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Trends in free WWW-based E-learning Modules seen from the Learning Resource Server Medicine (LRSMed)

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Abstract

Despite the lost enthusiasm concerning E-learning a lot of material is available on the World Wide Web (WWW) free of charge. This material is collected and systematically described by services like the Learning Resource Server Medicine (LRSMed) at http://mmedia.medizin.uni-essen.de/portal/. With the LRSMed E-learning modules are made available for medical students by means of a metadata description that can be used for a catalogue search. The number of resources included has risen enormously from 100 in 1999 up to 805 today. Especially in 2004 there was an exponential increase in the LRSMed's content. Anatomy is still the field with the highest amount of available material, but general medicine has improved its position over the years and is now the second one. Technically and didactically simple material as scripts, textbooks, and link lists (called info services) is still dominating. Similar to 1999, there is not one module which could be truly referred to as tutorial dialogue. Simple material can not replace face-to-face-teaching. But it could be combined with conventional courses to establish some kind of blending learning. The scene of free E-learning modules on the WWW is ready to meet current challenges for efficient training of students and continuing education in medicine.

Keywords:
Computer assisted instruction; E-learning; Learning; World Wide Web

1. Introduction

E-learning has disappeared from the political agenda of strategically important topics [1]. This is due to the fact that expectations and promises have failed; unrealistic enthusiasm is followed by deep frustration. According to Jennett [2] E-learning stands in a critical phase of new technologies' life cycle. Promising reports had been followed by professional adoption and public acceptance. Now we can notice a phase of professional denunciation and it is not clear, whether E-learning will reach the status of a standard procedure in medical studies and continuing medical education.

In Germany, current regulations for medical education offer new chances for a revival of E-learning. On the one hand, conditions for education of medical students have been revised [3]. Education at medical faculties should be more oriented to health practice and health care system requirements. Ex-cathedra teaching becomes less important, the role of

seminars and teaching small groups of one to three students has grown. As consequence lecturers are confronted with a dramatically increase in hours needed for education, which have been gained from time used for research and patient treatment. On the other hand continuing medical education becomes mandatory for physicians in outpatient care [4]. Within 5 years practitioners have to collect 250 points in certified courses to keep their licence and to avoid financial restrictions.

Both requirements, new regulations for medical education and mandatory continuing medical education, create new hopes and options for E-learning. Especially material offered on the World Wide Web (WWW) support the required efficiency in education and training through following advantages [5].

- Independence from local connections because the Internet allows access from all over the world with a low cost technical infrastructure.
- Independence from time restrictions because the material is available 24 hours 7 days a week without any technical necessity for downtime.
- Independence from the availability of teachers at the time of learning because their knowledge is integrated in learning modules.
- Easy and fast updating because all content is localized on the WWW-server.

A lot of useful material for WWW-based E-learning had been developed world-wide during the last 5 to 10 years of professional adoption. Especially material that is offered free of charge via a WWW-Browser is made accessible on demand by special catalogues in medicine. Well known academic services include:

- Computer aid learning reviews (CAL reviews) - http://axis.cbcu.cam.ac.uk/calreviews, a project of the Clinical & Biomedical Computing Unit at the University of Cambridge, UK, started September 1997.
- Commented database for E-Learning: Medicine (in German: Kommentierte E-Learning Datenbank: Medizin, KELDAmed) - http://www.ma.uni-heidelberg.de/bibl/KELDAmed/, offered by the University Hospital of Mannheim and the Heidelberg University, Germany.
- Learning Resource Server Medicine (LRSMed) - http://mmedia.medizin.uni-essen.de/portal/, developed and maintained by the Institute for Medical Informatics, Biometry and Epidemiology of the University Duisburg-Essen, Germany, started in 1997.

Being responsible for the LRSMed we are able to analyze the trend of free WWW-based E-learning modules over the last decade. In our article we will compare the content of LRSMed in the years 1999 [6], 2002 [7] and 2004 (data from November 2004).

