The implementation of distance learning in rural locations

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***Abstract*— Distance learning uses methods different from classic education, exploring the efficient usage of existing communication channels. In rural areas the usage of internet is spreading due to the expansion of fixed and mobile communication channels. This paper presents the low cost implementation of a distance learning program in a PHARE funded program, the problems that were encountered, the solutions that were found and the obtained results.**

***Keywords*— virtual class, distance leaning, rural, MEDURUR, SIUM, Romania**

I. INTRODUCTION

Distance learning defines any form of institutionalized instruction that includes elements of flexibility in order to make it more accessible for people that want to learn or improve their knowledge, compared with the traditional educational system. The concept of flexibility refers to the structure of the taught material, the learning – verification - evaluation methods, the class location and the forms of assistance offered to students.

Open education is characterized by programs where the dominant components are the use of informatics in the educational process, the use of various distance communication systems for support activities, self-instruction and self-testing.

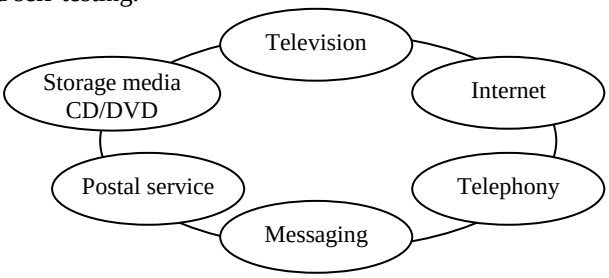

Fig. 1 Communication methods used in distance learning

In the development of the distance learning system new technologies from communication and information technologies had to be used for the educational process. Methodologically, distance learning implies the efficient use of the communication channels available to each participant: mail, telephone, fax, internet, radio, television. Students participating in the distance learning courses benefit – through universities- of a functional structure that ensures all the activities necessary to the development of he educational process.

The large number of students participating in this form of educational process, spread over a wide geographical area, made the use of the internet imperative. In Romania were created, starting with the '90s, distance learning centres in many universities (Bucureşti, Braşov, Cluj, Constanţa, Iaşi, Timişoara) using different managerial strategies. Two different concepts were targeted, depending on the possibilities of implementation: synchronous learning (where the instructor has direct interaction with the class and controls the lesson – often in real time – by creating, coordinating and monitoring the educational material) and asynchronous learning (where the student learns in its own timing and has the possibility for auto-testing, indirectly being monitored by the teacher by tests, projects and homework).

The synchronous learning is the most difficult to implement form of education in distance learning because it tries to implement the virtual class concept [1], where all the students and teachers situated in different geographical locations are reunited at the scheduled time by means of telecommunication methods. This method of teaching and learning implies the development of special procedures and the use of common multimedia applications, which on their own require a certain level of IT equipment, connectivity and knowledge. Because of these requirements, the distance learning was limited to cities and was out of reach for rural environments.

This paper presents the challenges, the solutions and the implementation of a distance learning program for rural environment in Romania.

II. EDUCATION IN RURAL ENVIRONMENT

The rapid spread of distance learning in urban environment was due to the wide spread of internet services with low cost (because of the existing competition). Unfortunately in rural environment – where distance leaning especially needed – the possibilities for internet connectivity are limited, often relying on high cost and low bandwidth media. The connectivity is ensured in these areas by mobile phone access.

The coverage with data services for some mobile telephony area is presented in figure 2, however most access is offered through costly CSD (Circuit Switched Data), and only small parts of the map offer fast internet services 3G+ / 3G / EDGE / GPRS.

