Closing Workshop Proceedings

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Multigrade teaching occurs in primary education when a teacher has to teach two or more primary school student grades in the same class. In multigrade schools a relatively small number of teachers try to be effective in their educational work while dealing simultaneously with a number of pupils of different ages, educational levels and needs. It follows that for children to learn effectively in multigrade environments; teachers need to be well trained, well resourced, and able to meet highly demanding teaching tasks and to hold positive attitudes to multigrade teaching.

Multigrade classrooms ought to be taken seriously into account since such schools are considered to play an important role in providing access to education for all in remote, isolated and underdeveloped rural areas. Such schools are more than a reality in primary education in many regions of Europe, Latin America, Asia, Africa and the rest of the world constituting a very common educational form in problematic rural areas, sparsely inhabited regions and urban areas with adverse social conditions. In such areas multi-grade schools not only aim to give enrolment and continuous attendance in school environments, but also to provide knowledge and pedagogy of good quality and in addition to play a wider role in social
In most of the cases the multigrade school is the only viable school formation in rural environment and the effort should be focused on improving the teaching and learning conditions in this school formation. Multigrade teaching is presented as a powerful pedagogical tool for promoting independent and individualized learning as well as group learning. These kinds of teaching and learning seem to have great advantages since the teaching programme is adjusted to the specific needs of the individual student or the groups of students and thus contributes to better learning outcomes.

Multigrade schools have potential and play an important role as educational units in underserved rural areas. In addition multigrade schools could present good teaching and learning practices useful and applicable in all kind of schools and classrooms. The unfortunate reality is that these schools form the most neglected part of the education system. National educational authorities, ministries of education and pedagogical institutions most of the times do not take into account or recognize or consider important the differentiation on the teaching and learning conditions in the multigrade environment. The formation of the school in multigrade class-rooms is in most cases considered as a “necessary evil” situation that is adopted just to fulfil the obligation of the official state for providing education for all. As far as this is the main goal of the state, to fulfil an obligation, then much less attention is paid to provide quality education or to support the specialised needs of the teachers working multigrade schools. Due to the geographical oddities, the socioeconomic peculiarities and the lack of adequate school infrastructure and personnel, these schools still remain at the education’s world cut off.

The MUSE (Multigrade School Education) project takes into consideration the numerous specialised conditions prevailing in multigrade education and establishes the framework in order to provide support to multigrade teachers in Europe. The project MUSE aims at the development of a new model of teacher’s training that assists teaching in multigrade schools. The project is based on a close cooperation between pedagogical experts, trainers, policy makers and teachers in order to develop and disseminate methods of fighting educational exclusion and school failure in rural areas, promote the integration of pupils with special educational needs, and provide equal opportunities in education. The MUSE Project is based heavily on ICT, acknowledging that the introduction of ICT promises revolutionary changes in any field of life, but is of specific importance for remote and geographically isolated areas. In this sense, ICT in multigrade schools is
expected to offer to teachers and pupils, as well as to other groups or individuals who will be involved in the project accessibility to information, no matter the area's size, geographic characteristics and the distance from the centre.

The MUSE project develops a platform for continuous interaction between teachers and trainers. The implementation scheme of the training programme includes extended cycles of school centred work. The realization of a workshop on multigrade teaching represents the systematic effort of the MUSE research team to present aspects of the training programme as well as to get valuable feedback by multigrade teachers at these early stages of the development of the training programme.

This booklet includes a description of a series of new initiatives (e.g. ZEUS project, Rural Wings project) that aim at continuing the initial efforts of the MUSE consortium, building on advanced technologies. Additionally includes the teachers point of view towards this direction.