2. LRSMed

The LRSMed is a multilingual service that retrieves E-learning modules freely available on the WWW, describes the modules with a metadata standard, stores the metadata in a database and offers a user-interface for retrieval, commenting and authoring. Main target group of LRSMed are medical students, but some material will also be useful for health care professionals as well as for the public. Figures 1 and 2 show screen-shots from the LRSMed. In Figure 1 a search for E-learning modules is specified using the criteria specialism (anatomy), application type (image atlas), and language (English). The result screen is shown in Figure 2. Eleven modules were retrieved from the database and information is presented including the modules' title, specialisms, application types, and languages. The user can call further information or can switch directly to the modules via

the title's hyperlink. As part of LRSMed's quality assurance strategy, comments about a module can be entered here. The result set can be transformed into a document in Portable Document Format (PDF) and printed out.

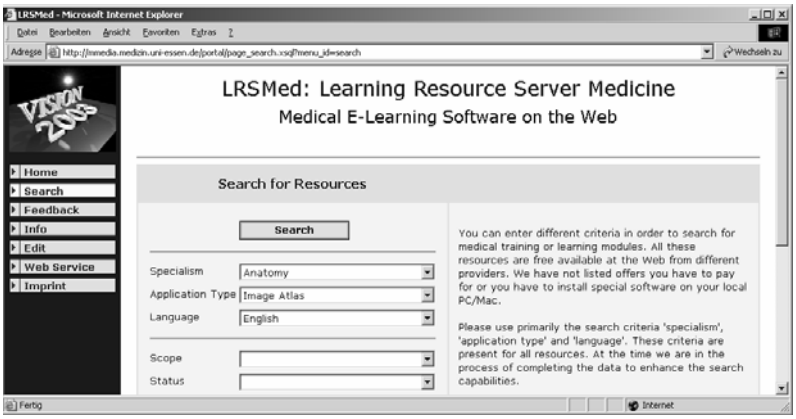

Figure 1 - User interface of the search for E-learning modules

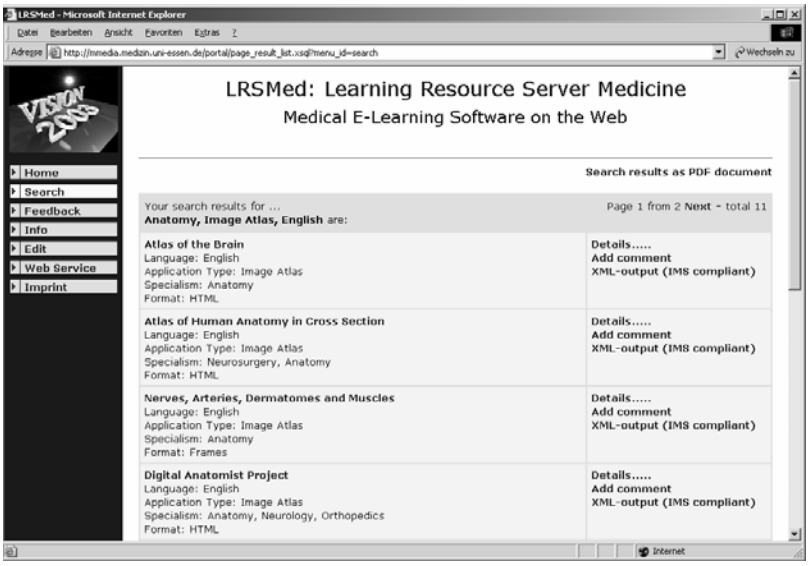

Figure 2 - Result set with further options and hyperlinks to the modules

Key features of LRSMed include the use of Learning Objects Meta-data (LOM) [8] in the implementation of the IMS Learning Resource Meta-data Information Model [9] as metadata-specification, the eXtensible Markup Language (XML) as syntax for interfaces and the Oracle suite for implementation. An application programming interface implemented with the Simple Object Access Protocol (SOAP) enables the integration of LRSMed in other applications as hospital information systems, E-learning platforms, etc.

Learning material has to fulfil several requirements to be accepted for inclusion in the LRSMed: availability (free of charge), technique (standard WWW-browser, only extended by common plug-ins), target group (primarily medical students), language (at the moment German and English), and application type (cf. figure 3).

A critical assessment of the E-learning module's quality is supported in two ways. Firstly, an interested user can read comments of others about that module. The comments are stored within the metadata and comprise free text as well as a simple score. Secondly, LOM had been extended with entities covering information about the module's development process (Was the development based on specific standards for software development?) as well as information about evaluation (Has the module demonstrated its educational impact in a controlled study?).

