Průcha and Pluskal). This method has been applied to college and university lecture notes and in the author´s opinion, it is also suitable for application to university multimedia coursebooks.

Apart from the evaluation method of the text difficulty, it is also possible to assess the co called didactic availability of a course book. This method lies in observing certain given components which occur in structure of the analyzed course book. These components are divided to visual and verbal ones and according to the

method mentioned above, we can observe 36 different types. Chosen components fall into to three groups on basis of their characteristics:

- Presentation of the subject matter (text, pictures etc.)
- Management of the learning process (questions, tasks etc.)
- Orientation in the course book (content, glossary etc.)

In application of this method, only presence of the component given is observed, not its amount. Followings, quantitative coefficients of use of the parts mentioned and visual and verbal components are calculated [2].

Apart from the didactic availability and difficulty of the text, physical characteristics, operation together with other results of the educational process (which is more important and more difficult) can be evaluated in course books and learning materials. This evaluation is of the highest importance, nevertheless, this process is very difficult and time demanding. In the first step, group of course books must be surveyed, optimal teaching material must be chosen and then it can be applied in the teaching process.

Models for Evaluation of the Multimedia Learning Materials

Process of evaluation of the multimedia learning materials and most importantly the multimedia course books is a very important step to providing high quality of the study materials. These processes can be observed in various angles. Professor Cesar Nunes and doctor Edmont Gainble present three tested models of evaluation in their paper called Technologies for Education [1]:

- Multimedia modules and components are tested by independent teams of professionals and each part is tested separately regarding its function and use. Whole complex multimedia material is later didactically tested in schools chosen in advance.
- Technical operation and suitability of components is verified by the realization team in the first phase. I the second phase, the multimedia material is used for a testing group of students.
- Complete multimedia material including support is made available on one of the web storage services where its users can contribute with concrete comments. For instance, this procedure is used by the MERLOT project database.

The last model can be included in so called alternative evaluative processes using social filtration. Users of modern teaching materials publish in the way mentioned can use wide range of evaluative possibilities. These on-line comments can be further processed and positive as well as negative results of the evaluation can be taken into account, e.g. priorities in searching the corresponding materials.

Evaluation of the Multimedia Course Book

The multimedia course books belong to group of pedagogical software which is pedagogically evaluated itself. Various evaluative questionnaires are frequent and

favorite tool for evaluation of the educational software. These questionnaires content certain criteria of the evaluations which are further worked out into individual characteristics. Minimal requirements on criteria of evaluation were mentioned by A. Meier [9] in 1995 as for example:

- Evaluation is made by trained and informed expert (technician, pedagogue; author´s note).
- Criteria are valid and reliable.
- Criteria are structured in categories.
- Evaluation questionnaire contents simple questions with simple answers.
- Evaluation questionnaire is well-editable (in case of an electronic questionnaire; author´s note) and well-arranged.

Evaluator assesses each characteristic of the teaching software and he/she writes the observations to a relevant questionnaire. Quality or criteria accomplished are evaluated with a scale given. It is possible to conclude that result of the evaluation depends on the evaluator himself/herself and type or organization of the evaluation questionnaire. This questionnaire should be organized in order to be able to encompass all aspects of the software assessed (technical, didactic and pedagogic part). Some evaluators approach SW evaluation in two stages and they divide the process into the pedagogical-didactic part (experience with application in teaching) and technical part (characteristics and elaboration of the application). A complex tool for evaluation of the pedagogical SW which worked in the two stages mentioned has been developed at the Faculty of Pedagogy in Olomouc [10].

Multimedia course books are not only pedagogic software, they are course books first of all. Therefore, they should contents some parts and components typical for course books. Let´s state a question: is it possible to apply method of measuring the didactic availability also on the multimedia course books? In the author´s opinion, these methods can be applied but the present components must be adjusted and supplemented by the new ones. Apart from the form and way of use, the multimedia course books differ to the classical ones in presence of the multimedia and interactive elements.

