Synchronous teaching of ICT courses to virtual classes over the Internet

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New pedagogical approaches are based on constructivist theory which includes three components

- Conceptualization
- Construction
- Metacognitive actions

Conceptualization involves knowledge and concepts understanding and actions and behaviours interpretation

Construction involves tasks of problem solving in real-life contexts

Metacognitive actions refer to the process of stepping back from the task and reviewing what has been done and experienced.

There seems to be a worldwide effort to test whether we are able to apply a constructivist-based pedagogical approach to virtual classes of students formed over the Internet

This work reports the execution of four experiments on the teaching of ICT courses to different types of virtual classes.

These classes were formed with students attending a regular curriculum on Electrical and Computer Engineering.

They were subjected to the constraints imposed by running these classes in parallel with the respective classes of the regular program

The constraints are:

- Students can be volunteers
- Selecting students with social and educational background and motives that represent the class of a regular program is rather difficult.
- A direct comparison of performances achieved with those of a regular class is not feasible.

The delivered courses were:

- ✓ Operating Systems
- ✓ Computer Networks
- ✓ High level Programming
- ✓ Industrial Informatics

The pedagogical approach involved:

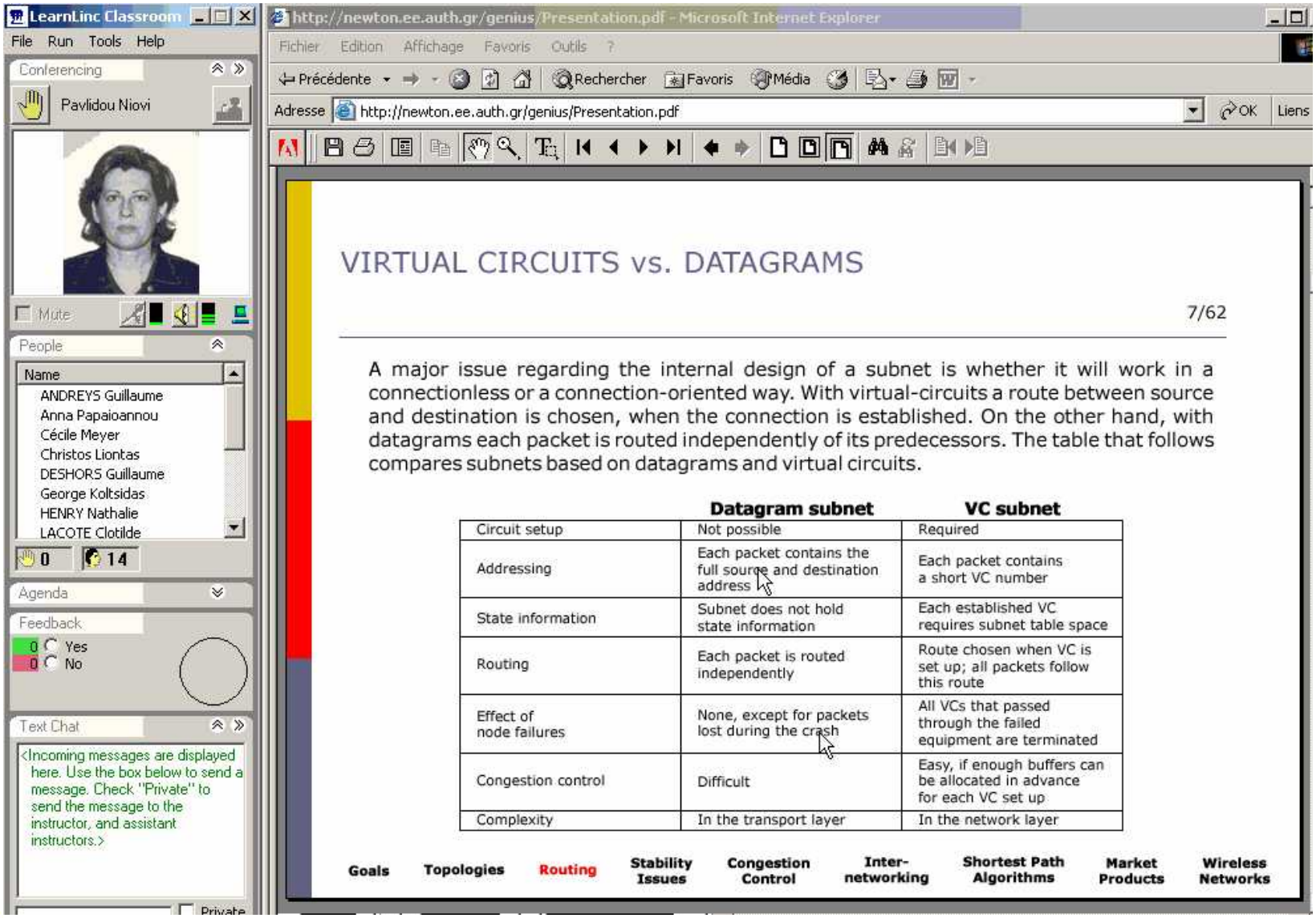
1. Setting the learning goals for each course.