This booklet in fact, aims at summarizing and presenting the activities of this workshop to the general public. The workshop would be considered successful if it could stimulate at least some of the teachers or other participants to pay attention to multigrade schools and proceed to measures of upgrading quality of multigrade education. Hopefully this booklet could contribute to this effort as well.
Multigrade Schools and Information and Communication Technologies in Greece

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Setting the parameters of the problem

Multigrade schools are the schools in which the teacher teaches more than one grade in one classroom. Multigrade schools in Greece are a necessity mainly due to the country’s specific geographic configuration. There are a lot of mountainous regions and large number small islands in the country. In the past, historical reasons, had forced the population to live in areas of difficult access, scattered in a great number of small and isolated villages that were located either deeply in the mainland, or in small islands. Even though nowadays, there is a change in the demographic dispersion, there is still a significant percentage of the population that still lives in the above described regions. This creates the need of having schools operating in small villages, even with a very small number of students and even when the conditions do not provide the ideal educational environment.
Nowadays, there is a tendency to reduce the number of multigrade schools. The most common practice is to merge neighbouring schools, providing transportation to pupils on a daily basis to a main village in a “hub” or “centre” school. But mergence (a) is not a choice of the inhabitants of the small villages and (b) does not exist as an option in the case of small islands where there is only one school. Moreover, mergence is strongly opposed by the residents, who consider the school, together with the local church, to be the traditional cornerstones of the village’s cultural and social life. They believe that if the school stops operating then the status of the village will be reduced and this will negatively affect its future. Their point is that a school is always a vivid cell and a vehicle of civilization that helps keeping the local population in place, preventing depopulation.

Sustaining a large number of multigrade schools is a difficult task. The problems that arise can be epitomized in two categories, the financial and the educational. On the one hand, the state has to provide the necessary economic means in order to keep schools fully equipped and in an acceptable operational condition. On the other hand, there must be adaptations in the curriculum; in order to fit in the way teaching is conducted in multigrade schools. These adaptations often lead to the belief that the quality of the provided education is inferior, compared to the quality of education in the rest of the schools. We believe there are a number of interventions that can be made to raise the quality, involving the extensive use of information technology.

Identifying the situation

Out of 5800 elementary schools in Greece, 2558 have five or less teachers, at least one less than the number of grades. Around 1800 schools have one or two teachers. More than 1300 schools operate with less than 20 students. This means that more than 40% of the elementary schools in Greece are multi-grade and with a small number of students. According to the relative legislation a class can be split in two if it has more than 25 students. The same applies for a school as a whole: if a school has less than 25 students in total, it operates with only one teacher, regardless of the number of grades that he/she has to teach. If the school has up to 50 students, a second teacher can be appointed and so on. Statistically the situation is not as bad since these limits are rarely met and the numbers of pupils per teacher are less than the above.

Not all multigrade schools are similar. There is a possibility that in a small
school, a grade is missing, simply because there are no pupils to attend. It is also likely that a multigrade school has one teacher teaching up to six grades, two teachers each one having to teach in up to three grades, three teachers each one having to teach in up to two grades, four teachers with some of them teaching two grades and, finally, five teachers with one of them teaching two grades.

There is also a certain way that grades are allocated to each teacher. In the case of two teachers, one teaches grades 1, 3 and 4 and the other grades 2, 5 and 6. In the case of three teachers, one teaches grades 1 and 2, the other grades 3 and 4 and the third grades 5 and 6. In case of four and five teachers, care is taken so that the first and second grades are taught separately. It is not an unusual situation for a pupil to attend a next grades’ curriculum first and in the subsequent year to be taught the lessons of the previous grade.

The most demanding type of multi-grade school is a single teacher school. Teaching in that kind of school is a difficult job. The approach adopted in general is that when the teacher teaches one grade, the rest of the pupils work by themselves or in groups. Due to the small number of pupils, the most common instructional method is cooperative learning, mixed with elements of self-learning. Working hours are extended and some of the breaks are skipped so that more teaching time is gained, though the truth is that in these cases, no matter the effort, the teacher spends less teaching time per grade, than in an ordinary school. Another method is to use peer teaching, with one or two of the best students acting as teaching assistants.

In order to meet the increased demands of his instructional duties, teachers have to be well prepared. They have to plan ahead and be exact on how and when to administer specific parts of the syllabus. Since the schoolbooks are the same as in any other school, there is a considerable work for the teacher who has to deal with different grades. It is easy to understand that the teacher acts under great pressure.

