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STANDARDISATIONISSUES

by Frans Van Assche

1 ISSUES

When dealing with standards in the context of national educational networks, two major **issues** should be considered:

- When, where and which standards should be used in the context of the network infrastructure and the contents.
- Which standards initiatives should national networks or the EUN get involved in

In dealing with these issues it is important to understand the educational context, the nature of standards, and why they are used. Next, this paper gives an overview of educational areas for which standards are (being) developed and finally we look at the second major issue: the desired level of involvement.

2 BACKGROUND

While ICT in education has been explored in various projects since the mid nineties[1], the concept of a network of networks was elaborated in 1997, establishing the European Schoolnet (EUN). Full recognition of the importance of ICT in education for the future of European prosperity came when the European Commission in December 1999 launched the eEurope initiative with the objective to bring Europe on-line. Heads of State and Government committed themselves at the extraordinary Lisbon Summit of March 2000. One of the important themes of the eEurope initiative is to lead "European youth into the digital age" with organised actions including the availability of educational resources on the Internet, e-learning platforms, access to multilingual multimedia learning materials, etc.

It goes without saying that these actions can only succeed at a European level in a climate of co-operation between school networks. In addition School Networks are not so powerful in resources as other sectors - like Universities and Industry - and can benefit substantially from such a co-

[1] See for instance the Web for Schools project, TRENDS, and ARIADNE.

operation at different levels since expensive infrastructure, tools, and material is involved. Figure 1 gives a schematic overview of the education delivery and means provision in the educational sector.

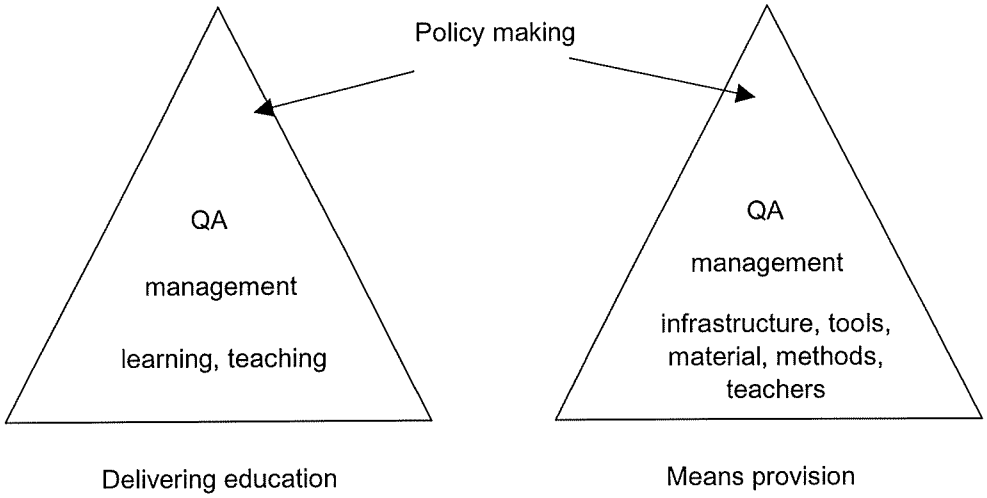

Figure 1: Delivering education and means provision

Delivering educational includes activities such as:

- learning
- teaching
- resource management
- quality assurance
- policy making

Providing education means includes

- infrastructure provision
- ICT tools provision
- educational ICT material provision
- ICT adapted training methods
- teacher training
- management and policy making of the above

In section 4 we give an overview of specific standardisation activities in the above fields but first we explore how standards lead to improvements in efficiency and effectiveness and why the lack of standards in the educational sector is currently a major inhibitor in the deployment of ICT in education.

3 IMPROVEMENTS THROUGH STANDARDS

Standards, specifications, and agreements can play a major role in improving the operation of the whole educational system as they are instrumental in achieving higher levels of interoperability, ease of operation, reuse, and quality.

Interoperability covers more than one issue. Firstly, it deals with the issue of integration of components. If we want to integrate two components - for instance a nut and a bolt - the two must fit together. Similarly, if we want to integrate a web-bases video player into our own curriculum material it must fit the hardware and software environment we are currently using.

Secondly, interoperability deals with sharing and collaboration on the technical level as well as the semantic level. For instance a web-browser and an Internet server will collaborate in providing useful information to the user. They collaborate on various levels using various protocols and standards (from physical to TCP/IP, XML, and HTML) within a client-server architecture. Another example on the semantic level is how we share information. If one server is to 'understand' information provided by another they must share the same semantic model.

A special aspect of sharing and collaboration are mappings and vocabularies. People in different countries and regions use different structures, concepts, and locale (e.g. language, alphabet, currency and date formats). Mappings define how one element can be translated to another element. For instance a multilingual thesaurus will deal with the mapping in different languages of keywords. **Localisation** is one of the major aspects for interoperability to work.

Sharing and collaboration provides economies of scale not only by exchanging information but also when networks would share the software they develop. Each network is bound to provide databases on projects, resources, schools, etc together with all the facilities to add, delete, edit and search these databases. Obviously, they can be provided at a fraction of the cost if networks are deploying the same system, which of course must be customisable to the actual situation.

Ease of operation (including ease of learning and ease of use) in a standardisation context has to do with the fact that if a person can relate an activity to something he has been doing before it goes easier. For instance it will be much easier if a person can search the different school networks using the same user interface and the same structure of information than when he would need to learn new procedures for each network.

A special case of ease of operation has to do with accessibility of ICT. Standard efforts should be undertaken to meet the needs of persons with a disability.

Reuse involves a number of interoperability issues with the specific purpose of putting existing components to use again. Reuse involves four activities: finding, evaluation, adaptation and integration.

Finding the candidate component for reuse. Finding is the result of search. Measures of search are *precision* (the ratio of number of correct results found over the number of results found) and *recall* (the ratio of number of correct results found over number of correct results in the population). For reuse it is especially precision which is of importance in an Internet context. Improving precision requires that data be structured differently highlighting more semantics. Hence the emergence of standard and specification efforts in this area such as the use of metadata in order to improve the results of search engines, crawlers and harvesters.

Evaluation. The second task in reusing a component is evaluation of the fact that the component is what we need, and whether we can adapt and integrate it. Reusable components should provide the necessary information to this purpose.

Adaptation to the own environment and situation. Adaptation may be in terms of localisation, with respect to the local technical infrastructure, or for the purpose the user has in mind.

Integration into a whole. A reusable component will eventually be part of a bigger whole, be it a software system, an online workshop or a classroom activity.

The task of evaluation, adaptation and integration is facilitated by the provision of guidelines and one or more examples of adaptation, integration, and putting the component to use.

Standards can be instrumental to achieve higher levels of **quality** by providing yardsticks, procedures and guidelines. However, within the educational community, care should be taken were to apply them. There is for instance no general agreement about the desirability of standards concerning values or pedagogical approach. On the other hand it would be of great help if quality standards or specifications could be adopted on for instance content. Also, there is no reason why quality standards such as ISO-900x could not apply to a number of management aspects in the educational system.

4 OVERVIEW OF STANDARDISATION WORK IN THE FIELD OF EDUCATION

Different standards bodies are active in the field of education. Below follows a list of current learning technology areas were standards work is of interest or is already being done[2].

General

A Reference Model/Architecture for component-based Computer-Aided Instruction (CAI) systems.
Work in this area seeks to do for the CAI system industry what the Object Management Group's Common Object Request Broker Architecture (CORBA) is doing for the distributed object computing industry. It should establish

[2] See the IEEE LTSC, CEN-ISSS, SIF, and others.

guidelines (required and recommended) for implementation of CAI system components, and define system services that are to be available to all components.

Infrastructure
In order to enable applications to exchange their defined data objects and events, some mechanism must be defined to provide the transport functionality. This can be done through messages that are used by applications to register themselves, provide for data objects, subscribe to events, request data objects, respond to requests, and to provide administration functions. Work in this area intends to design the messages and protocols that are used to transmit data objects and events.

A Glossary.
A list of terms to be used in standards and specification definitions.

Learner related

The Learner Model
Work in this area seeks to specify the syntax and semantics of a 'Learner Model,' which characterises a learner (student or knowledge worker) and his or her knowledge/abilities. This includes elements such as knowledge (from coarse to fine-grained), skills, abilities, learning styles, records, and personal information. A standard would allow these elements to be represented in multiple levels of granularity, from a coarse overview, down to the smallest conceivable sub-element. A standard would allow different views of the Learner Model (learner, teacher, parent, school, employer, etc.) and should substantially address issues of privacy and security.

Student identification
Work in this area seeks to specify the syntax, semantics, encoding, registration, resolution, and authentication of unique student identifiers. A student identifier is a name, e.g., a login name, that is associated with a student. These identifiers should be simple enough for students (even as young as grade school) to memorize, and for non-technical organizations (such as schools) to issue. No other standard system of unique identifiers meets these requirements today.

Quality System for Technology-Based Life-Long Learning
Work in this area focuses on the learner-centered processes of life-long learning. It seeks to specify the required elements of a user-centered quality system (e.g. goal-setting, planning, execution, tracking, documentation, continuous process improvement, etc.) for life-long learning. It aims also to recommend various levels of technological capabilities (e.g. computer access, Internet access, learner-centered records, etc.) and data interoperability, to be accomplished in part by building profiles of other standards. It would result into a typical quality standard.

Competency Definitions
The purpose of work in this area is to define a universally acceptable Competency Definition model to allow the creation, exchange and reuse of Competency Definition in applications such as Learning Management Systems, Competency or Skill Gap Analysis, Learner and other Competency profiles, etc.