J. Mikk and P. Luik (University of Tartu) have been dealing with possibilities of evaluation of the multimedia course books and results of their research are summarized in their paper "*Characteristics of multimedia textbooks that affect post-test scores*". Their method differs to the method developed by Nesterová-Průcha-Pluskal, nevertheless it is also focused on observing certain components. Apart from volume of space taken by various components (pictures, text in cm2), difficulty level and format of the text, Mikk observes also [3]:

- Existence of known and usually used commands (Play/Stop etc.)
- Existence of known and usually used icons and symbols (question mark – question, camera – video etc.)
- Presence of the hypertext links (inner interconnection of the topics, external links etc.)
- Presence of navigation, searching
- Presence of audio/video elements, animations

- Option of or presence of the bookmarks (own editing the bookmarks)
- Use of keys in navigation (arrows, PageUp/Down), presence of the Back button.

Regarding the latest trends, it would be proper to include also other elements which are didactically suitable and today´s technology provides them to the adjusted methodology. These are for example new formats or new possibilities of interaction. Various 3D animations and pictures (anaglyphs) are attractive and functional. Student can become part of a 3D space which he/she could not visit during a usual lecture (e.g. interiors of a foundry or a nuclear power plant) [4].

Other elements which are applied in the multimedia course books for elementary schools by the Fraus publisher can be possibilities of editing the book by the lector himself/herself or presence of the interactive exercises and activities [5]. Testing the pupils is a very interesting element extending possibilities of today´s students. This component can operate at two levels. The first one lies in on-line interconnection of the computers in the classroom. The lector controls the multimedia course book and in doing so it is possible to send test to the pupils in the class. They react and send the completed tests back to the lector. Fraus publisher has been experimenting with this system which equipped students with net books with their multimedia course book in terms of their project and it observes effectiveness of the teaching process. So far, the testing component does not form part of the course book but the complex portal for management of the learning process called Flexilearn. The second level consists of standard voting system. Voice control of the course book can be another observed component etc. [8].

Observation of presence of various didactic components of the multimedia course book was chosen by authors Jacqueline McLaughlin and Daniel A. Arbeider from the Pennsylvania State University for their project of university study of biology. Several groups of questions focused on structure and accuracy of the materials as well as on used didactic components [6] were suggested for evaluation of the study material. Questions in this process were directed to the lector who used percentage scale 0% - 100% during the process of evaluation. For example following questions can be used for measuring quality of content and chosen structure:

- The content is in accordance with aims of the unit
- The subject matter in complete (its content is complete)
- Student has enough information for reaching aims of the individual units
- Subject matter can be understood also without knowledge of the previous subject matter etc.

Questions for observing didactic components used:

- Presence of an easy navigation
- Presence of a clear graphics, animations, sounds and videos
- Presence of contents, glossary
- Presence of internal and external hypertext links etc.

We can see that the components observed are in accordance with profile of observed components of methodology for evaluation of course books or they are similar to adjusted suggestion of evaluation of the multimedia course books. It is also interesting to take a look at the second level of evaluation which is verification of this concrete multimedia application in teaching. Authors have stated 7 evaluative categories [7]:

1) Purpose and achievement of the aims of teaching,
2) Students´ ideas and opinions are take into account,
3) Students take part in experiments (demonstration etc.)
4) Development and use of the current scientific findings (connection to real life)
5) Opportunity to express someone´s opinions and development of understanding (feedback from the teachers and classmates)
6) Own evaluation of the educational process (understanding of the essential ideas and possibility of their verification)
7) Support of science and social competences of the students (simplifies understanding of science, supports belonging to a group and alternative approaches).

Purpose of each category is defined and individual categories are divided into several concrete questions. In this methodology, indicators as possible answer options to the question stated are added. A simple scale with one central and two extreme values (excellent, satisfactory, fail) as evaluation "excellent" can be gained after fulfilling all criteria etc., serves for evaluation of extent of fulfilling the defined criteria.

The categories mentioned imply that this analysis stretches across wide scale of various spheres. Questions are directed back to the lector who observes mutual interactions between the pupils, lector and the course book and its components during the lesson. Such evaluation of the teaching material can objectively assess quality of the analyzed multimedia material. This can be carried out in a wide extent reaching from the teaching goals across possibilities of the personal development up to the social impact of changes of the teaching style.

Content and Structure of the Multimedia Course Books

In the Czech Republic there are a large number of both public and private entities that go into creating and developing multi-media course books. Didactic contents are mostly prepared by pedagogical specialists from primary schools and universities. The final electronic form is created by teams of professional programmers. Creating these forms of course books is relatively exacting from the organizational point of view. Two major publishing houses in this country tackled this difficult task, Nová Škola and Fraus.