Another problem of multigrade schools is the fact that some subjects are not taught at all. For example, there are multigrade schools in which foreign language is not taught, though this is part of the primary schools’ curriculum. In most of them, a specialized teacher does not teach art and music as in the rest of schools. The same applies for physical education and many of the school activities that are skipped and everything is left to the initiative of the teacher. These differentiations exist at the expense of quality.

In an ordinary school, the headmaster has very few, if any, teaching du-
ties, and is concentrated in purely administrative work and liaising between the school and local authorities. This kind of job is time-consuming but also very important, particularly since local authorities are responsible for schools’ maintenance. In multigrade schools, usually there is no headmaster but a teacher “acting as headmaster”, having the double role of manager and teacher. This means that besides their teaching duties, multigrade schoolteachers have a great deal of administrative work.

Given these difficulties, one would expect that the state would employ skilled and experienced teachers for multigrade schools. This is not the case: The vast majority of them are newly appointed or on contract (not permanent job). They have very little experience, if any, and they are not trained for multi-grade teaching. Studies for multi-grade schools are not included in the academic courses of nearly all Greek Universities and no specific in-service training is provided for multi-grade schoolteachers. In multigrade schools with one teacher, since there is no help from any colleague, the teacher has to face any arising problem alone.

Finally, apart from the teaching experience that the teacher gets, there are very limited incentives for a teacher to stay in a multigrade school. The most important of them is the fact that they get more points within the context of a point system that forms the basis for teachers’ evaluation. These points help the teachers to have a choice later in their career mainly when transferred from one school to another.

The new technology in the old school

The role of ICT in education is significant in general but can be decisive in the case of multigrade schools. There are three areas where this role is distinguished, namely (a) teaching (b) training and supporting teachers and (c) administration.

To use ICT in teaching includes various tools and methodologies as:

Commercial software readily available, tailor made software for specific subject teaching, televised lectures to be presented off line or video on demand, videoconferences, on line connections with others schools, on line and off line exercises and didactical material.

For teacher training: On line lecturing and consultation, on line and off line material and references specially selected for the instructional needs of a multi-grade school can be used.
For the treatment of administrative problems, templates of all the documents a school uses with instructions when each one is used, on/off line communication with the educational and local authorities, are among the solutions that can be considered. Of paramount importance is the support that is needed to all of these activities – educational, technical, administrative - by any supervising authority.

The introduction of ICT in multigrade schools is related to some difficulties, which are presented below.

Since ICT applications are based on an extensive use of the Internet and other means of on-line communication, school units should have computers and the Internet connections as minimum prerequisites before the ICT introduction. Though this appears essential, in practice, computers are not always available, or are available but inadequate even though every school has at least one simple (PSTN) telephone line. ISDN is the only broadly applied choice for on-line communication and especially for videoconferencing. All the restrictions that the limited bandwidth imposes, apply in this case. Few schools are connected with ISDN lines, even though a lot of them are in the process to be connected in this way.

The standards of the E.U. specify that the ratio of computers per students must be 1 to 25 (1 to 20 in the year 2006). Following this ratio, every Greek school with 25 pupils in one class should have at least one computer lab. In case of multi-grade schools, where the class may be small, the above-mentioned ratio has no meaning. In such schools usually there are no extra rooms available to be used as computer labs, yet the machines are needed in the class where teaching is conducted. The standards for the number of computers for a multi-grade school have to be established according to the number of teachers, grades and working groups and not according to the total number of students. The smaller the school, the smaller the ratio pupils/computers should be.

The policy concerning computers in elementary schools is recent in Greece. “Society of Information”, is an extensive strategic scheme concerning the introduction of ICT in many fields of life. Within this framework it is proposed that elementary schools should apply to establish computer lab with Internet connection. The number of computers in such a lab depends on availability of extra rooms and the number of students, criteria that are not met in most multi-grade schools and certainly not in single teacher schools. The way of financing ICT is bureaucratic and leads to delays.