Content related

CBT Interchange Language
Currently, much computer-based training (CBT) courseware produced is not easily portable from one authoring system to another. The primary reason for this is that the content (Audio, Graphics, Video, Composition, and Logic) are often in a format proprietary to the CBT authoring tool(s) used to create the CBT. Work in this area seeks to improve interchangeability of CBT with respect of authoring tools, and delivery systems.

Course Sequencing
Work in this area seeks to provide a specification language and environment for managing sessions in learning technology systems, e.g., computer-aided instruction, intelligent learning environments, and intelligent tutoring systems.

Content packaging
Work in this area aims to describe the packaging of learning content. Learning content, typically, is a collection of components that are copied, transmitted, purchased, executed, and used as a single unit. Units may be combined to make larger units. A standard would describe the format, coding, encoding, environment, attributes, and interactions of this content.

Data and metadata

Ontology
Work in this area seeks to specify the semantics of a general-purpose upper level ontology. An ontology is a set of terms and formal definitions. This would be limited to the upper level, which provides definition for general-purpose terms and provides a structure for compliant lower level domain ontologies. It is estimated to contain between 1000 and 2500 terms plus roughly ten definitional statements for each term. It is intended to provide the foundation for ontologies of much larger size and more specific scope.

Collaborative information provision
Teachers, learners, and parents use ICT to search for information about projects, initiatives, calls, (self) assessment, multimedia content, instructional content, learning objectives, instructional software and software tools, persons, organizations, or events referenced during technology supported learning. Work in this area focuses on the minimal set of attributes needed to allow these education related objects to be managed, located, and evaluated.

Localisation
Work in this area deals with localisation issues for learning technologies. This includes facilitating human language translations (for instance of learning documents or learning object metadata vocabularies), but also more technical issues (for instance character sets and encodings), as well as more general cultural issues (for instance appropriate icon representations or user interface metaphors.

Exchange bindings
Work in this area seeks to define a semantic framework so that semantic elements defined in one conforming standard can be directly integrated into another conforming standard. Possible examples of semantic elements are data elements, abstract data types, and organizational categories. The standard would also define related, common conventions for syntax and protocol bindings needed for information exchange. An example of such a binding would be XML.

Data Interchange Protocols
A good number of protocols exist for exchanging data, such as FTP, HTTP, CORBA. However, these protocols don't perform well (e.g., HTTP is not good for fine grain data), they don't have enough semantics (e.g., FTP cannot get/put address attributes, properties, or metadata), or they are difficult to interface to (e.g., CORBA cannot be conveniently accessed in Perl or Tcl). A lightweight protocol that was easily implementable and addressed the needs of learning technology would have wide acceptance and integration within many applications because protocols are one of the key elements to portable, interoperable distributed (distance) learning systems.

Instruction Management Systems and Applications

Computer Managed Instruction
Work in this area is concerned with describing what is in a course (including objectives), organizing and sequencing individual lessons in a single course, launching or starting assignable units with course management software, reporting student performance information, and relating performance to objectives.

Tool/Agent Communication
Work in this area is concerned with educational systems consisting of one (or more) user tools and one (or more) instructional agents. User tools are standard software applications that the student might work with in an educational context (such as spreadsheets, text editors or graphing tools). Instructional agents are software modules able to provide guidance to students using such tools in pursuit of some educational goal.

The envisaged standard should address communication between multiple instructional agents which may exist in a single learning environment.

School administration

Administrative
Work in this area is concerned with exchanging information about a number of administrative and management objects in sub-areas such as:

- Food Services. The information dealt with includes the amount of remaining breakfast/lunch credits, cash balance, meal status (free/reduced) etc of student meals.
- Gradebook. The Gradebook deals with student grades, comments, attendance, and scores.
- Human Resources/Financials. This sub-area is concerned with purchasing, billing, payment, vendor information, employee information, time worked, etc.
- Library Automation. This sub-area is concerned with student/teacher lending status information such as the titles currently checked out, the fines or refunds assessed, titles that are ready for the student or teacher to pick up.
- Student Information. This sub-area is concerned with information about the student such as personal data, whom to contact, siblings, picture, enrolment, discipline, assessment, daily attendance, etc
- Transportation. This sub-area is concerned with information about the transportation to and from the school. The most important of these may be the geographic component of the transportation system, which provides the ability to locate data and events in space permitting a wide range of data analysis.

5 OVERVIEW OF ICT SERVICES TO THE EDUCATIONAL COMMUNITY AND STANDARDS USE

The needs of the networks are to a large extend based on the needs of their users: primarily teachers, students, parents, school management, and policymaking. Services that networks are providing or are likely to provide are:

Information provision in general (for instance in a news letter) or making resources (often stored in virtual libraries) available through specific delivery mechanisms such as streaming audio, video, etc. In addition there is the need to provide information about specific items such as resources (including material, tools, practice, training and help), announcements (calls and events), forums, initiatives, industry offers, organisations (industry, ministries, schools), persons (teachers, tutors, contacts), projects, evaluations (including self assessment), etc.

Standards, specifications or agreements in this area are of interest as networks wish to exchange information, or implement collaborative information provision, or share development costs. For instance there is a lively interest among teachers to find information about classroom projects, examples of good practice, funded projects and partnerships outside their

own country. In order to provide such a cross border service, structured internetworking is a requirement and standards, specifications or at least agreements must be adopted at various levels, from exchange protocols to a number of specific vocabularies.

Interactive services such as (multilingual) chat, forums, and helpdesks. Examples of chats and forums would be about partner finding forum, curriculum material, authoring, technical issues, pedagogy, teacher training, and policy making. Examples of helpdesk would be about authoring, pedagogy, or technical. Combined interactive services integrate some of the above services together with information into for instance on-line workshops, collaborative learning, or collaborative authoring.

Implementing such collaborative services on an international scale requires some standards, specifications or agreements about the collaboration, and/or a supra national centralised implementation.

Management and Schools Administration. Every network has a large amount of school administration. Standards, specifications, and agreements will help in exchanging information, aggregation of information for study purposes, and cost reduction when developing the supporting systems.

6 DISCUSSION OF STANDARDS ACTIVITIES FOR WHICH THE NETWORKS ARE STAKEHOLDER

Clearly, no single network is a primary player on the international standards scene. However as a community (or network of networks) we have a role to play. Some standards we should simply apply others we should get involved in the definition of it as we are a main stakeholder.

Primary stakeholder

Networks are primary stakeholder on certain aspects of *collaborative information provision*; in particular educational information provision (see section 5) is of importance. While some standards already exist (e.g. vCard for business card information and vCalendar for scheduling), it is the networks that should provide the knowledge model for the structured educational contents as well as some multilingual vocabularies and a multilingual thesaurus.

Currently this is covered partially by the metadata activities of the EUN multimedia project and the EUN European Treasury Browser project. Important standardisation activities include

- The Dublin Core initiative
- the Learning Object Metadata Model of the IEEE Learning Technology Standardization Committee
- the Question & Test Specification of the IMS initiative
- the EML (Educational Markup Language) basically a currently limited knowledge model with an XML binding.

The two mentioned EUN projects (MM1010 and ETB) deal also with the multilingual thesaurus and some classifications such as user level for the use of resources.

The next step is to provide, based on experiences from the networks, a more complete knowledge model that will allow users to find in a transparent way information provided by different networks across Europe. In addition work should continue on improved classifications for resources and other knowledge elements. The EUN .Safe project will deal with rating standards for filtering and Internet safety.

In addition to the information provision, *school administration and management* is an important concern for the schools sector. In this area a prominent initiative is the Schools Interoperability Framework led by Microsoft and the Enterprise Specification work of the IMS that is aimed at administrative applications and services that need to share data about learners, courses, performance, etc., across platforms, operating systems, user interfaces, and so on. Both efforts are basically North-American initiatives.

The next step is to join these efforts such that also European schools can benefit of it. One initiative to obtain this is the OASIS project in which the EUN participates.

Secondary stakeholder or user.

In a number of areas, networks are currently secondary stakeholders or simply users. For a number of areas listed in section four it is especially the publishers and content providers that take the lead, and it is in their own interest to involve the educational sector were necessary.

For many (emerging) standards, networks are simply users. This is for instance the case for most of the technical standards, specifications, and agreements. Also, a number of vocabularies and coding schemes are well established. For instance international coding schemes exist for countries, languages, currencies, etc.

What is important for networks is that they are aware of these standards together with some guidelines or recommendations of their use. To this end the EUN should set-up an observatory task and awareness activities as part of its Insight initiative.

7 CONCLUSION

Standards are part of and influence ICT use in education very much. They can provide substantial benefits in terms of cost reduction, quality and accessibility. Standard efforts in the field of education exist in areas including: learner related, content related, data and metadata, instruction management systems and applications, school administration. For quite a number of standards, the networks are simply users or secondary stakeholders. Networks are primary stakeholders in a few areas such as collaborative information and service provision and school administration.

