

# МАТЕМАТИКА И МАТЕМАТИЧЕСКО ОБРАЗОВАНИЕ



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МАТЕМАТИЧЕСКО  
ОБРАЗОВАНИЕ

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## TOWARDS THE VIRTUAL UNIVERSITY

Radoslav Pavlov

As we get deeper in the information age we observe global networking, knowledge media, learning-on-demand and virtualisation affecting the role of learning institutions in our society. Traditional barriers between universities, school etc., that were caused by distance, regional and national borders are disappearing. New web technologies rendered it possible to organise and network knowledge acquisition and exchange ubiquitously through digital learning infrastructure. The education (academic, vocational, continuous etc.) has gradually migrated towards the World-wide web mostly under the slogan of free accessible education, to and from any place, at anytime. The customisation of Internet for educational delivery has enabled an entirely new modality of education to emerge – online education – profoundly distinct from traditional distance and classroom education.

In traditional distance learning students receive a set of educational materials by mail, broadcast radio or TV programs, work alone and then communicate with the tutor for clarification or further directions. In this scheme the Web is used typically in a similar way: the learners receive and submit course packages and comments electronically, but the tutor operates on one-to-one or one-to-many (broadcast or lecture) mode.

The network technologies provide more powerful opportunities for organising teaching and learning in a new phenomenon: network-mediated online collaborative learning environment. Its conceptual framework includes the following key features:

- group communication (many-to-many),
- anyplace (place independence),
- anytime (time independence),
- multimedia-based,
- computer-mediated communication.

Technologically these features cannot be provided only by e-mail systems (even with group mail services). New forms of computer-mediated communication such as computer conferencing tools, and new system architectures such as virtual classroom/campus are necessary.

**Virtual University** (e-University) is a paradigm for Web-based networked collaborative online learning environment, customised for post-secondary and/or workplace education. As a course management system it provides a framework for designing, delivering and managing individual courses or whole programs.

The Virtual University supports a wide range of flexible learning technologies (learning-by-doing, collaborative and group learning, individualised learning, project-based learning). It provides advanced facilities for:



- personalised mix of courses,
- virtual learners mobility,
- new ways for interaction between learners and tutors.

Individualised learning focuses on student abilities to select the mode of delivery and timing of course material. It addresses essentially different learning styles and aptitudes of the students.

Co-operative learning represents a paradigm shift in thinking that encourages students to learn from each other, not only from the teacher. It includes simultaneous interaction, equal participation, positive interdependence, individual accountability, group skills etc. Co-operative learning teaches group and communication skills and is felt to increase job retention, academic achievement, critical thinking and problem solving skills.

The Virtual University architecture consists of the following main modules:

- **Virtual training centre.** It ensures the systematic learning/teaching process in the university, servicing the common long-term university activities. It also acts as a virtual structure to organise qualification courses and skill acquisition outside the curricula structures (short term courses, focus on hands-on experience, courses on demand).

- **Virtual electronic publishing enterprise** with authors studio, producing all kind of multimedia learning materials.

- **Virtual library/repository** (dataware house for reusable multimedia learning materials), storing various types of documents or data required by the actors to fulfil their functions. Normally it is implemented as a distributed multimedia database with metadata presentation of the learning objects (e.g. LOM standard).

- **Public relations department** with personal learners guides, which act as information mediators for the users (admission advisers, career advisers, employing consultant etc.).

- **University management unit**, organising administrative activities, document management etc.

The main actors in the Virtual University are:

- **Learner** - transfers the information into knowledge. S/he uses the courseware from the distributed repository acting as learning scripts navigator, repository resources explorer, self-evaluator of personal assessments, participant in collaborative forms of learning.

- **Trainer/advisor** - assists the learners in the educational process, acting as producer of diagnoses, mentor, assignment evaluator, coach.

- **Manager** - manages the actors and events in the educational process, acting as planner, decision maker, supervisor, team or group organiser.