Now let's have a look at what a utilized multi-media and interactive course book looks like in practice nowadays. We can see it as a classic course book, however, in electronic form. The course book has a frontispiece and a back page, pages with contents and chapters, pages with didactic contents or a subject index in alphabetical

order. The course book can be divided into a text, graphic, multi-media and an interactive part. Each of these parts, with the exception of the interactive and the multi-media one, can be described using relevant didactic components, which are applied even when standard paper course books are evaluated [2].

Text and graphic parts

These parts are the main carrier of information. If compared with a classic form of course book, we come to the conclusion that the contents of the text part does not differ too much. If contents are changed, it is due to the fact that new information or facts appeared, scientific progress reached another limit, etc. After the introduction of framework and school educational plans, the elements of interdisciplinary relations and environmental and global linkages appeared in course books. What is apparent at first sight, however, is innovation in the area of structuring and dosing schoolwork or in the area of controlling schoolwork.

The teacher works with pupils, whose capabilities may differ greatly, especially as far as apprehension, creativity and motivation are concerned. The authors of these modern course books respect this specificity and differences in pupils and react by creating course books, where the content of the curriculum is structured into the basic part, supplementary part, etc. In this aspect, modern course book elements are utilized, such as those used in study materials for distance learning. These elements include, for example, pages divided into columns, icons, resolved problems, supplementary texts, highlighting or separation of important passages, etc [11].

Multi-media and interactive parts

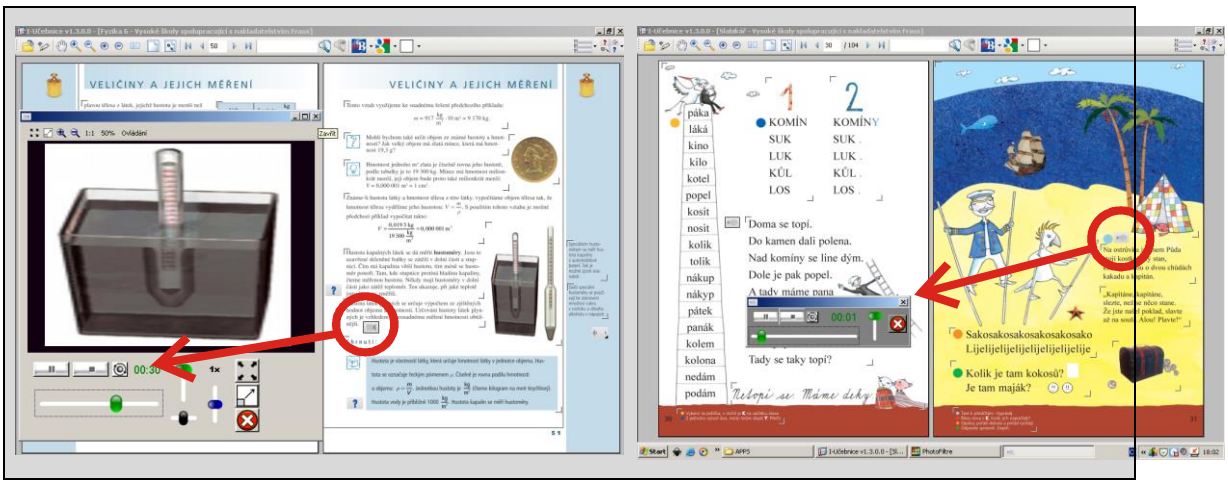
Innovation in the text and graphic areas concerns standard paper course books too. However, the principal difference between a classic course book and an interactive course book consists in the presence of new didactic components. At the present time, these new didactic components comprise above all interactive and multi-media elements.