APPENDIX: OVERVIEW OF SOME RELEVANT STANDARDS AND STANDARD ACTIVITIES

- Dublin Core: The Dublin Core is a metadata element set intended to facilitate discovery of electronic resources. <http://purl.org/dc/>.
  The EUN European Treasury Browser project adapts and extends the Dublin Core for the field of education. <http://www.eun.org/>.
- Learning Object Metadata. This proposed IEEE standard defines a structure for interoperable descriptions of learning objects. <http://ltsc.ieee.org/doc/wg12/LOM_WD4.htm>
  A project named EduML (Educational Markup Language), using these metadata, is in progress at Supélec; the main goal of EduML is to apply these new technologies to the publication of teaching programs (printed and on-line, on the Web).
  <http://www.nllinux.co.uk/eduml/intro.html>
- The Schools Interoperability Framework (SIF) is an industry initiative to develop an open specification for ensuring that K-12 instructional and administrative software applications work together more effectively. <http://www.sifinfo.org/>
- ISO 639: This is an international standard for the representation of languages. Version 1 uses two-letter language codes, e.g. 'en' for English, 'fr' for French, 'nl' for Dutch, etc. These language codes are a basis for the IETF registry of language tags, as specified in RFC 1766: Tags for the identification of languages.
  <http://lcweb.loc.gov/standards/iso639-2/>
- ISO 3166: This is an international standard for the representation of country names, e.g. 'BE' for Belgium, 'CA' for Canada, 'FR' for France, 'GB' for United Kingdom, 'US' for United States, etc.
  <http://www.din.de/gremien/nas/nabd/iso3166ma/codlstp1.html>
- ISO 8601: This is an international Standard that specifies numeric representations of date and time. The basic notation is YYYY-MM-DD where YYYY is the year in the usual Gregorian calendar, MM is the month of the year between 01 (January) and 12 (December), and DD is the day of the month between 01 and 31.
  <http://www.cl.cam.ac.uk/~mgk25/iso-time.html>
- ISO 10646-1: This is an international Standard that specifies a character set that relies on 32 bits, includes approximately 4 billion characters, of which the first 65536 are Unicode, the first 256 are ISO 8859-1, and the first 128 are ASCII.
  <http://wwwold.dkuug.dk/JTC1/SC2/WG2/>
- RFC 1766: This Internet standard defines a language tag, referring to ISO 639 for the language, and to ISO 3166 for the country code. http://ds.internic.net/rfc/rfc1766.txt
- vCard: <http://www.imc.org/pdi/>: This standard defines how contact details for people and organisations can be represented.
- vCalendar: <http://www.imc.org/pdi/>: This standard defines a transport and platform-independent format for exchanging calendaring and scheduling information in an easy, automated, and consistent manner.

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CONTENT: PRESENTATION & WORKSHOP (Jordi Vivancos and Robert van Oosten)

Discussion paper by Jordi Vivancos

Issue:

How to develop and produce educational content for schools on the web site?

Introduction

1. The Information Society is characterised by structural changes that have profound implications in the development of educational policies. These changes include industrial and occupational change, globalisation and the challenges of the information technology revolution. Knowledge, skills, and training have become one of the most valuable resources for countries and organisations.

2. Online educational content development is one of the main concerns of the eLearning Action Plan presented by the European Commission to the Education Council last November in the framework of the European eLearning initiative[1]. On the same lines, the Information Society Technology Programme (IST)[2] has defined a key action "multimedia content and tools " whose main priority for 2001 will be the investigation of paradigm shifts that are likely to affect multimedia content systems and services in the future.

3. Digital technology is bringing together three previously distinct industries - broadcasting, computing and telecommunications. But whilst the rate of technological or media convergence is breathtaking, so far the rate of consumer take up for new converged services is relatively slow. Content packagers such as publishers and TV channel owners have long had an important role in education, producing books, films and other learning content that has been the primary means of conveying knowledge from experts to students. Today, the traditional content industry role is changing with the rise of digital technology and the Internet.

4. This paper does not intend to cover all the issues that influence Content production, but raise general questions and develop some aspects of the Pedagogical and Production/industrial factors. Standard Issues will be considered in another paper.

Towards a definition of Web Educational Content

5. To clarify the issues arising in web content development for schools, it is important to state what we are talking about. Let's start with a first attempt to define Web Educational Content (WEC):

[1] eLearning Initiative (http://europa.eu.int/comm/education/elearning/index.html)

[2] IST Key Action III - Multimedia Content and Tools (http://www.cordis.lu/ist/bwp_en4.htm)

> Web based high-quality, reliable, and relevant digital information, resources and services, adapted to learning needs and suitable for educational environments.

6. According to this definition we could identify several WEC typologies:
   1. **Referential** (Encyclopaedia, Dictionary, Virtual Exhibition, Documentary film, Manual,...)
   2. **Factual** (Databases, News,...)
   3. **Instructional** (Course, Lesson, Tutorial, Simulation, "Learningware", Project, Activity, Test,...)
   4. **Ludo-educational** or **"Edutainment"** (Game, Contest, Quiz...)
   5. **Instrumental** (authoring system, learning management system (LMS), organisational and collaborative tool)
   6. **Help & Support** (Forums, Self-Diagnostic, Ask the expert, on-line tutor,...)

7. These six categories could be grouped under three broader ones:
   - **Information products** (Referential, Factual and Instructional)
   - **Support and communication services** for online support of the learners
   - **Tools** (Technologies to develop elearning portals, virtual campuses, school intranets, content repositories and authoring systems)

The interactivity associated to the web is expanding the concept of Content from products to services.

Issues in WEC production

8. Educational Content production is affected by many factors:
   - **Administrative/political** (National/European Policies, Regulatory framework, Curriculum diversity, Decision making decentralisation);
   - **Pedagogical** (Curriculum Relevance, Work Flow, Validation);
   - **Socio-Cultural** (Access Equity, Innovation pace, Multilinguality, Multiculturality);
   - **Technical** (Development tools, Standardisation, Reusability, Usability, Accessibility);
   - **Infrastructural** (Platform, Interoperability, Bandwidth usage);
   - **Legal** (Copyright, Content regulation, Privacy and data protection);
   - **Production/Industrial** (Media Convergence, Value Chain, Market needs&barriers, Customisation, Distribution strategies, Economies of scale, Cost effectiveness);
   - **Economical/Financial** (eCommerce, Pro-competitive regulation, Funding sources).

Factors affecting European WEC production

9. European Web educational Content has not reached a significant presence yet.

The main factors for lack of WEC market development could be summarised as:

- **Market fragmentation.** The European educational content market is very fragmented: national educational requirements, language issues, subjects, and diversity of technical platforms (PC and bandwidth).
- **Low differentiation** between free and fee content implies user's perception that content on the Internet is and should be free. Development and distribution costs are neglected.

- **Copyright concerns** by content creators: Copy and dissemination is very easy (The Napster phenomenon). Most of the developers of high cost content are not on the web.
- **Technical instability** due to a lack of consolidated standards and the pace of ICT changes (technological lifecycle is much shorter than pedagogical).
- **Low profits** or low Return on Investment (ROI). Risks are higher and content products have an unpredictable lifecycle.
- **Slow development process** due to the fact that the multimedia industry has no mature tools and standards compared with the traditional content industries.
- **Lack of curriculum exigency** for using multimedia and web based content in education.

Pedagogical Issues: WEC Evaluation

10. While much has been written about pedagogic issues related to the use of interactive media in teaching, most schools and teachers are still not much beyond the *early adopter* [3]stage. Curriculum planners and Teachers are coping with how to integrate the enormous resources on the web into the curriculum, and transform this information into knowledge. To analyse and understand how to generalise the most appropriate Internet tools, services and content for learning purposes, there is a growing need for applied research.

11. Evaluation research means a systematic use of scientific methods and techniques to prove the usefulness of a result. Evaluation can be carried out in different ways: Summative, Formative and State of the art evaluation:

- S*ummative evaluation* is a global, summarising evaluation after finishing an intervention and testing the increase of knowledge.
- *Formative evaluation* takes place during the learning process. It gives information of the learner's step by step knowledge construction. This process includes a recursive system of feedback.
- *State of the art evaluation* describes a form of evaluation that considers all relevant and accepted research information/literature about the subject to be evaluated.

12. Within the framework of educational multimedia a number of tools and methods are available[4] to evaluate and analyse: content relevance, didactical design and ergonomics (analysis of quality).

13. One example of European-based Multimedia Content evaluation is Project Pedactice[5] that has developed a co-operative methodology for validating multimedia content triangulating the views of the main actors involved: teachers, researchers and publishers.

The Value chain of Web Content development

14. *Value chain* is a term that defines the circuit a product takes from its genesis until it reaches the end user. At each stage, value is added to the product. The value chain might include editors, who help authors share and refine their ideas to better meet user needs; a distribution system, that makes it easy for end users to get what they need when they need it; and after-sales service and support.

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[3] See ROGERS, E.M. (1997) *Diffusion of Innovations*

[4] Multimedia Evaluation tools [http://mime1.marc.gatech.edu/MM_Tools/evaluation.html]

[5] PEDACTICE Project [http://www.vordingbsem.dk/pedactice/index.htm]

can share their developments. According to his promoters, POOL will result in richer courses and a more economical course creation process.

The business models of eLearning

28. There is no single business model for the emerging market of eLearning. Moreover business models are continually and quickly evolving in the net economy. According to a report[11] published recently eLearning companies could be categorised following three main variables:

- **Markets served or target audience**: formal education, corporate training, general public
- **Revenue model**: Pay-per-use, contract, subscription, sponsorship, and advertising
- **Core offering**: Content (learningware, factual, referential), services (content distribution, implementation, eCommerce, portal) or technology (LMS, development tool, collaboration environment)

29. As organisations develop new business models to support eLearning, there is a need to take a new look at "rights management" for creators, authors and publishers. "Ownership" of content becomes more complex as open access to information expands. Traditional processes of copyright and "fair use" do not address on-line "learning objects" or the new ways content will be recombined and reused by teachers, trainers and learners.

30. Examples:

- Anglia Campus (http://www.angliacampus.co.uk/) Curriculum contents for school and home. Subscription.
- CISCO eLearning (http://www.cisco.com/warp/public/10/wwtraining/elearning/) Content for companies and vocational training. Contract.
- Defis Internet (http://www.defis-scolaires.com) Content and service for schools. Pay-per-use.
- Descartes (http://www.pntic.mec.es/Descartes/) Content for schools. Public funding.
- Kennisnet (http://www.kennisnet.nl) Content for schools. Public funding.
- Lightspan (http://www.lightspan.com) Content and services for both school and home use. Subscription.
- Rue des écoles (http://www.ruedesecoles.com) Content and services for both school and home use. Advertising and Sponsorship
- WebCT (http://www.webct.com) LMS Technology. Contract
- XTEC: Clic (http://www.xtec.es/recursos/clic/) Downloadable school content. Public funding and user support

Open Questions

- How to develop synergies between printed and web based content?
- What are the added values of web based content and web based learning methods? How can we evaluate or measure them?