2. Lecturing on the concepts and theoretical aspects of each topic, presenting the teaching material by the use of either overhead projector slides, scripts on a blackboard, graphics, animation and display of internet sites.

3. Questioning the students by oral and written (e-mail) means.

4. Presenting examples to the students.
5. Allocating computing resources to students for running simulators and writing programs.
6. Breaking-out the students to groups and assigning projects to each group.

The functions of the e-learning software which allow the tutor to implement the principles of the pedagogical approach are depicted in the following figure


LearnLinc Classroom
File Run Tools Help
Conferencing
Pavlidou Niovi
Mute
People
Name
ANDREYS Guillaume
Anna Papaioannou
Cécile Meyer
Christos Liontas
DESHORS Guillaume
George Koltsidas
HENRY Nathalie
LACOTE Clotilde
0
14
Agenda
Feedback
0 Yes
0 No
Text Chat
<Incoming messages are displayed here. Use the box below to send a message. Check "Private" to send the message to the instructor, and assistant instructors.>
Private
http://newton.ee.auth.gr/genius/Presentation.pdf - Microsoft Internet Explorer
Fichier Edition Affichage Favoris Outils ?
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Rechercher
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OK
Liens
VIRTUAL CIRCUITS vs. DATAGRAMS
7/62
A major issue regarding the internal design of a subnet is whether it will work in a connectionless or a connection-oriented way. With virtual-circuits a route between source and destination is chosen, when the connection is established. On the other hand, with datagrams each packet is routed independently of its predecessors. The table that follows compares subnets based on datagrams and virtual circuits.
Datagram subnet
VC subnet
Circuit setup
Not possible
Required
Addressing
Each packet contains the full source and destination address
Each packet contains a short VC number
State information
Subnet does not hold state information
Each established VC requires subnet table space
Routing
Each packet is routed independently
Route chosen when VC is set up; all packets follow this route
Effect of node failures
None, except for packets lost during the crash
All VCs that passed through the failed equipment are terminated
Congestion control
Difficult
Easy, if enough buffers can be allocated in advance for each VC set up
Complexity
In the transport layer
In the network layer
Goals
Topologies
Routing
Stability Issues
Congestion Control
Inter-networking
Shortest Path Algorithms
Market Products
Wireless Networks

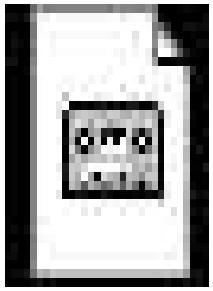
Description of the experiments

- Operating Systems
  - 20 students from Spain, UK and Greece
  - Dispersed in three sites, one in Madrid,, one in Reading and one in Thessaloniki
  - Content delivered by three instructors

The delivery included

- Powerpoint slides presentation
- Animated presentations
- Feedback on questions posed to the students
- Free hand raising and student interaction with the tutor and the other students with the use of voice, e-mail and video.
- Project assignment to students and follow-up

A recorded demonstration of the delivered course



12.+Process+Synchronization.lrc

Computer Networks

- 20 students from UK, Spain, France and Greece
- dispersed in four sites, one in Lyon, one in Reading, one in Madrid and one in Thessaloniki
- content delivered by four instructors

The schedule and content of the course on Computer Network

Date	Time(CET)	Topic	Institution
5 March 2003	9:00-13:00	Routing Techniques for Contemporary Networks	Aristotle University of Thessaloniki, Greece
19 March 2003	9:00-13:00	Network Administration Part I	INSA Lyon, France
26 March 2003	9:00-13:00	Network Administration Part II	INSA Lyon, France
2 April 2003	9:00-13:00	GRID Computing	University of Reading, Reading,UK
9 April 2003	9:00-13:00	Web Services and HTTP Protocol	University Carlos III, Madrid, Spain

High Level Programming

120 students from Greece

Studying at different semesters of a program in Electrical and Computer Engineering

Separated in four groups.