- **Mediator (information broker)** - facilitates the navigation of the other participants, acting as information communicator, user profiles producer etc. Normally it is implemented by intelligent agents technology.

The following configuration of instrumental tools in a virtual university is recommended [2]:

- **Video conferencing system** - an asynchronous communication system giving the ability to set up collaborative groups easily and to define structures, tasks and objectives.

- **Chat system** - a real time synchronous communication system that enables users to chat in "rooms" they create for the purpose. It allows the incorporation of multimedia in the messaging options.

- **Course structuring tool** - allows the instructors to create courses without having programming knowledge by templates and to send multimedia files to the virtual university servers.

- **Gradebook** - database of students' grades.

- **Personal workspace** for users own resources.

- **System administration tools** for creating and maintaining accounts, defining access privileges and establishing courses on the system

The virtual university is like a real university in its mission and educational process. The principal difference is in the student access. "Students in the virtual university can gain access to the courses from anywhere, at any time, convenient to them and appropriate to the course."

One of the first virtual university projects was the Canada's Virtual-U (<http://www.vu.vlei.com>) at Simon Fraser University, Vancouver. It supports more than 450 courses to a total of 15 000 students, organised in a full university structure with diploma delivery.

Another example is University of Illinois Online environment which is not separate degree granting virtual university [3]. All the courses and programmes offered by it are grounded in the academic programmes of University of Illinois.

Third form of organisation is the professional virtual university, addressing adult education in asynchronous group learning activities. It tend to employ part-time professional faculty and offer a centralised curriculum.

New model of virtual university activities is the network or consortium model, in which selected universities and education providers collaborate to provide courses and/or programmes for the lifelong learning in distributed environment.

An open distributed learning environment was developed with participation of Bulgarian academic institutions under the international project ARCHIMED "Advanced Multimedia-System Architectures and Applications for Educational Telematics" (1998-2000) [4, 5]. The environment, called Archimed Knowledge Village (AKV), is organised around the modern computer-assisted education metaphor of "virtual campus", ensuring sufficient functionality, relevant to the modern pedagogical approaches and tendencies for teacher-assisted and learner-centred education in local and global computer networks with some collaborative learning possibilities. The experiments with the pilot application with different user groups revealed the AKV potential and shortcomings and lead to some decisions about the further development and improvement of the environment.

The pilot implementation of AKV multimedia environment organises distant training centres which integrate a set of necessary methods, services and tools assuring a self-paced and/or remotely monitored learning in a given knowledge field with the help of available courseware materials and the pedagogical interactivity between a teacher/instructor and a student/learner. All real implementations of systems, dealing with multimedia content, have to compromise between the requirements for full functionality and the constraints imposed by the available resources. The AKV environment contains two types of distant training centres:

- **Intranet-based distant training centre**, build upon a local computer network of an institution in Client-Server mode and accessed also through remote terminals. This organisation takes into account the state-of-the-art of the public communications on a part of the Archimed partner countries, where on-line access to multimedia courseware is

not always feasible. The technologies used for the implementation of the Intranet version include:

- *Client machine*: Archimed Client Programme, Windows NT Workstation or Windows 2000 Professional, Windows 2000 Server, Internet Explorers 4.0 or higher.

- *Server machine*: Archimed Server Programme, Windows NT 4.0 or Windows 2000 Server, MS SQL Server 7.0, COM + Service, Internet Information Server 4.0 or higher. For the terminal extension a Windows Terminal server is needed.

- **Internet-based distant training centre**: this version of the system has as its objective to serve the needs of working people who have no capability to move and remain for extended time periods at the premises of the teaching organisation. The technologies used for the implementation of the Internet version include:

- Relational database management system (SQL server) for the backbone of the system and for supporting the model (data model plus operation's model – transactions) of the learning environment.

- Access to the functionality of the learning model and tools from distance using the standard Internet protocols (HTTP, web browser, web server).

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