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[11] RUTTENBUR, B.; SPICKLER, G.; LURIE,S. (2000) *ELearning. The engine of the knowledge economy.* Morgan Keegan

- What are the most promising business models in the area of web-based content development and delivery? What are the key issues that make these models successful?
- What are the existing difficulties affecting the growth of the eLearning market?
- What is the potential of the European/International market for eLearning products and services?
- What specific policy approaches are necessary to assure greater growth of eLearning market?
- What are the teaching and learning strategies needed to make the best use of the Internet?
- What curriculum adaptations are necessary to take full advantage of eLearning?
- What validation or assessment measures are required to assure that new web-based learning approaches lead to significant achievement?
- Do current curriculum requirements adequately reflect the skills students need in the Information Society?
- How will definitions of content quality conceived in a "narrow-band" world have to be adjusted for "broad-band" technologies?

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STIMULATING THE MAJORITY OF TEACHERS IN THE INSTRUCTIONAL USE OF ICT

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Abstract

In order to introduce a broad instructional use of ICT in primary, secondary and vocational education, it is necessary to stimulate the majority of teachers, who have not yet made much use of ICT in their classroom practice. This paper focuses on this subject.
ICT and teaching methods is one of the themes of 'professional development', an important chapter in the Dutch government memorandum Education on line, connections to the future_. In this memorandum the government states the ultimate goals, creates the conditions and gives the necessary information to achieve a further introduction of ICT in education.
Three ways to stimulate the majority of teachers in the use of ICT and teaching methods will be discussed in this paper.

Keywords

National policies, service teacher training, good practice, networking, support services, primary education, secondary education, vocational education.

Introduction

ICT is sparking an unparalled dynamic trend in our society. Its influence is felt more and more in schools, too. Society is forcing schools to respond properly to this echnical innovation. ICT provides both pupils and teachers with more opportunities than ever before to adapt learning and teaching to individual needs.

The broad and integrated application of ICT is a complex and dynamic process that varies greatly in pace, content and structure. For that reason the Dutch government has opted for a very broad approach to the further introduction of ICT in education. In this respect, schools and colleges have their own responsibilities and freedom of choice. The government memorandum 'Education on line, connection to the future' gives a specification of the structural funds that will be made available to the schools and colleges. The government states the ultimate goals, creates the conditions and gives the necessary information. The schools themselves implement an ICT policy according to their own plans.

Professional development

The governmental objective for professional development is formulated in Education on line: 'Over the next few years, teachers, head teachers, school boards and others working in or for a school will acquire the knowledge and skills they need in order to integrate ICT effectively into new school practice'.
The successful introduction of ICT in our teaching depends, among other things, on the availability of reliable educational software, but it is also important for both teachers and school management to increase their knowledge of ICT. In this context the challenge is not how to motivate the early adapters but how to reach the majority of workers in education.
Therefore, the government focuses on:

1. The Digital Drivers Licence (Dutch acronym: DRO, Digitaal Rijbewijs Onderwijs), a certificate meant for teachers in primary and secondary education to improve their ICT skills. The government has defined a set of objectives for these skills.

2. The qualification of ICT coordinator that every school has to appoint. The ICT coordinator is the person in the school (mostly a teacher) who stimulates the instructional use of ICT in the school.
3. The terms of reference for school management which specify the skills a school manager must have to be able to implement the managerial, educational, and financial changes, as well as the human resources necessary to introduce ICT in the school.
4. The relationship between ICT and teaching methods. How can teachers make complete use of the endless possibilities of ICT?

For the real renewal of education the last subject is the most interesting, so we will elaborate on this.

The relationship between ICT and teaching methods

As we said before, it is an important goal in our national policy to motivate and train the majority of teachers, who have made little use of ICT in their classroom practice until now. We are trying to achieve this goal in several ways.

The database of training arrangements

In education, ICT is used in very different ways and at very different levels. There is a need for training, however the supply is very diverse. Incidentally, our definition of training is broad: we do not only mean courses and lectures, but also peer consultancy and networks of teachers, because teachers learn most in practice, together with colleagues. It would be good, if we were able to match the good practices (situations in education in which ICT is used in a way) and adequate training. The matching of the two, we call training arrangements.
CPS, a national educational advisory center, has made a database design of such arrangements by government order. The database will be accessible by means of Kennisnet (Knowledge Net). Knowledge net is the national educational network, in which schools, colleges, libraries and museums are linked together.

The visitor of the database might be a provider one time and a user another time. Several groups of users and providers will be interested in the database:

1. Teachers, because ICT practices are matched with adequate training;
2. School managers and ICT coordinators, because the database might be an instrument for them to stimulate the instructional use of ICT in education;
3. Networks of teachers who can exchange and share information;
4. Teacher trainers, because the database is a means to offer exact fitting courses and training;
5. Publishers, because the database might be an marketing instrument for them and a means to publish new developed materials.

It is possible that also pupils will become providers of good practices: there are already examples of pupils in primary and secondary schools who achieve these practices.

The users will probably come from all the groups. In this database users need to have the possibility to search easily in this database for good practices and corresponding training in their own sector of education: primary education, secondary education, vocational education and pre-service teacher training.
Every user will be asked several questions that lead him to a relevant selection of training arrangements.

Let us take the example of a teacher looking for relevant good practices. She will be asked to select her sector of education (if she wishes to). After that she will be invited to make a diagnosis of her level of technical and instructional use of ICT. From a view of professional development it is important that in the end she will not only select the good practices that she can manage, but also the relevant practices that she cannot manage yet. The university of Twente (Enschede, The Netherlands) is developing an instructional instrument for the users of this database. Than she selects further, for example on subject, terms of examination, distance learning, instructional working method.
After the selection of good practices, information will be given about the goal of the good practice, the necessary technical and teaching skills for teachers (for example managing cooperative learning), the technical and organizational terms on the level of the school and, in the end, the corresponding

training. In due time, evaluations of users of the practice might be added, too.

The context of this paper makes it onsuitable to explain how we have arranged the different good practices and sorts of training to achieve an adequate matching. The database design of training arrangements will be put on line on Knowledge Net in May 2000. Visitors of Knowledge Net will be invited to respond and to suggest improvements. Therefore we speak of a dynamic publication.

Stimulation of teacher networks

Another way to stimulate a broad instructional use of ICT in education is to give financial governmental support to teacher networks in order to achieve a mutual professional development. In an earlier support program in the Netherlands, the PIT Project_ (Projects on Information Technology), this approach turned out to be a very effective alternative compared to more traditional in-service training. PIT reached 50 % of the schools; the main objective was to stimulate and to increase effective integration of ICT in eight disciplines in lower secondary education. The present-day support is meant for all disciplines in primary, secondary and vocational education. To begin with, 200 networks can obtain financial support. The networks will be monitored in their progress and obliged to start an electronic group within Kennisnet (Knowledge Net).

Developing new training arrangements

The government gives the opportunity to a limited number (20) of teacher training institutions, schools with an own division for educational development and educational advisory centers to develop new ICT training schemes in cooperation with schools.
We give two examples of such projects:

- An organization called Codename Future is developing a model in which teachers of secondary schools will be supported by their students to implement ICT in their classroom practice.
- CPS, the educational advisory center that made the database design of training arrangements, is developing a virtual workspace for teachers in primary education.

Results in 2002

With the described activities the Dutch government tries to achieve the following results in ICT and teaching methods at the end of 2002:

1. A clear vision on the instructional use of ICT in education, developed and made concrete in a framework; ICT skills and competencies will be described for the use of ICT in education; a range of innovative learning situations will be generated in which ICT plays an essential role.
2. Some terms of examination demand the use of ICT. Teachers are to be able to support the achievement of these terms by their pupils.
3. The majority of the teachers will have made a real start to integrate ICT in an effective and substantial way.
4. Most schools and other institutions of education will have formulated their goals with respect to ICT and will have them described in a school policy document.
5. ICT training and support of teachers will be a regular part of the plans of in-service professional development of the schools and other institutions of education.
6. ICT skills and competencies will be a part of the terms of examination of pre-service teacher training institutions.
7. ICT skills and competencies are to be a part of the description of the profile of teacher profession and therefore a part of the competencies of the register of teachers that will be developed.
8. A mature supply market will be created for a variety of arrangements of ICT, training and support.

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BIOGRAPHY

Ruud Brunemann is a historian by origin. From 1985 on he worked in the field of new technologies and education. He was a member of the management team that managed several projects on implementing new technologies in secondary education in the Netherlands. In 1999 he became a member of the supporting team that initiates and runs governmental projects on professional development. He is also project coordinator/webmaster of a large database-driven web site for lower vocational education.(www.vmbo-loket.nl).
Pieter Hogenbirk has been a teacher in secondary education. He was involved in the development of innovative educational materials at the universities of Utrecht and Amsterdam. He has been in charge of managing projects on the development of the curriculum, courseware and in-service training, and the implementation of materials and training for Informatics and Computer Aided Learning. From 1998 he has been the ICT project manager on secondary education of the Dutch Ministry of Education, Culture and Science. From 1999 he is also in charge as manager professional development in Dutch education.
Hans Puper has been a teacher in secondary education and adult education. He was involved in the development of innovative educational materials at the university of Utrecht. From 1999 he has been a trainer and consultant at an educational advisory center. In 1999 he became a member of the supporting team that initiates and runs governmental projects on professional development. .