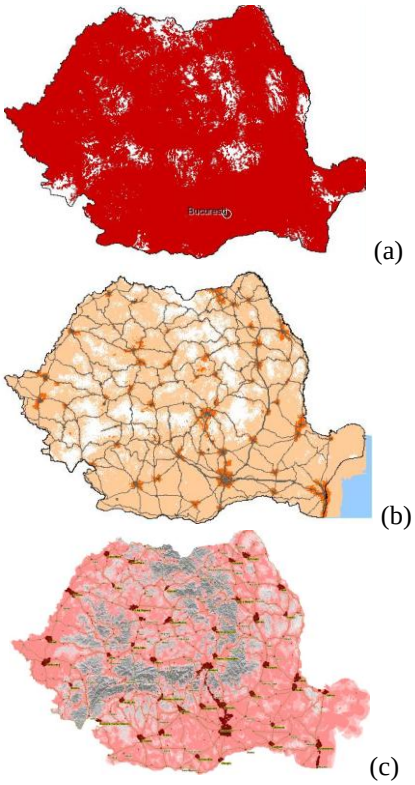

Fig. 2 Coverage map for mobile access in the phone networks: Zapp[2] (b) Orange[3] (c)Vodafone[4]. The darker spots (for (b) and (c)) represent the high speed internet access zones

In rural areas many problems appeared because of the drastic natality decrease in the last 20 years (over 30%) and the migration of the workforce to urban areas. Some of the problems include: the increase of children with parents working abroad which increases the schools responsibility in counselling; the increase in scholar abandon due to low income and youth involvement in domestic responsibilities in detriment of school; the large number of teachers that don't have the adequate level of training – especially in IT domain.

The implementation of this process was helped by two projects: MEDURUR („*Si in mediul rural educaţia poate fi condusă performant*") and SIUM (*"Sistem Inteligent pentru utlizatorul mobil*").

The MUDURUR project was developed as part of the European Union's PHARE 2005 financing program for social and economical cohesion. The project ensures the improvement of the quality of education in rural environment by providing managerial and IT skill development classes. The project implements the virtual class concept, letting the students (teacher at secondary school level in rural areas) directly interact with instructors from different cities (Pitesti, Sibiu, Bucuresti). Also, the project will bring together these persons from various geographical areas in open discussions, as part of the virtual class, in order to present their problems and find solutions using the information they have learnt during the classes.

The objective of the program is to insure the development of the competences and abilities of the target group (the personal with managerial function in secondary schools in rural areas) placing accent on the problems that are stringent in these areas: promoting the secondary schools in order to reduce scholar abandon, acquisition and use of modern instructional equipment, improvement in the usage of the secondary school's human resources, identification and usage of supplementary financing sources, usage of partnerships for the development of the material base and finally the extension of the implication of the school in solving local community's problems.

The SIUM Project [10], financed by the Romanian Ministry of Education and Research, had the purpose of developing integrated service oriented applications for mobile users. The design of a schedule server for the MEDURUR program was one of its target implementations.

III. IMPLEMENTING DISTANCE LEARNING FOR RURAL ENVIRONMENT

The majority of the existing distance learning programs are based on a dedicated software platform, usually developed specifically for that program. There is no unified vision on a single program for distance learning – meaning that each institution that is ready to start such courses must have funds allocated for program development according to the needs and the changes that may appear. The costs may prove prohibitive for programs with fewer students, especially if complex multimedia communications are programmed.

In order to implement the distance learning program the following aspects had to be solved, keeping the implementation costs al low as possible as to not exceed the program's funding:

-students access to the course's and laboratory's material and their updates;

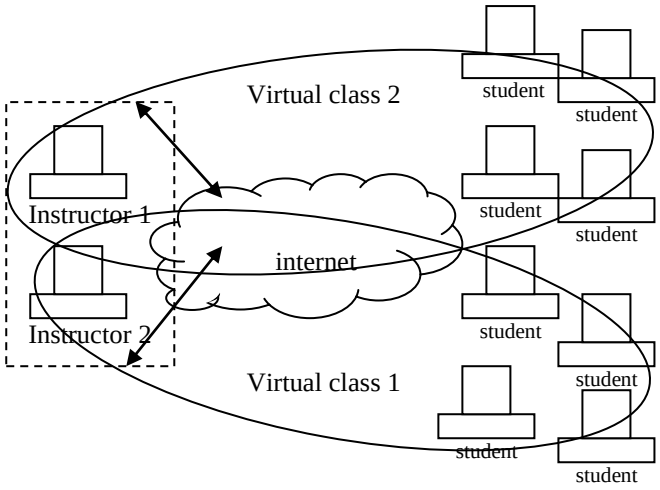

Fig. 3 Synchronous learning assumes real time contact ("virtual class") through text/audio/video between instructor and student. Instructors have the same physical location while students are distributed in different geographical locations