Multi-media elements in course books

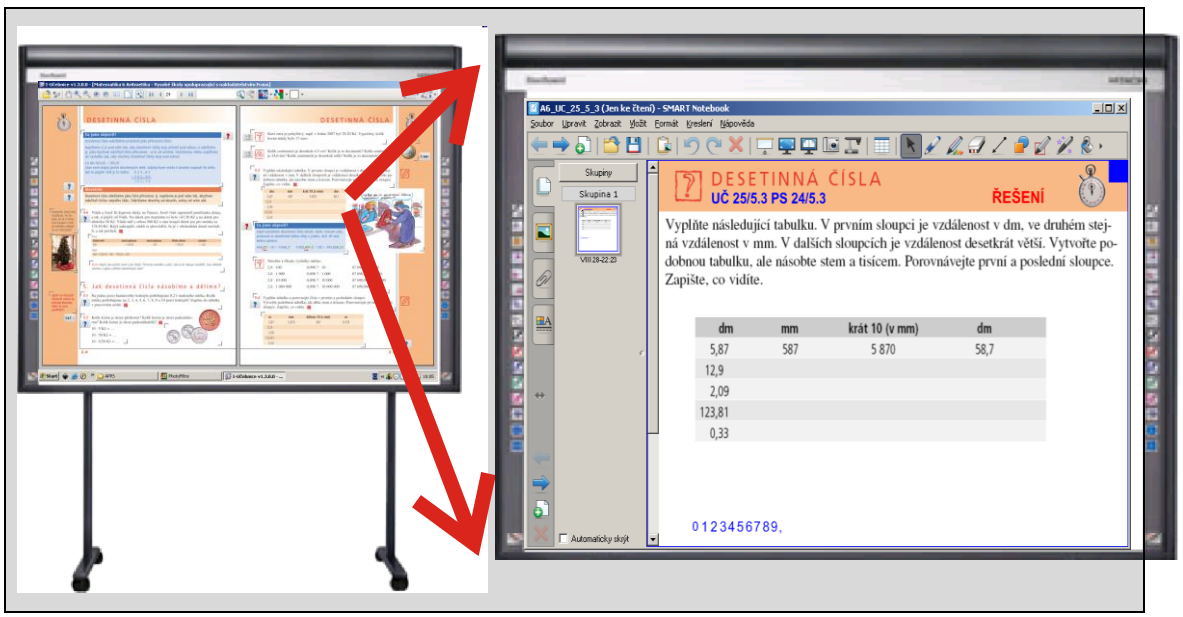
In order that a textbook is a multi-media one and provides information to pupils through as many information channels as possible (effective teaching), it is suitable to enrich its contents with multi-media elements conceived in a modern way, especially with motivation and teaching videos, animations and sounds. It is always necessary that a given element have its purpose in the course book. The same applies to pictures and graphics. By means of these elements the course book imparts such knowledge to pupils as cannot be verified or demonstrated directly in the teaching process (such as a nuclear explosion) or as is presented more effectively in this way (such as an audio record of a native speaker).

Interactive elements in course books

The goal of these elements is to make pupils take an active part in the teaching process. Interactive elements can be divided into interactive surroundings and interactive control. Interactive control relates particularly to controlling and control elements in the course book itself. Interactive surroundings arise when interactive course books, interactive activities and interactive and multi-media didactic techniques are used correctly (such as a visualizer, blackboard, voting systems and suchlike). These modern course books include presentations, exercises and activities in which pupils and teachers interfere directly and have a possibility of direct editing [5].



Picture 1. Multimedia elements in the course book from Fraus publishing (the icon for video and audio)



Picture 2. Start and work with the interactive exercise in Smart Note book on the interactive board.

CONCLUSION

New technologies are coming very quickly, while the introduction of them into the teaching process is substantially slower. "*Not every change must lead to better results and a more effective teaching process*" [12]. Before new technologies are introduced into teaching, a particular alternative must be subjected to pedagogical research and great care must be taken when introducing them. Pupils are changing. They normally use computers and social networks and mini-robots programming. It is more and more difficult to draw the attention of these children by standard teaching. It is clear, therefore, that even in the field of education we must keep up with new trends. If on the one hand children are changing and we adapt teaching accordingly, on the other hand we must "adapt" teachers to. Continuous education of teachers in the field of information technologies must be one of the priorities. We can still see lack of interest on the part of some teachers to innovate their teaching in this way. Luckily, the number of such teachers is decreasing.

Research and evaluation of the multimedia course books is a vital tool for determination of new forms of these materials and their parts. Basic ideas and available tools were mentioned in this article. New and faster communicational and audiovisual components are being introduced, e.g. interconnection of the teaching materials and social networks or communication of the multimedia course books with portable tablets and smart phones.

Thank to possibilities of the high-speed wireless networks and internet availability we have possibility to choose from a wide range of teaching materials. There are various web databases of the multimedia course books and teaching materials or their free components. For example the internet services Multimedia Educational Resource for Learning and Online Teaching (MERLOT.org), California Learning Resource Network (clrn.org) or CK-12 Foundation (ck12.org) etc.