Every pair of groups is dispersed in two computer rooms

The same instructor for each pair of groups

The schedule and content of the course on High level Programming

Date	No of sessions per group	Session duration (hours)	Topic
12/3-31/3	**3**	**3, 3, 2**	**UNIX/LINUX**
1/4-7/4	**3**	**3, 3, 2**	**MATLAB**
10/4-9/5	**3**	**3, 3, 2**	**Visual C++**
15/5-25/5	**3**	**3, 3, 2**	**JAVA**

Industrial Informatics

- 30 students, registered to take this course as part of the requirements for getting the degree in Electrical and Computer Engineering.
- Students were placed in two computer rooms
- Lab exercises were assigned on-line and students requested to carry them out by the use of simulators.

The content of the course on Industrial informatics

No	Topic
1	Information Model of an Industrial Environment
2	Architecture of the Distributed Computer Control System
3	Algorithms and Functions for the Automatic Control of Processes
4	Configuration Environments of Distributed Computer Systems
5	Open architecture Systems-The IEC 61131-3 standard
6	Programming Languages (Ladder Logic Diagrams, Instruction List, Function Blocks, Sequential Function Charts)

ASSESSMENT

Attribute	% of students that gave a grade of				
	1	2	3	4	5
Interest	3.3	6.6	14.7	27.9	47.5
learning	3.3	24.6	42.6	22.9	6.6
Environment	0	1.6	22.9	47.5	27.9

Percentage of student ratings for the Operating Systems course

ASSESSMENT (Cont'd)

Attribute	% of students that gave a grade of				
	1	2	3	4	5
Interest	0	0	0	83.3	16.6
Learning	0	0	87.5	12.5	0
Environment	0	0	37.5	62.5	0

Percentage of student ratings for the Computer Network course

ASSESSMENT (Cont'd)

Attribute	% of students that gave a grade of				
	1	2	3	4	5
interest	0	0	37.5	62.5	0
learning	0	3.3	49.2	18	29.5
Environment	0	1.7	35.8	51.7	10.8

Percentage of student ratings for the Programming course

ASSESSMENT (Cont'd)

Attribute	% of students that gave a grade of				
	1	2	3	4	5
Interest	0	6.7	36.7	33.3	23.3
learning	0	3.3	13.3	56.7	26.7
Environment	0	0	40.0	50.0	10.0

Percentage of student ratings for the industrial informatics course

ASSESSMENT (Cont'd)

	Level of skill				
Skill	**1**	**2**	**3**	**4**	**5**
Conceptualization	**0**	**10**	**30**	**40**	**0**
Problem Solving	**0**	**15**	**75**	**10**	**0**
Metacognition	**5**	**20**	**45**	**25**	**0**

Assessment results of the test and project work on Operating Systems course

ASSESSMENT (Cont'd)

	Level of skill				
Skill	**1**	**2**	**3**	**4**	**5**
Conceptualization	**0**	**11.1**	**38.9**	**50**	**0**
Problem Solving	**5.6**	**16.7**	**33.3**	**44.4**	**0**
Metacognition	**11.1**	**22.2**	**38.9**	**27.8**	**0**

Assessment results of the test and project work on Computer Networks course

ASSESSMENT (Cont'd)

	Level of skill				
Skill	**1**	**2**	**3**	**4**	**5**
Conceptualization	**4.2**	**7.5**	**43.3**	**29.2**	**15.8**
Problem Solving	**1.7**	**1.7**	**45**	**48.3**	**16.7**
Metacognition	**2.5**	**1.7**	**40**	**53.3**	**2.5**

Assessment results of the test and project work on the Programming course

ASSESSMENT (Cont'd)

	Level of skill				
Skill	**1**	**2**	**3**	**4**	**5**
Conceptualization	**0**	**6.7**	**36.7**	**43.3**	**13.3**
Problem Solving	**0**	**0**	**60.0**	**30.0**	**10.0**
Metacognition	**0**	**3.3**	**40.0**	**36.7**	**20.0**

Assessment results of the test and project work on Industrial Informatics course

CONCLUSIONS

- Applying a collaborative synchronous pedagogical approach for the teaching of ICT courses to virtual classes of students is quite feasible by the use of the present state-of-the-art e-learning software environments.

- Students feel that interest to attend a course is raised when the collaborative pedagogical approach is combined with the use of e-learning environments

CONCLUSIONS (Cont'd)

- Irrespectively of the class composition the performance of students as far conceptualization, problem solving skill and metacognitive actions are concerned, ranges from good to excellent for the majority of the students (80 %).