-instructors and students access to test and self-test material;

-instructors and students access to real time multimedia communications;

-students and instructors must be able to easily access the class's schedule (vital component in order to be able to take part in the class in real time).

Implementing a web site for education, where the course and the laboratories can be downloaded, is an easy task nowadays, this being simplified by the emergence of CMS (Content Management Systems) sites such as Claroline NET [5] or Joomla [6], where people with less knowledge about web development (such as the instructors in the program) can manage parts of the site, making the task of the administrator easier.

Fig. 4 Frontpage of Centrul de Formare Muntenia website - MEDURUR is a sub-program of this educational center [9]

Testing and self-testing were implemented in order to monitor the student's progress and to help them correct their errors. They constitute the basis of distance learning.

Fig. 5 Online testing is necessary for student's auto-evaluation

In recent years the terms videoconference and even telepresence have become key words when describing remote discussions (not only in education but also in medicine, business, etc). In rural areas the limiting factors that are the bandwidth and the low hardware specifications of end systems (lack of high resolution displays), make high resolution conversations hard to implement. For this program two free videoconferencing programs were tested: Sykpe [7] and Yahoo Messenger [8]. Each of them has its own limitations and advantages that is why they were both used to allow the implementation of a virtual class.

The other important aspect was the class access to the schedule. Because changes might appear in the programs of teachers situated in different towns, it was necessary to reflect the modifications as soon as possible. At first the schedule was only displayed as a web page, but soon it was necessary to have an implementation for mobile device users. Accessing a normal web page from a mobile device is not always optimal; therefore an interface was developed for accessing the schedule information directly from any mobile device running Java Micro Edition.

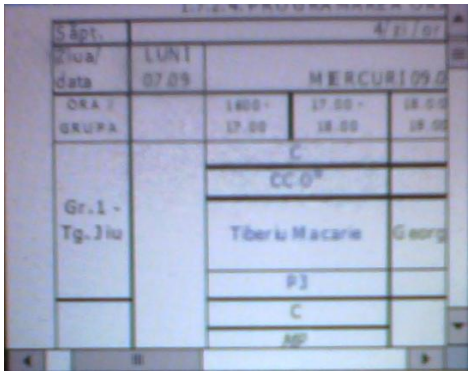

Fig. 6 The schedule page seen in a mobile phone browser it is hardly readable as the page is optimized for PC displays

The application development is part of the development of the research program SIUM (Sistem Integat pentru Utilizatorul Mobil – Integrate System for Mobile User). As you can see in the pictures, through this application the schedule is optimized for viewing from any mobile device. The application for mobile access represents a complementary method to accessing the schedule server data from the PC.