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STANDARDISATIONISSUES

by Frans Van Assche

1 ISSUES

When dealing with standards in the context of national educational networks, two major **issues** should be considered:

- When, where and which standards should be used in the context of the network infrastructure and the contents.
- Which standards initiatives should national networks or the EUN get involved in

In dealing with these issues it is important to understand the educational context, the nature of standards, and why they are used. Next, this paper gives an overview of educational areas for which standards are (being) developed and finally we look at the second major issue: the desired level of involvement.

2 BACKGROUND

While ICT in education has been explored in various projects since the mid nineties[1], the concept of a network of networks was elaborated in 1997, establishing the European Schoolnet (EUN). Full recognition of the importance of ICT in education for the future of European prosperity came when the European Commission in December 1999 launched the eEurope initiative with the objective to bring Europe on-line. Heads of State and Government committed themselves at the extraordinary Lisbon Summit of March 2000. One of the important themes of the eEurope initiative is to lead "European youth into the digital age" with organised actions including the availability of educational resources on the Internet, e-learning platforms, access to multilingual multimedia learning materials, etc.

It goes without saying that these actions can only succeed at a European level in a climate of co-operation between school networks. In addition School Networks are not so powerful in resources as other sectors - like Universities and Industry - and can benefit substantially from such a co-

[1] See for instance the Web for Schools project, TRENDS, and ARIADNE.

operation at different levels since expensive infrastructure, tools, and material is involved. Figure 1 gives a schematic overview of the education delivery and means provision in the educational sector.

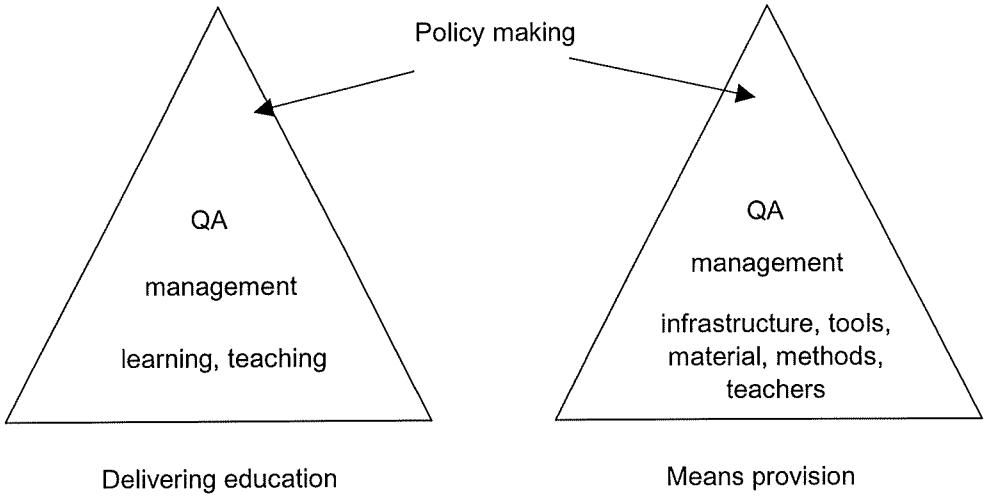

Figure 1: Delivering education and means provision

Delivering educational includes activities such as:

- learning
- teaching
- resource management
- quality assurance
- policy making

Providing education means includes

- infrastructure provision
- ICT tools provision
- educational ICT material provision
- ICT adapted training methods
- teacher training
- management and policy making of the above

In section 4 we give an overview of specific standardisation activities in the above fields but first we explore how standards lead to improvements in efficiency and effectiveness and why the lack of standards in the educational sector is currently a major inhibitor in the deployment of ICT in education.

3 IMPROVEMENTS THROUGH STANDARDS

Standards, specifications, and agreements can play a major role in improving the operation of the whole educational system as they are instrumental in achieving higher levels of interoperability, ease of operation, reuse, and quality.

Interoperability covers more than one issue. Firstly, it deals with the issue of integration of components. If we want to integrate two components - for instance a nut and a bolt - the two must fit together. Similarly, if we want to integrate a web-bases video player into our own curriculum material it must fit the hardware and software environment we are currently using.

Secondly, interoperability deals with sharing and collaboration on the technical level as well as the semantic level. For instance a web-browser and an Internet server will collaborate in providing useful information to the user. They collaborate on various levels using various protocols and standards (from physical to TCP/IP, XML, and HTML) within a client-server architecture. Another example on the semantic level is how we share information. If one server is to 'understand' information provided by another they must share the same semantic model.

A special aspect of sharing and collaboration are mappings and vocabularies. People in different countries and regions use different structures, concepts, and locale (e.g. language, alphabet, currency and date formats). Mappings define how one element can be translated to another element. For instance a multilingual thesaurus will deal with the mapping in different languages of keywords. **Localisation** is one of the major aspects for interoperability to work.

Sharing and collaboration provides economies of scale not only by exchanging information but also when networks would share the software they develop. Each network is bound to provide databases on projects, resources, schools, etc together with all the facilities to add, delete, edit and search these databases. Obviously, they can be provided at a fraction of the cost if networks are deploying the same system, which of course must be customisable to the actual situation.

Ease of operation (including ease of learning and ease of use) in a standardisation context has to do with the fact that if a person can relate an activity to something he has been doing before it goes easier. For instance it will be much easier if a person can search the different school networks using the same user interface and the same structure of information than when he would need to learn new procedures for each network.

A special case of ease of operation has to do with accessibility of ICT. Standard efforts should be undertaken to meet the needs of persons with a disability.

Reuse involves a number of interoperability issues with the specific purpose of putting existing components to use again. Reuse involves four activities: finding, evaluation, adaptation and integration.

Finding the candidate component for reuse. Finding is the result of search. Measures of search are *precision* (the ratio of number of correct results found over the number of results found) and *recall* (the ratio of number of correct results found over number of correct results in the population). For reuse it is especially precision which is of importance in an Internet context. Improving precision requires that data be structured differently highlighting more semantics. Hence the emergence of standard and specification efforts in this area such as the use of metadata in order to improve the results of search engines, crawlers and harvesters.

Evaluation. The second task in reusing a component is evaluation of the fact that the component is what we need, and whether we can adapt and integrate it. Reusable components should provide the necessary information to this purpose.

Adaptation to the own environment and situation. Adaptation may be in terms of localisation, with respect to the local technical infrastructure, or for the purpose the user has in mind.

Integration into a whole. A reusable component will eventually be part of a bigger whole, be it a software system, an online workshop or a classroom activity.

The task of evaluation, adaptation and integration is facilitated by the provision of guidelines and one or more examples of adaptation, integration, and putting the component to use.

Standards can be instrumental to achieve higher levels of **quality** by providing yardsticks, procedures and guidelines. However, within the educational community, care should be taken were to apply them. There is for instance no general agreement about the desirability of standards concerning values or pedagogical approach. On the other hand it would be of great help if quality standards or specifications could be adopted on for instance content. Also, there is no reason why quality standards such as ISO-900x could not apply to a number of management aspects in the educational system.

4 OVERVIEW OF STANDARDISATION WORK IN THE FIELD OF EDUCATION

Different standards bodies are active in the field of education. Below follows a list of current learning technology areas were standards work is of interest or is already being done[2].

General

A Reference Model/Architecture for component-based Computer-Aided Instruction (CAI) systems.
Work in this area seeks to do for the CAI system industry what the Object Management Group's Common Object Request Broker Architecture (CORBA) is doing for the distributed object computing industry. It should establish

[2] See the IEEE LTSC, CEN-ISSS, SIF, and others.

guidelines (required and recommended) for implementation of CAI system components, and define system services that are to be available to all components.

Infrastructure
In order to enable applications to exchange their defined data objects and events, some mechanism must be defined to provide the transport functionality. This can be done through messages that are used by applications to register themselves, provide for data objects, subscribe to events, request data objects, respond to requests, and to provide administration functions. Work in this area intends to design the messages and protocols that are used to transmit data objects and events.

A Glossary.
A list of terms to be used in standards and specification definitions.

Learner related

The Learner Model
Work in this area seeks to specify the syntax and semantics of a 'Learner Model,' which characterises a learner (student or knowledge worker) and his or her knowledge/abilities. This includes elements such as knowledge (from coarse to fine-grained), skills, abilities, learning styles, records, and personal information. A standard would allow these elements to be represented in multiple levels of granularity, from a coarse overview, down to the smallest conceivable sub-element. A standard would allow different views of the Learner Model (learner, teacher, parent, school, employer, etc.) and should substantially address issues of privacy and security.

Student identification
Work in this area seeks to specify the syntax, semantics, encoding, registration, resolution, and authentication of unique student identifiers. A student identifier is a name, e.g., a login name, that is associated with a student. These identifiers should be simple enough for students (even as young as grade school) to memorize, and for non-technical organizations (such as schools) to issue. No other standard system of unique identifiers meets these requirements today.

Quality System for Technology-Based Life-Long Learning
Work in this area focuses on the learner-centered processes of life-long learning. It seeks to specify the required elements of a user-centered quality system (e.g. goal-setting, planning, execution, tracking, documentation, continuous process improvement, etc.) for life-long learning. It aims also to recommend various levels of technological capabilities (e.g. computer access, Internet access, learner-centered records, etc.) and data interoperability, to be accomplished in part by building profiles of other standards. It would result into a typical quality standard.

Competency Definitions
The purpose of work in this area is to define a universally acceptable Competency Definition model to allow the creation, exchange and reuse of Competency Definition in applications such as Learning Management Systems, Competency or Skill Gap Analysis, Learner and other Competency profiles, etc.