It is clear that bureaucratic and centralized policies are major barriers for
applying ICT in multigrade schools. It depends mainly on the teacher who acts as a schoolmaster as well as to the other teachers to take initiatives, at the school’s benefit. Good public relations with local authorities and the local community help a great deal. Interestingly enough, it seems that these practices are effective and, despite the difficulties, many schools are nowadays equipped with computers, which were acquired using funds that (a) were directed for this purpose from the central educational authorities to local authorities, (b) were available for this purpose in the budget of European or national pilot projects in which a school participated and (c) were offered through donations.

Providing schools with computers is one issue, ensuring their usage is another. Teachers use a computer if (a) they know how to use it (b) they are persuaded that it is a tool in support of their teaching duties and (c) they realise that ICT’s may potentially support other duties that they have in their multiple role at school. These dimensions are analysed below:

So far as (a) is concerned, the most decisive factor for multigrade schoolteachers to learn how to use ICT effectively is schoolteachers’ training, and, in this context, on-site teacher training, though a costly practice, seems to be the best solution. With training in situ, there is no need for teachers to travel, their teaching duties are exercised during the training period and training is offered on an individual basis which in many times proves to be efficient. Moreover, in situ, the trainer ensures that computers are properly installed, solves any technical problems and gives instructions on how to cope with everyday problems. At this point it is worth mentioning that in multi-grade schools the “plug and play” concept is priceless. Hardware and software must come pre-installed and ready to use. Taking for granted that schoolteachers have no previous experience with computers, the whole interface must be as friendly as possible. Helpdesk and technical support by telephone must be constantly available and the schoolteacher should be confident that there is always someone to help if something goes wrong.

So far as (b) is concerned, proving the importance of computers as educational tools is a difficult task. Given the extreme time pressure within which schoolteachers in a multi-grade schools work, ICT can provide quick and practical solutions in actual problems.

An example of such an application is the development of a database with exercises and activities for all the grades. The teacher can plan the day’s work selecting from the database the appropriate material for the appropriate grade. Thus, the pupils of one grade can work on their own on paper or with the computer the selected exercises, while the teacher teaches
another grade.

Such databases, which can be on-line freely accessible, so as to be enriched with new exercises and activities, are useful particularly in cases of inexperienced and newly appointed teachers (who are profiled frequently in multi-grade schools).

In multigrade schools, a common practice within the teaching context is that, when the schoolteacher is engaged lecturing one grade’s pupils, the rest of them divided in groups, are engaged in preparing exercises or studying previous or next hour’s lessons. Educational software is useful in this case, particularly if specifically prepared for the purpose of this time-sharing type of studying. Commercial educational software is also a good and practical solution, but has the disadvantage of not being directly referred to the contents of the school’s curriculum; hence it can be used as a supplement to ordinary teaching approaches as well as a basic instrument in student-centred activities, such as the preparation and presentation of a project in the classroom. Moreover if pupils deal with educational material not necessarily referred to the curriculum, it is difficult for the teacher to check whether they are studying or not. For providing educational material directly adjusted to the school’s curriculum, there are several solutions:

- A simple way is to convert text books into e-books; this is not a desired solution, since it does not give ICT instruments the chance to offer to pupils something different and more attractive compared with conventional educational material.
- Another way is to form a comprehensive library of commercial educational software, with detailed information about the parts that correspond to specific sections of the school’s curriculum. This partially solves the problem.
- Another approach is to rely on synchronous teaching (videoconference) by a distant teacher, who covers all parts of teaching process.
- Finally, asynchronous teaching (web pages) can be implemented, a technique that gives similar results as in videoconferencing from teaching point of view.

These practices in their combination provide tools that guarantee quality of teaching and facilitate multi-grade schoolteachers in doing their job.

In parallel, schoolteachers should be convinced that horizontal commu-
communication with schools, organizations and other institutions in a number of ways (e-mail, web pages, and videoconference) helps them, supports pupils, provides access to information and reduces isolation. Cross-school activities, lecturing and direct communication with experts can help teachers to promote quality of teaching and to face a number of problems.