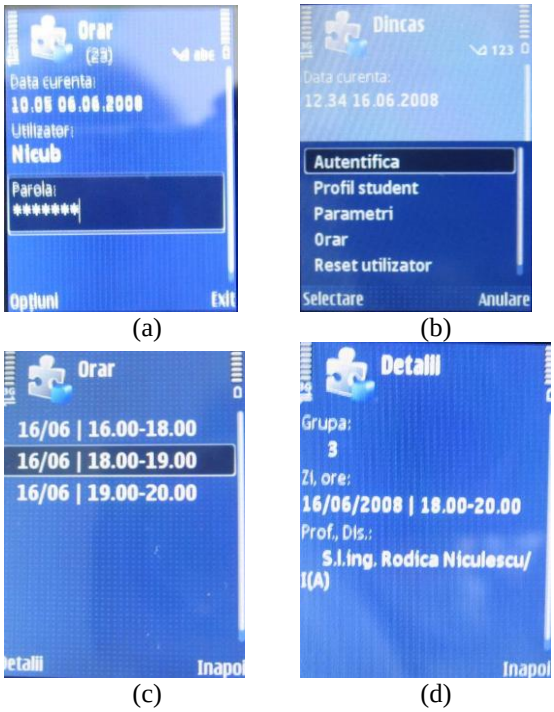

Fig. 7 Actual pictures of accessing the schedule page from mobile device through JME application offers a readable interface: (a) login, (b) options, (c) all schedule listing for a group, (d) schedule details for a class

IV. Implementation problems and solutions

The diversity in the performance of computers and the connectivity solutions present in rural areas are the factors that led to many of the problems that had to be solved.

The first problems came from the internet connections quality: at first simultaneous video-audio connections between students and instructor were considered compulsory, but soon only the audio remained as standard for the majority of users because of low connections speeds. Also the two video conference programs have limitations for the maximum number of users connected in conference– so the class had to be split accordingly in order to accommodate all students in parallel audio/video conferences. This proved to be a major problem not only for the students, but also for the instructors who needed all students in one single virtual class.

In order to implement a good virtual class all students should be able to have access to the same material to complement de instructors' audio conference. This is why the course materials had to be modified in order to be easy to follow during the audio/video conference and easy to identify the study stages both during the conference and in offline mode (by using indexing and color coding).

Due to the number of instructors from different university centers, changes appeared in the scheduled conferences, so a module for monitoring user traffic was added to the web site so people that didn't access the schedule page in time to see the changes could be announced not to miss their classes. As an extension to this, a helpdesk solution had to be adopted that answered the questions from students related to messaging application problems.

Some courses relied on visual interaction between student and instructor not only audio communication. This is why the students had to present their projects/homeworks in videoconference wherever that was possible. This solution strengthened the otherwise impersonal link between student and teacher.

Finally an application had to be developed for mobile devices in order to allow students and instructors to access changes in the schedule. This was necessary as schedule changes appeared very often and all persons had to be announced as soon as possible. This application allows the access of the schedule from virtually any location with mobile phone coverage.

V. Conclusions

The distance learning form of education will hopefully be included in the accredited forms of education for pre-university studies and will improve the quality of the rural teachers. They will have the chance to use modern means for instruction and information and they, at their own term, will pass this knowledge and will for research to their pupils.

Through the general adopted methodology, the students in this program have various methods for gathering and fixating knowledge that can be applied to the secondary schools where they teach, for improving the courses content and for performing inter-personal exchanges of information using the virtual and classical communication media.

Even if numerous problems were encountered and had to be solved, the result is that: many teachers from rural areas have obtained access to instructors and classes not easy to attend in classical form because of the geographical and financial resources; it was possible to implement with limited resources the concept of virtual class and have extended it beyond course hours by facilitating the participants in the program to exchange information about their personal experiences in off-class discussions that will hopefully help them solve many of the current local educational problems; an finally many instructors from different university centres were able to participate together in the program –an otherwise impossible thing to do with classical forms of education due to schedule differences and large geographical distance. New competences were developed that will allow the school to be implicated at local level in solving some of the communities problems and in return of obtaining the help from the local community, competences in improving the existing rural secondary school teachers, competences in developing a curricula that is adequate to the specific rural environment (that will also reduce scholar abandon), competences for the efficient use of the existing material and financial resources, and for bringing new resources in and environment presently in economical decline.

The online educational system forces the secondary school managers to be directly implicated in the use of computers and other technologies for education. In this way the level of awareness of the secondary school's management team for the new means available through the use of IT tools is increased and this interest will be passed on to all the subordinated secondary school teachers. In this way it will be accelerated the national strategic interest of limiting the differences in education quality in rural and urban environments.

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