Content related

CBT Interchange Language
Currently, much computer-based training (CBT) courseware produced is not easily portable from one authoring system to another. The primary reason for this is that the content (Audio, Graphics, Video, Composition, and Logic) are often in a format proprietary to the CBT authoring tool(s) used to create the CBT. Work in this area seeks to improve interchangeability of CBT with respect of authoring tools, and delivery systems.

Course Sequencing
Work in this area seeks to provide a specification language and environment for managing sessions in learning technology systems, e.g., computer-aided instruction, intelligent learning environments, and intelligent tutoring systems.

Content packaging
Work in this area aims to describe the packaging of learning content. Learning content, typically, is a collection of components that are copied, transmitted, purchased, executed, and used as a single unit. Units may be combined to make larger units. A standard would describe the format, coding, encoding, environment, attributes, and interactions of this content.

Data and metadata

Ontology
Work in this area seeks to specify the semantics of a general-purpose upper level ontology. An ontology is a set of terms and formal definitions. This would be limited to the upper level, which provides definition for general-purpose terms and provides a structure for compliant lower level domain ontologies. It is estimated to contain between 1000 and 2500 terms plus roughly ten definitional statements for each term. It is intended to provide the foundation for ontologies of much larger size and more specific scope.

Collaborative information provision
Teachers, learners, and parents use ICT to search for information about projects, initiatives, calls, (self) assessment, multimedia content, instructional content, learning objectives, instructional software and software tools, persons, organizations, or events referenced during technology supported learning. Work in this area focuses on the minimal set of attributes needed to allow these education related objects to be managed, located, and evaluated.

Localisation
Work in this area deals with localisation issues for learning technologies. This includes facilitating human language translations (for instance of learning documents or learning object metadata vocabularies), but also more technical issues (for instance character sets and encodings), as well as more general cultural issues (for instance appropriate icon representations or user interface metaphors.

Exchange bindings
Work in this area seeks to define a semantic framework so that semantic elements defined in one conforming standard can be directly integrated into another conforming standard. Possible examples of semantic elements are data elements, abstract data types, and organizational categories. The standard would also define related, common conventions for syntax and protocol bindings needed for information exchange. An example of such a binding would be XML.

Data Interchange Protocols
A good number of protocols exist for exchanging data, such as FTP, HTTP, CORBA. However, these protocols don't perform well (e.g., HTTP is not good for fine grain data), they don't have enough semantics (e.g., FTP cannot get/put address attributes, properties, or metadata), or they are difficult to interface to (e.g., CORBA cannot be conveniently accessed in Perl or Tcl). A lightweight protocol that was easily implementable and addressed the needs of learning technology would have wide acceptance and integration within many applications because protocols are one of the key elements to portable, interoperable distributed (distance) learning systems.

Instruction Management Systems and Applications

Computer Managed Instruction
Work in this area is concerned with describing what is in a course (including objectives), organizing and sequencing individual lessons in a single course, launching or starting assignable units with course management software, reporting student performance information, and relating performance to objectives.

Tool/Agent Communication
Work in this area is concerned with educational systems consisting of one (or more) user tools and one (or more) instructional agents. User tools are standard software applications that the student might work with in an educational context (such as spreadsheets, text editors or graphing tools). Instructional agents are software modules able to provide guidance to students using such tools in pursuit of some educational goal.

The envisaged standard should address communication between multiple instructional agents which may exist in a single learning environment.

School administration

Administrative
Work in this area is concerned with exchanging information about a number of administrative and management objects in sub-areas such as:

- Food Services. The information dealt with includes the amount of remaining breakfast/lunch credits, cash balance, meal status (free/reduced) etc of student meals.
- Gradebook. The Gradebook deals with student grades, comments, attendance, and scores.
- Human Resources/Financials. This sub-area is concerned with purchasing, billing, payment, vendor information, employee information, time worked, etc.
- Library Automation. This sub-area is concerned with student/teacher lending status information such as the titles currently checked out, the fines or refunds assessed, titles that are ready for the student or teacher to pick up.
- Student Information. This sub-area is concerned with information about the student such as personal data, whom to contact, siblings, picture, enrolment, discipline, assessment, daily attendance, etc
- Transportation. This sub-area is concerned with information about the transportation to and from the school. The most important of these may be the geographic component of the transportation system, which provides the ability to locate data and events in space permitting a wide range of data analysis.

5 OVERVIEW OF ICT SERVICES TO THE EDUCATIONAL COMMUNITY AND STANDARDS USE

The needs of the networks are to a large extend based on the needs of their users: primarily teachers, students, parents, school management, and policymaking. Services that networks are providing or are likely to provide are:

Information provision in general (for instance in a news letter) or making resources (often stored in virtual libraries) available through specific delivery mechanisms such as streaming audio, video, etc. In addition there is the need to provide information about specific items such as resources (including material, tools, practice, training and help), announcements (calls and events), forums, initiatives, industry offers, organisations (industry, ministries, schools), persons (teachers, tutors, contacts), projects, evaluations (including self assessment), etc.

Standards, specifications or agreements in this area are of interest as networks wish to exchange information, or implement collaborative information provision, or share development costs. For instance there is a lively interest among teachers to find information about classroom projects, examples of good practice, funded projects and partnerships outside their

own country. In order to provide such a cross border service, structured internetworking is a requirement and standards, specifications or at least agreements must be adopted at various levels, from exchange protocols to a number of specific vocabularies.

Interactive services such as (multilingual) chat, forums, and helpdesks. Examples of chats and forums would be about partner finding forum, curriculum material, authoring, technical issues, pedagogy, teacher training, and policy making. Examples of helpdesk would be about authoring, pedagogy, or technical. Combined interactive services integrate some of the above services together with information into for instance on-line workshops, collaborative learning, or collaborative authoring.

Implementing such collaborative services on an international scale requires some standards, specifications or agreements about the collaboration, and/or a supra national centralised implementation.

Management and Schools Administration. Every network has a large amount of school administration. Standards, specifications, and agreements will help in exchanging information, aggregation of information for study purposes, and cost reduction when developing the supporting systems.

6 DISCUSSION OF STANDARDS ACTIVITIES FOR WHICH THE NETWORKS ARE STAKEHOLDER

Clearly, no single network is a primary player on the international standards scene. However as a community (or network of networks) we have a role to play. Some standards we should simply apply others we should get involved in the definition of it as we are a main stakeholder.

Primary stakeholder

Networks are primary stakeholder on certain aspects of *collaborative information provision*; in particular educational information provision (see section 5) is of importance. While some standards already exist (e.g. vCard for business card information and vCalendar for scheduling), it is the networks that should provide the knowledge model for the structured educational contents as well as some multilingual vocabularies and a multilingual thesaurus.

Currently this is covered partially by the metadata activities of the EUN multimedia project and the EUN European Treasury Browser project. Important standardisation activities include

- The Dublin Core initiative
- the Learning Object Metadata Model of the IEEE Learning Technology Standardization Committee
- the Question & Test Specification of the IMS initiative
- the EML (Educational Markup Language) basically a currently limited knowledge model with an XML binding.

The two mentioned EUN projects (MM1010 and ETB) deal also with the multilingual thesaurus and some classifications such as user level for the use of resources.

The next step is to provide, based on experiences from the networks, a more complete knowledge model that will allow users to find in a transparent way information provided by different networks across Europe. In addition work should continue on improved classifications for resources and other knowledge elements. The EUN .Safe project will deal with rating standards for filtering and Internet safety.

In addition to the information provision, *school administration and management* is an important concern for the schools sector. In this area a prominent initiative is the Schools Interoperability Framework led by Microsoft and the Enterprise Specification work of the IMS that is aimed at administrative applications and services that need to share data about learners, courses, performance, etc., across platforms, operating systems, user interfaces, and so on. Both efforts are basically North-American initiatives.

The next step is to join these efforts such that also European schools can benefit of it. One initiative to obtain this is the OASIS project in which the EUN participates.

Secondary stakeholder or user.

In a number of areas, networks are currently secondary stakeholders or simply users. For a number of areas listed in section four it is especially the publishers and content providers that take the lead, and it is in their own interest to involve the educational sector were necessary.

For many (emerging) standards, networks are simply users. This is for instance the case for most of the technical standards, specifications, and agreements. Also, a number of vocabularies and coding schemes are well established. For instance international coding schemes exist for countries, languages, currencies, etc.

What is important for networks is that they are aware of these standards together with some guidelines or recommendations of their use. To this end the EUN should set-up an observatory task and awareness activities as part of its Insight initiative.

7 CONCLUSION

Standards are part of and influence ICT use in education very much. They can provide substantial benefits in terms of cost reduction, quality and accessibility. Standard efforts in the field of education exist in areas including: learner related, content related, data and metadata, instruction management systems and applications, school administration. For quite a number of standards, the networks are simply users or secondary stakeholders. Networks are primary stakeholders in a few areas such as collaborative information and service provision and school administration.