With respect to (c), it is important to bring evidence that ICT helps teachers to implement various administrative duties like students records, calendar of events, certificates etc. All these can be produced in a very efficient manner after templates for all the necessary documents have been developed. As far as communication is concerned, given the adverse geographic conditions, multigrade schools’ post is usually delayed so that teachers and pupils are not informed on time about activities and projects in which they would probably want to participate. It is clear that on line communication is expected to improve the situation.

Finally, it is worth noticing that there is a need for a platform for delivering the content addressed to teachers and pupils. An effective platform comes in the form of a simple portal-like web site. A portal is a web site that is intended to be an all-in-one entrance to the Internet, which also provides Internet services: email, chat rooms, free personal web pages, guides, calendaring, etc. Portals provide a single point of access to aggregated information. The main reasons for using such a site are:

**Presentation.** It provides a single consistent interface across diverse content and function. Provides common user interaction model and API, which new applications can build on. Delivers a common user experience across different device form factors.

**Access.** Provides common access mechanism for users to a range of applications (single sign-on). Allows different classes of users to have different levels of privileges, mutable and manageable. Provides access in a continuously available, responsive environment

**Personalization.** Permits customisations in the interface, to fit each user’s specified preferences. Allows portal management to tailor the user experience for different classes of users, based on both implicit and explicit preferences.

**Administration.** Allow multiple organizational units to create and contribute content and to administer sections of the portal. Allows a central management entity to manage multiple portals across the entire organization
Efforts to introduce ICT in multigrade schools

It is believed that there are strong social and educational reasons why the field of ICT in multi-grade schools should be investigated, and for this reason a number of projects have been designed, developed and are executed (at various phases in their timetables). Some of them are worth presenting here.

The SXEDIA project.

The usefulness of ICT in multigrade schools may be examined through the experience gained from the implementation of SXEDIA project. This project, funded by the Ministry of the Aegean, has been developed in 2000, as a pilot program with the task to introduce ICT applications to schools of the Aegean (which in their majority are multi-grade). This program involved the installation of computers in 46 schools in 32 small islands of the Aegean Sea. It also involved the connection of the schools to the Internet, teacher training, work with educational software, development of web pages to represent the schools and help them to communicate and finally, distance learning from the University of the Aegean in Rhodes, using synchronous and asynchronous teaching methods.

Part of SXEDIA’s success may be attributed to the fact that (a) specific care was taken for every school separately and the activities were individualized according to the specific characteristics and needs of every school. (b) close links of communication have been developed between the support team and the teachers. The training approach and continuous contacts, either face-to-face, or through videoconferencing, e-mail and telephone contributed highly in the project’s efficiency. All those that participated in the project felt as members of a team that worked for their own benefit and not because they were obliged to do so.

During implementation, one of the problems faced was the fact that a large number of teachers serving in multigrade schools were not staying in their posts for more than a year. This had a negative impact on the schools’ network operation, since it was necessary to provide training to the new teachers so as to become quickly familiar with the way in which the network operates and to start using them with no delay.

The MUSE project

The MUSE project (Multi-grade School Education), funded by the E.C., aims to develop an in-service training program especially designed to
meet the needs of multi-grade schoolteachers and to improve educational performance in multi-grade school environments. Training is based on an innovative methodological approach for multi-grade school teaching and on an extensive use of ICT applications so as to provide:

- A flexible, interactive in-service training programme for teachers of multi-grade schools.
- The development of a platform for training, collaboration, networking and exchanging of ideas between teachers, students and trainers.

The MUSE project will provide continuous training and support to multi-grade schoolteachers, enhancing communication among remote multi-grade school teaching environments. The development of the proposed training program will be based on the adoption of a teacher centred approach. Implementation of the training program will include extended cycles of school centred work. Teachers will continuously give feedback to the academic team about their experiences gained in the classroom. This will not only will motivate teachers, but also provide the necessary cross-links between theory and practice. Upon suggestions of the teachers, the academic team will perform the necessary adjustments to the proposed approach. The duration of the project was two years.