3. Trends in frequency, specialism and application type

The number of E-Learning modules available in LRSMed has increased dramatically. Having 100 modules in the first quarter of 1999, this number raises linear up to 267 until the second quarter in 2002 and exponential up to 439 the first quarter, 653 the second quarter, and 763 the fourth quarter 2004. The LRSMed offers currently 805 active resources (status 2005-01-07). In comparison KELDAmed provides 1135 resources including 591 eBooks (PDF-files) the same day. The number of resources included in CAL reviews is not published.

Figure 3 shows an overview of the relative frequency of modules categorized according to the application type. Because LRSMed allows multiple classifications of E-learning modules to different application types some modules count twice in Figure 3. Similiar to 1999, simple scripts are most commonly offered in 2004 (30 %). The type info service jumped from a bad position of 2 % in 1999 to position 3 with 12 %. We define info services as enhanced link lists concerning a medical topic. Other application types that received a higher relative frequency in 2004 than in 1999 are textbook, drill and practice, and virtual presentation. On the opposite the relevancy of simulation, image atlas, presentation, and audio database decreased. Video database and questionnaire were introduced later.

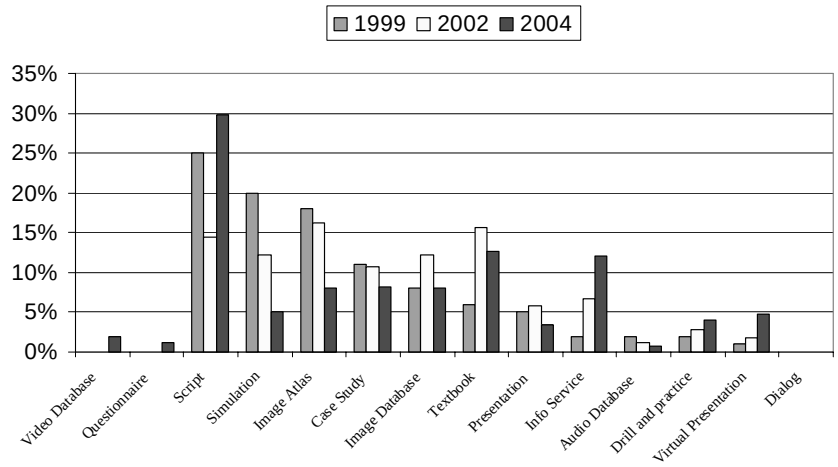

Figure 3 - Relative frequency of E-learning modules in LRSMed 1999 (left column), 2002 (middle column) and fourth quarter in 2004 (right column) categorized according to the application type. From left to right the application types are ordered in descending relative frequency from 1999.

The six most frequent specialities in 1999 are also present in the TOP 10 of 2004: internal medicine divided in its specialities cardiology, hematology and oncology, and gastroenterology; anatomy; neurology; radiology; dermatology; pathology. Medico-theoretical fields as biochemistry, biometry, and epidemiology lost their position in the TOP 10-list. In 2004, number 2 behind anatomy is general medicine, which improved its position from 8 in 2002. Firstly visible in the TOP 10 in 2004 is pediatrics at position 8. Histology (position 4), first aid (position 8), and otolaryngology (position 10) had an intermediate visit in the TOP 10-list 2002. Between 2002 and 2004 internal medicine had been divided into its sub-specialisations due to a high number of respective modules. The most frequent combinations of specialism and application type in 2004 are shown in Table 1.

Table 1 - Combinations of specialism and application type with 10 or more modules in 2004.

Specialism	**Application type**	**Number of modules**
Anatomy	Image database	18

General medicine	Info service	17
Microbiology	Script	16
Virology	Script	16
General medicine	Script	15
Cardiology	Textbook	13
Cardiology	Script	13
Radiology	Case study	13
Biochemistry	Script	12
Hematology and Oncology	Script	12
Anatomy	Simulation	11
Gastroenterology	Script	11
Pharmacology	Script	11
Hematology and Oncology	Info service	10

4. Conclusions

On the WWW, the number of freely available E-learning modules in medicine has increased enormously between 1999 and 2004. Some remarkable national and supranational funding programs in the last decade might be one reason for this increase in learning material. For example, the German government funded 180 projects within its program “New Media for Education” between 2000 and 2003 with more than 180 million EURO, from which 16 projects in medicine received 34 million EURO [10]. In addition, the large number of scripts might indicate that many lecturers offer material they have developed for own purposes before. Meanwhile, the coverage of specialities has changed. Image oriented specialities like anatomy, radiology, and pathology dominated in the late 90s as well as medico-theoretical fields like biochemistry. Nowadays clinical fields with a high common relevancy are present in the top-list of E-learning modules. Especially general medicine made its way into the WWW. General surgery is still underrepresented in comparison to its importancy.