APPENDIX: OVERVIEW OF SOME RELEVANT STANDARDS AND STANDARD ACTIVITIES

- Dublin Core: The Dublin Core is a metadata element set intended to facilitate discovery of electronic resources. <http://purl.org/dc/>.
  The EUN European Treasury Browser project adapts and extends the Dublin Core for the field of education. <http://www.eun.org/>.
- Learning Object Metadata. This proposed IEEE standard defines a structure for interoperable descriptions of learning objects. <http://ltsc.ieee.org/doc/wg12/LOM_WD4.htm>
  A project named EduML (Educational Markup Language), using these metadata, is in progress at Supélec; the main goal of EduML is to apply these new technologies to the publication of teaching programs (printed and on-line, on the Web).
  <http://www.nllinux.co.uk/eduml/intro.html>
- The Schools Interoperability Framework (SIF) is an industry initiative to develop an open specification for ensuring that K-12 instructional and administrative software applications work together more effectively. <http://www.sifinfo.org/>
- ISO 639: This is an international standard for the representation of languages. Version 1 uses two-letter language codes, e.g. 'en' for English, 'fr' for French, 'nl' for Dutch, etc. These language codes are a basis for the IETF registry of language tags, as specified in RFC 1766: Tags for the identification of languages.
  <http://lcweb.loc.gov/standards/iso639-2/>
- ISO 3166: This is an international standard for the representation of country names, e.g. 'BE' for Belgium, 'CA' for Canada, 'FR' for France, 'GB' for United Kingdom, 'US' for United States, etc.
  <http://www.din.de/gremien/nas/nabd/iso3166ma/codlstp1.html>
- ISO 8601: This is an international Standard that specifies numeric representations of date and time. The basic notation is YYYY-MM-DD where YYYY is the year in the usual Gregorian calendar, MM is the month of the year between 01 (January) and 12 (December), and DD is the day of the month between 01 and 31.
  <http://www.cl.cam.ac.uk/~mgk25/iso-time.html>
- ISO 10646-1: This is an international Standard that specifies a character set that relies on 32 bits, includes approximately 4 billion characters, of which the first 65536 are Unicode, the first 256 are ISO 8859-1, and the first 128 are ASCII.
  <http://wwwold.dkuug.dk/JTC1/SC2/WG2/>
- RFC 1766: This Internet standard defines a language tag, referring to ISO 639 for the language, and to ISO 3166 for the country code. http://ds.internic.net/rfc/rfc1766.txt
- vCard: <http://www.imc.org/pdi/>: This standard defines how contact details for people and organisations can be represented.
- vCalendar: <http://www.imc.org/pdi/>: This standard defines a transport and platform-independent format for exchanging calendaring and scheduling information in an easy, automated, and consistent manner.

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CONTENT: PRESENTATION & WORKSHOP (Jordi Vivancos and Robert van Oosten)

Discussion paper by Jordi Vivancos

Issue:

How to develop and produce educational content for schools on the web site?

Introduction

1. The Information Society is characterised by structural changes that have profound implications in the development of educational policies. These changes include industrial and occupational change, globalisation and the challenges of the information technology revolution. Knowledge, skills, and training have become one of the most valuable resources for countries and organisations.

2. Online educational content development is one of the main concerns of the eLearning Action Plan presented by the European Commission to the Education Council last November in the framework of the European eLearning initiative[1]. On the same lines, the Information Society Technology Programme (IST)[2] has defined a key action "multimedia content and tools " whose main priority for 2001 will be the investigation of paradigm shifts that are likely to affect multimedia content systems and services in the future.

3. Digital technology is bringing together three previously distinct industries - broadcasting, computing and telecommunications. But whilst the rate of technological or media convergence is breathtaking, so far the rate of consumer take up for new converged services is relatively slow. Content packagers such as publishers and TV channel owners have long had an important role in education, producing books, films and other learning content that has been the primary means of conveying knowledge from experts to students. Today, the traditional content industry role is changing with the rise of digital technology and the Internet.

4. This paper does not intend to cover all the issues that influence Content production, but raise general questions and develop some aspects of the Pedagogical and Production/industrial factors. Standard Issues will be considered in another paper.

Towards a definition of Web Educational Content

5. To clarify the issues arising in web content development for schools, it is important to state what we are talking about. Let's start with a first attempt to define Web Educational Content (WEC):

[1] eLearning Initiative (http://europa.eu.int/comm/education/elearning/index.html)

[2] IST Key Action III - Multimedia Content and Tools (http://www.cordis.lu/ist/bwp_en4.htm)

> Web based high-quality, reliable, and relevant digital information, resources and services, adapted to learning needs and suitable for educational environments.

6. According to this definition we could identify several WEC typologies:
   1. **Referential** (Encyclopaedia, Dictionary, Virtual Exhibition, Documentary film, Manual,...)
   2. **Factual** (Databases, News,...)
   3. **Instructional** (Course, Lesson, Tutorial, Simulation, "Learningware", Project, Activity, Test,...)
   4. **Ludo-educational** or **"Edutainment"** (Game, Contest, Quiz...)
   5. **Instrumental** (authoring system, learning management system (LMS), organisational and collaborative tool)
   6. **Help & Support** (Forums, Self-Diagnostic, Ask the expert, on-line tutor,...)

7. These six categories could be grouped under three broader ones:
   - **Information products** (Referential, Factual and Instructional)
   - **Support and communication services** for online support of the learners
   - **Tools** (Technologies to develop elearning portals, virtual campuses, school intranets, content repositories and authoring systems)

The interactivity associated to the web is expanding the concept of Content from products to services.

Issues in WEC production

8. Educational Content production is affected by many factors:
   - **Administrative/political** (National/European Policies, Regulatory framework, Curriculum diversity, Decision making decentralisation);
   - **Pedagogical** (Curriculum Relevance, Work Flow, Validation);
   - **Socio-Cultural** (Access Equity, Innovation pace, Multilinguality, Multiculturality);
   - **Technical** (Development tools, Standardisation, Reusability, Usability, Accessibility);
   - **Infrastructural** (Platform, Interoperability, Bandwidth usage);
   - **Legal** (Copyright, Content regulation, Privacy and data protection);
   - **Production/Industrial** (Media Convergence, Value Chain, Market needs&barriers, Customisation, Distribution strategies, Economies of scale, Cost effectiveness);
   - **Economical/Financial** (eCommerce, Pro-competitive regulation, Funding sources).

Factors affecting European WEC production

9. European Web educational Content has not reached a significant presence yet.

The main factors for lack of WEC market development could be summarised as:

- **Market fragmentation.** The European educational content market is very fragmented: national educational requirements, language issues, subjects, and diversity of technical platforms (PC and bandwidth).
- **Low differentiation** between free and fee content implies user's perception that content on the Internet is and should be free. Development and distribution costs are neglected.

- **Copyright concerns** by content creators: Copy and dissemination is very easy (The Napster phenomenon). Most of the developers of high cost content are not on the web.
- **Technical instability** due to a lack of consolidated standards and the pace of ICT changes (technological lifecycle is much shorter than pedagogical).
- **Low profits** or low Return on Investment (ROI). Risks are higher and content products have an unpredictable lifecycle.
- **Slow development process** due to the fact that the multimedia industry has no mature tools and standards compared with the traditional content industries.
- **Lack of curriculum exigency** for using multimedia and web based content in education.

Pedagogical Issues: WEC Evaluation

10. While much has been written about pedagogic issues related to the use of interactive media in teaching, most schools and teachers are still not much beyond the *early adopter* [3]stage. Curriculum planners and Teachers are coping with how to integrate the enormous resources on the web into the curriculum, and transform this information into knowledge. To analyse and understand how to generalise the most appropriate Internet tools, services and content for learning purposes, there is a growing need for applied research.

11. Evaluation research means a systematic use of scientific methods and techniques to prove the usefulness of a result. Evaluation can be carried out in different ways: Summative, Formative and State of the art evaluation:

- S*ummative evaluation* is a global, summarising evaluation after finishing an intervention and testing the increase of knowledge.
- *Formative evaluation* takes place during the learning process. It gives information of the learner's step by step knowledge construction. This process includes a recursive system of feedback.
- *State of the art evaluation* describes a form of evaluation that considers all relevant and accepted research information/literature about the subject to be evaluated.

12. Within the framework of educational multimedia a number of tools and methods are available[4] to evaluate and analyse: content relevance, didactical design and ergonomics (analysis of quality).

13. One example of European-based Multimedia Content evaluation is Project Pedactice[5] that has developed a co-operative methodology for validating multimedia content triangulating the views of the main actors involved: teachers, researchers and publishers.

The Value chain of Web Content development

14. *Value chain* is a term that defines the circuit a product takes from its genesis until it reaches the end user. At each stage, value is added to the product. The value chain might include editors, who help authors share and refine their ideas to better meet user needs; a distribution system, that makes it easy for end users to get what they need when they need it; and after-sales service and support.

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[3] See ROGERS, E.M. (1997) *Diffusion of Innovations*

[4] Multimedia Evaluation tools [http://mime1.marc.gatech.edu/MM_Tools/evaluation.html]

[5] PEDACTICE Project [http://www.vordingbsem.dk/pedactice/index.htm]

can share their developments. According to his promoters, POOL will result in richer courses and a more economical course creation process.

The business models of eLearning

28. There is no single business model for the emerging market of eLearning. Moreover business models are continually and quickly evolving in the net economy. According to a report[11] published recently eLearning companies could be categorised following three main variables:

- **Markets served or target audience**: formal education, corporate training, general public
- **Revenue model**: Pay-per-use, contract, subscription, sponsorship, and advertising
- **Core offering**: Content (learningware, factual, referential), services (content distribution, implementation, eCommerce, portal) or technology (LMS, development tool, collaboration environment)

29. As organisations develop new business models to support eLearning, there is a need to take a new look at "rights management" for creators, authors and publishers. "Ownership" of content becomes more complex as open access to information expands. Traditional processes of copyright and "fair use" do not address on-line "learning objects" or the new ways content will be recombined and reused by teachers, trainers and learners.

30. Examples:

- Anglia Campus (http://www.angliacampus.co.uk/) Curriculum contents for school and home. Subscription.
- CISCO eLearning (http://www.cisco.com/warp/public/10/wwtraining/elearning/) Content for companies and vocational training. Contract.
- Defis Internet (http://www.defis-scolaires.com) Content and service for schools. Pay-per-use.
- Descartes (http://www.pntic.mec.es/Descartes/) Content for schools. Public funding.
- Kennisnet (http://www.kennisnet.nl) Content for schools. Public funding.
- Lightspan (http://www.lightspan.com) Content and services for both school and home use. Subscription.
- Rue des écoles (http://www.ruedesecoles.com) Content and services for both school and home use. Advertising and Sponsorship
- WebCT (http://www.webct.com) LMS Technology. Contract
- XTEC: Clic (http://www.xtec.es/recursos/clic/) Downloadable school content. Public funding and user support

Open Questions

- How to develop synergies between printed and web based content?
- What are the added values of web based content and web based learning methods? How can we evaluate or measure them?