**The DIAS (ZEUS) project**

The ZEUS (DIAS - Satellite Network of Rural Schools) project has envisioned the implementation of advanced communication channels for the provision of support to isolated schools in Greece. The project will be based on a close cooperation between pedagogical experts, trainers, teachers, software developers and communication experts to design, develop and implement an advanced learning environment which will be based on satellite communications in order to support the training of teachers in schools located in rural areas, mainly in Central Greece and in the Aegean Sea. Subsequently, the teachers could act as instructors to familiarise the local community with using eLearning facilities (e.g. students, farmers). The proposed project aims at providing in service training to multigrade teachers by utilizing the capabilities of advanced satellite systems. The training programme aims at enhancing professional skills of multigrade schoolteachers as well as to develop their abilities in using ICT as supporting tool in everyday teaching. The ZEUS project will provide a framework and a model for the continuous training and support of multigrade schoolteachers, enhancing communication among remote multigrade school teaching
environment and outside educational community

Conclusions

Drastic constraints concerning teaching time per student, intense fragmentation of the teaching procedure, lack of coherence, the need for time-sharing so as to meet the needs of a non-homogeneous class, make the multigrade school a very demanding professional area. The teacher of such a learning environment is called to unify diversified groups, set objectives for more than one grade, transform heterogeneous groups into collaborative teams and integrate pupils into a functional entity.

In teaching multigrade schools ICT is an indispensable tool that can provide solutions that improve the educational services offered by these schools. In many instances ICT is used less by the people that need it most. The main purpose of the above projects is to indicate in practice that ICT is needed in multigrade schools and should become a basic ingredient that has to be included in the design of a new curriculum for these schools. Multigrade schools, irrespectively of their reducing numbers, will be present in the educational scene for a long time yet, either as a necessary handicap for some or as an interesting pedagogical experiment for others.

However, multigrade schools have little chance to be the priority in educational planning within this institutional framework. To change the situation a change in attitude could be involved. Changing the attitude with respect to multigrade schools is a big challenge and ICT could work positively in this context.
Bridging the Digital Divide: 
The Rural Wings project

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Within the framework of the mid-term review of the eEurope 2005 Action Plan in early 2004, the European Commission will propose to set up a Forum on the Digital Divide. This Forum will bring together all stakeholders in the area of the Information Society and electronic communications, including the satellite constituency and ESA, and will analyse how to bridge the digital divide. White Paper “Space: a new European frontier for an expanding Union”, COM (2003) 673

Introduction

In recent years there have been several initiatives in the field of satellite telecommunications applications, in order to address the needs of rural communities. This indicates the unique advantages of satellite technologies for providing high quality wireless broadband connection to any type
of population within large geographical areas. Rural Wings is an ambitious project that proposes to develop an advanced learning platform through satellite DVB-RCS access technologies, promoting a user-centred methodological approach which constitutes its major innovation. The main aim of the proposed approach is to support the creation of a new culture in rural communities promoting digital literacy and reducing resistance to the use of new technologies. It will go a step further, encouraging users to add their significant contribution to the emerging applications by involving them in meaningful activities, tailored to address the needs of different user groups. Thus, Rural Wings aims to offer stimulating and creative learning environments to support vibrant user communities and will attempt an extended implementation in dozens of pilot sites in 18 countries worldwide. It is expected that Rural Wings project will help to catalyse the satellite broadband take up in Europe and beyond.

The Rural Wings project will be based on innovation practices and techniques deployed in industrial environments, aiming to the optimization of the new products’ development process. The ultimate goal is the transfer of knowledge and the adjustment of these practices in different knowledge spaces (at school, at work, at home) as a mean for interaction between user needs and technological developments: The needs of users in rural areas feed the integration of the educational environment with dynamic requirements for new services or for the adaptation of existing ones. In this way the users’ perception of their problems/needs leads the development of technology and of learning practices.