REFERENCES

[1] Nunes, C. A. A.; GAIBLE, E. Development of multimedia materials. In Technologies for Education, Academy for Educational Development, Washington DC, 2002, ISBN 0-89492-112-6.

[2] Průcha, J. Učebnice: Teorie a analýzy edukačního média. Brno: Paido, 1998. ISBN 80-85931-49-4.

[3] Mikk, J; Luik, P. Characteristics of multimedia textbooks that affect post-test scores. Journal of Computer Assisted Learning, Hoboken, Blackwell Publishing Ltd. 2003, Ročník 1, Číslo 19, s. 528-537.

[4] Krotký, J. 3D a fotografie. In Člověk a svět práce, Praha: Dr. Josef Raabe, s.r.o., 2009. 13 s. ISSN 1802-4513.

[5] Krotký, J. Interaktivní aktivity ve výukové prezentaci. In Strategie technického vzdělávání v reflexi doby. Ústí nad Labem : UJEP, 2009, s. 69. ISBN: 978-80-7414-126-3.

[6] Mclaughlin, J.; Arbeider, D. A. Evaluating multimedia-learning tools based on authentic research data that teach biology concepts and environmental stewardship. Contemporary Issues in Technology and Teacher Education, 8(1), University of Virginia, 2008, s. 45-64.

[7] Advancing science serving society, High School Biology Textbooks: A Benchmarks-Based Evaluation [online] 18.10. 2010 [cit. 2010–12–01]. Dostupnéz. <http://http://www.aaas.org>

[8] Krotký, J; Kocur, P. Současné trendy v tvorbě multimediálních učebnic. In Technické vzdelávanie ako súčasť všeobecného vzdelávania. 1 diel. Banská Bystrica: Univerzita Mateja Bela, 2009, s. 253-257. ISBN: 978-80-8083-878-2.

[9] Meier, A. (1995). Qualitätsbeurteilung von Lernsoftware durch Kriterienkataloge. In Schenkel, P. & Holz, H. (Hrsg.) Evaluation multimedialer Lernprogramme und Lernkonzepte. Berichte aus der Berufsbildungspraxis (S. 149-191). Nürnberg: BW Bildung und Wissen.

[10] Klement, M. Quality of educational programs and evaluation. In Journal of Technology and Information Education. Olomouc, 2009, s. (33-38). ISSN 1803-537X.

[11] Zlámalová, H. (2006) Příručka pro autory distančních vzdělávacích opor. Praha: Národní centrum distančního vzdělávání ISBN: 80-86302-39-3.

[12]Krotký, J., Honzíková, J. Interwrite - řešení v oblasti interaktivní výuky. In Infotech 2007. Díl 1. Olomouc: Votobia, 2007. s. 587-589. ISBN: 978-80-7220-301-7.

Multimedya Ders Kitapları ve Öğretici Bölümlerin Analiz ve Değerlendirmesi

Özet

Günümüzdeki mevcut bulgular doğrultusunda yeni öğretim yöntemlerinin geliştirilmesi sonucunda eğitim materyallerinde yeni formlar ortaya çıkmıştır. Multimedya ders kitapları da bu doğrultuda interaktif, multimedya ve hipermedya bileşenlerini kapsar. Çek Cumhuriyeti'nde bir çok multimedya ders kitabı tanıtılır ve öğretmenler bunlardan birini seçer. Multimedya ders kitabı seçme sürecinde teknik parametreler, öğretici materyaller, bölümlerin kontrolü ve kalitesi gibi pek çok boyut dikkate alınmalıdır. Basılı ders kitapları için onaylanmış pek çok değerlendirme araçları bilinmektedir. Acaba bu değerlendirme araçları elektronik kitaplar için de kullanılabilir mi? Eğer kullanılabilirse hangi koşullar altında kullanılması uygundur? Ortak pedagojik bir yazılım ile multimedya ders kitaplarına erişebilir miyiz? Yazarlar, multimedia ders kitaplarının hem teorik hem de uygulama boyutlarını değerlendirme olanaklarını incelemiş ve bazı önerileri sunmuştur.

Anahtar Sözcükler: Multimedya ders kitabı, ders kitabı, interaktif ders kitabı, öğretim materyalleri, multimedya öğretim, öğretmenlerin gelişimi.