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[11] RUTTENBUR, B.; SPICKLER, G.; LURIE,S. (2000) *ELearning. The engine of the knowledge economy.* Morgan Keegan

- What are the most promising business models in the area of web-based content development and delivery? What are the key issues that make these models successful?
- What are the existing difficulties affecting the growth of the eLearning market?
- What is the potential of the European/International market for eLearning products and services?
- What specific policy approaches are necessary to assure greater growth of eLearning market?
- What are the teaching and learning strategies needed to make the best use of the Internet?
- What curriculum adaptations are necessary to take full advantage of eLearning?
- What validation or assessment measures are required to assure that new web-based learning approaches lead to significant achievement?
- Do current curriculum requirements adequately reflect the skills students need in the Information Society?
- How will definitions of content quality conceived in a "narrow-band" world have to be adjusted for "broad-band" technologies?

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STIMULATING THE MAJORITY OF TEACHERS IN THE INSTRUCTIONAL USE OF ICT

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Abstract

In order to introduce a broad instructional use of ICT in primary, secondary and vocational education, it is necessary to stimulate the majority of teachers, who have not yet made much use of ICT in their classroom practice. This paper focuses on this subject.
ICT and teaching methods is one of the themes of 'professional development', an important chapter in the Dutch government memorandum Education on line, connections to the future_. In this memorandum the government states the ultimate goals, creates the conditions and gives the necessary information to achieve a further introduction of ICT in education.
Three ways to stimulate the majority of teachers in the use of ICT and teaching methods will be discussed in this paper.

Keywords

National policies, service teacher training, good practice, networking, support services, primary education, secondary education, vocational education.

Introduction

ICT is sparking an unparalled dynamic trend in our society. Its influence is felt more and more in schools, too. Society is forcing schools to respond properly to this echnical innovation. ICT provides both pupils and teachers with more opportunities than ever before to adapt learning and teaching to individual needs.

The broad and integrated application of ICT is a complex and dynamic process that varies greatly in pace, content and structure. For that reason the Dutch government has opted for a very broad approach to the further introduction of ICT in education. In this respect, schools and colleges have their own responsibilities and freedom of choice. The government memorandum 'Education on line, connection to the future' gives a specification of the structural funds that will be made available to the schools and colleges. The government states the ultimate goals, creates the conditions and gives the necessary information. The schools themselves implement an ICT policy according to their own plans.

Professional development

The governmental objective for professional development is formulated in Education on line: 'Over the next few years, teachers, head teachers, school boards and others working in or for a school will acquire the knowledge and skills they need in order to integrate ICT effectively into new school practice'.
The successful introduction of ICT in our teaching depends, among other things, on the availability of reliable educational software, but it is also important for both teachers and school management to increase their knowledge of ICT. In this context the challenge is not how to motivate the early adapters but how to reach the majority of workers in education.
Therefore, the government focuses on:

1. The Digital Drivers Licence (Dutch acronym: DRO, Digitaal Rijbewijs Onderwijs), a certificate meant for teachers in primary and secondary education to improve their ICT skills. The government has defined a set of objectives for these skills.

2. The qualification of ICT coordinator that every school has to appoint. The ICT coordinator is the person in the school (mostly a teacher) who stimulates the instructional use of ICT in the school.
3. The terms of reference for school management which specify the skills a school manager must have to be able to implement the managerial, educational, and financial changes, as well as the human resources necessary to introduce ICT in the school.
4. The relationship between ICT and teaching methods. How can teachers make complete use of the endless possibilities of ICT?

For the real renewal of education the last subject is the most interesting, so we will elaborate on this.

The relationship between ICT and teaching methods

As we said before, it is an important goal in our national policy to motivate and train the majority of teachers, who have made little use of ICT in their classroom practice until now. We are trying to achieve this goal in several ways.

The database of training arrangements

In education, ICT is used in very different ways and at very different levels. There is a need for training, however the supply is very diverse. Incidentally, our definition of training is broad: we do not only mean courses and lectures, but also peer consultancy and networks of teachers, because teachers learn most in practice, together with colleagues. It would be good, if we were able to match the good practices (situations in education in which ICT is used in a way) and adequate training. The matching of the two, we call training arrangements.
CPS, a national educational advisory center, has made a database design of such arrangements by government order. The database will be accessible by means of Kennisnet (Knowledge Net). Knowledge net is the national educational network, in which schools, colleges, libraries and museums are linked together.

The visitor of the database might be a provider one time and a user another time. Several groups of users and providers will be interested in the database:

1. Teachers, because ICT practices are matched with adequate training;
2. School managers and ICT coordinators, because the database might be an instrument for them to stimulate the instructional use of ICT in education;
3. Networks of teachers who can exchange and share information;
4. Teacher trainers, because the database is a means to offer exact fitting courses and training;
5. Publishers, because the database might be an marketing instrument for them and a means to publish new developed materials.

It is possible that also pupils will become providers of good practices: there are already examples of pupils in primary and secondary schools who achieve these practices.

The users will probably come from all the groups. In this database users need to have the possibility to search easily in this database for good practices and corresponding training in their own sector of education: primary education, secondary education, vocational education and pre-service teacher training.
Every user will be asked several questions that lead him to a relevant selection of training arrangements.

Let us take the example of a teacher looking for relevant good practices. She will be asked to select her sector of education (if she wishes to). After that she will be invited to make a diagnosis of her level of technical and instructional use of ICT. From a view of professional development it is important that in the end she will not only select the good practices that she can manage, but also the relevant practices that she cannot manage yet. The university of Twente (Enschede, The Netherlands) is developing an instructional instrument for the users of this database. Than she selects further, for example on subject, terms of examination, distance learning, instructional working method.
After the selection of good practices, information will be given about the goal of the good practice, the necessary technical and teaching skills for teachers (for example managing cooperative learning), the technical and organizational terms on the level of the school and, in the end, the corresponding

training. In due time, evaluations of users of the practice might be added, too.

The context of this paper makes it onsuitable to explain how we have arranged the different good practices and sorts of training to achieve an adequate matching. The database design of training arrangements will be put on line on Knowledge Net in May 2000. Visitors of Knowledge Net will be invited to respond and to suggest improvements. Therefore we speak of a dynamic publication.

Stimulation of teacher networks

Another way to stimulate a broad instructional use of ICT in education is to give financial governmental support to teacher networks in order to achieve a mutual professional development. In an earlier support program in the Netherlands, the PIT Project_ (Projects on Information Technology), this approach turned out to be a very effective alternative compared to more traditional in-service training. PIT reached 50 % of the schools; the main objective was to stimulate and to increase effective integration of ICT in eight disciplines in lower secondary education. The present-day support is meant for all disciplines in primary, secondary and vocational education. To begin with, 200 networks can obtain financial support. The networks will be monitored in their progress and obliged to start an electronic group within Kennisnet (Knowledge Net).

Developing new training arrangements

The government gives the opportunity to a limited number (20) of teacher training institutions, schools with an own division for educational development and educational advisory centers to develop new ICT training schemes in cooperation with schools.
We give two examples of such projects:

- An organization called Codename Future is developing a model in which teachers of secondary schools will be supported by their students to implement ICT in their classroom practice.
- CPS, the educational advisory center that made the database design of training arrangements, is developing a virtual workspace for teachers in primary education.

Results in 2002

With the described activities the Dutch government tries to achieve the following results in ICT and teaching methods at the end of 2002:

1. A clear vision on the instructional use of ICT in education, developed and made concrete in a framework; ICT skills and competencies will be described for the use of ICT in education; a range of innovative learning situations will be generated in which ICT plays an essential role.
2. Some terms of examination demand the use of ICT. Teachers are to be able to support the achievement of these terms by their pupils.
3. The majority of the teachers will have made a real start to integrate ICT in an effective and substantial way.
4. Most schools and other institutions of education will have formulated their goals with respect to ICT and will have them described in a school policy document.
5. ICT training and support of teachers will be a regular part of the plans of in-service professional development of the schools and other institutions of education.
6. ICT skills and competencies will be a part of the terms of examination of pre-service teacher training institutions.
7. ICT skills and competencies are to be a part of the description of the profile of teacher profession and therefore a part of the competencies of the register of teachers that will be developed.
8. A mature supply market will be created for a variety of arrangements of ICT, training and support.

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BIOGRAPHY

Ruud Brunemann is a historian by origin. From 1985 on he worked in the field of new technologies and education. He was a member of the management team that managed several projects on implementing new technologies in secondary education in the Netherlands. In 1999 he became a member of the supporting team that initiates and runs governmental projects on professional development. He is also project coordinator/webmaster of a large database-driven web site for lower vocational education.(www.vmbo-loket.nl).
Pieter Hogenbirk has been a teacher in secondary education. He was involved in the development of innovative educational materials at the universities of Utrecht and Amsterdam. He has been in charge of managing projects on the development of the curriculum, courseware and in-service training, and the implementation of materials and training for Informatics and Computer Aided Learning. From 1998 he has been the ICT project manager on secondary education of the Dutch Ministry of Education, Culture and Science. From 1999 he is also in charge as manager professional development in Dutch education.
Hans Puper has been a teacher in secondary education and adult education. He was involved in the development of innovative educational materials at the university of Utrecht. From 1999 he has been a trainer and consultant at an educational advisory center. In 1999 he became a member of the supporting team that initiates and runs governmental projects on professional development. .