The quality of the E-learning modules is difficult to access. Published studies demonstrate a poor reliability in assessing health teaching resources [11]. An impression could be received by the trend in application types. Not the number of complex and sophisticating types had been raised - simple scripts are still the most frequent application type available in 2004. As mentioned in 1999 by Haag et al. [12], modules offering a tutorial dialog are still missing. So the WWW is used mainly for a distribution of classic material. The possibilities of the medium are still not fully exploited.

We do not know whether the situation seen in our LRSMed is representative for the scene. But our analysis demonstrates that a lot of material is available which could be integrated into courses because of its simple structure. Today, lecturers can utilise this material and combine it with face-to-face teaching to establish an ideal synergy of blended learning.

5. Acknowledgements

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6. References

[1] The European ODL Liaison Committee. Distance Learning and eLearning in European policy and practice: the vision and the reality. 17 November 2004, available at http://www.odl-liaison.org/, accessed 2004-11-26.

[2] Jennett B. High technology medicine. Benefits and burdens. Oxford: Oxford University Press, 1986.

[3] Approbationsordnung für Ärzte vom 27. Juni 2002. Bundesgesetzblatt Teil 1, 2002; pp. 2405-35.

[4] Gesetz zur Modernisierung der gesetzlichen Krankenversicherung (GKV-Modernisierungsgesetz - GMG). Bundesgesetzblatt Teil 1, 2003; pp. 2190-258.

[5] Lowe HJ, Lomax EC, Polonkey SE. The World Wide Web: a review of an emerging Internet-based technology for the distribution of biomedical information. *JAMIA* 1996: 3 piii: 1-14.

[6] Stausberg J, Bündgens D, Prange J. Multimediale medizinische Lehr- und Lernsoftware im World Wide Web: Eine Angebotsanalyse. In Victor N, Blettner M, Edler L, Haux R, Knaup-Gregori P, Pritsch M, Wahrendorf J, Windeler J, Ziegler S, eds. Medical informatics, biostatistics and epidemiology for efficient health care and medical research. München: Urban & Vogel, 1999; pp. 333-6.

[7] Geueke M, Stausberg J. A meta-data based Learning Resource Server for Medicine. *Computer Methods and Programs in Biomedicine* 2003: 72 piii: 197-208.

[8] IEEE Learning Technology Standards Committee (LTSC), Learning Object Model 6.1, available at http://ltsc.ieee.org/doc/wg12/LOM_WD6-1_1_without_tracking.pdf, accessed 2002-05-30.

[9] IMS Global Learning Consortium, IMS Learning Resource Meta-data Information Model Version 1.2. Final Specification. 17 May 2001, available at http://www.imsglobal.org/metadata/index.html, accessed 2002-06-26.

[10] Projektträger Neue Medien in der Bildung + Fachinformation des BMBF in der Fraunhofer Gesellschaft. Förderprogramm Neue Medien in der Bildung. Förderbereich Hochschule. Aktuelle Fördervorhaben aus der Förderbekanntmachung zum Einsatz Neuer Medien in der Hochschullehre. Sankt Augustin Dezember 2002, available at http://www.gmd.de/PT-NMB/Projektdokus/Hochschul_Vorhaben.pdf, accessed 2003-05-05.

[11] Darmoni SJ, le Duff F, Joubert M, le Beux P, Fieschi M, Weber J, Benichou J. A preliminary study to assess a French code of ethics for health teaching resources on the Internet. In Surján G, Engelbrecht R, McNair P, eds. Health data in the information society. Proceedings MIE2002. Amsterdam: IOS, 2002; pp. 621-6.

[12] Haag M, Maylein L, Leven FJ, Tönshoff B, Haux R. Web-based training: a new paradigm in computer-assisted instruction in medicine. *International Journal of Medical Informatics* 1999: 53 piii: 79-90.

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