**Project’s background**

Information and Communication Technologies (ICT) are inherently associated with the access and use of knowledge which is the fundamental and strategic resource of society. ICT require the active, informed, literate participation of the user. The internet is of little use to people who are not able to exploit electronic access to information to improve their lives. In 2003, about 150 million European citizens had not completed higher secondary level education and about 2/3 of EU workers had never had any computer training. The term “digital divide” in its more generic definition refers to the technological and socio-economic disparity among countries and peoples.

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1 The Rural Wings project is co-financed by the European Commission (FP6-IP-516161), the Canadian Space Agency and the National Science Foundation (USA).
as is reflected to the ICT access, applications, literacy and usage skills. This broad definition includes inequalities between countries at different levels of development, between urban and rural regions of the same country and between people of different ethnic group, gender, age, educational level and income. The digital divide brings with it grave disparities in economic opportunities, education, health, safety, housing, employment and even transportation, and as such has an important and long-term impact on society (P. Cohendet (2003), Report for ESA: “The Digital Divide in the European Enlarged Economic Scenario: An Assessment of the Socio-economic Effects”).

The European Union aims at becoming a truly knowledge-based economy, to enhance the quality of life, the working conditions and the overall competitiveness of its industries and services. Through its Europe 2005 Action Plan the Union has set itself the objectives of providing adequate infrastructure for education and medical care and a favourable environment for private investment and for the creation of new jobs, in order to boost productivity, to modernise public services and to give everyone the opportunity to participate in the global information society. To achieve these objectives, widespread availability and usage of broadband and high-speed Internet throughout the EU needs to be established. However, the digital divide in Europe remains large as the rural and less favoured regions lack the same access and supply of internet access and broadband connection as the urban areas have. Even where the rural areas do have access, connection speed is lower (employing early technology) than in the cities. A large number of European households living in remote areas – as many as 14 million – do not have a realistic perspective of achieving access to high-speed Internet before many years. This constitutes a serious obstacle for making the benefits of the information society available to all citizens in the European Union.

Unfortunately, despite the incredible technological advances of the past decade, the digital revolution has not yet touched the lives of many people. In fact, there are indications that the digital divide is actually growing as a result of the new technological developments, as is occurring with broadband access in some countries, leaving the rural communities increasingly behind in the digital revolution: On the one hand, cities and suburban areas offer service providers a ready, high-volume market and provide an incentive to the private sector for developing, installing and maintaining state-of-the-art infrastructure, access and services. On the other hand, local infrastructure developments in rural areas are restricted due to the impossibility of reaching commercial viability. And there is little hope that providers will
develop and maintain infrastructure for services in rural areas (bridging the digital divide) without incentives to built the information highways and policies aimed at bringing down existing barriers for providing the necessary infrastructure (P. Cohendet (2003), Report for ESA: “The Digital Divide in the European Enlarged Economic Scenario: An Assessment of the Socio-economic Effects”).

This is a problem that the European Union and local governing authorities have recognised. The European Union’s eEurope 2005 initiative states that all businesses, schools and universities of present Union members must have broadband access to the Internet by 2005. The EU has also stated its intention to use existing Structural Funds, such as regional and social funds, to facilitate broadband access in remote and rural regions throughout Europe (including the 10 new European countries). Thus, the market place is evolving towards the use of IP applications requiring broadband connectivity (streaming, FTP, News feed, Web-browsing, Video Conference). This is further driven by the fact that reliable and cost efficient broadband access technologies are more and more being deployed. It is thus now becoming more and more evident that the vision of “Education for All” will be realised through the emergent actions for “Broadband for All”.

Figure 1: Learning and teaching in rural schools in Greece, Finland and Peru. Different countries, different cultures several thousands of kilometers away with a common need: “Education for All”.

Can satellite be one of the alternative wireless technologies that can help close the widening digital divide in Europe?

Depending on the required bandwidth and the population density, several access technologies are presently in use: via copper lines, cable networks, terrestrial or satellite wireless connections, fiber optics networks (see Figure 1).
Within the satellite environment, the broadband two-way access is often released in a hybrid form, forward link via satellite and return link via terrestrial manner. Most of these methods even those allowing for high bandwidth capacity, target markets that are typically situated in dense or urban population areas and to a less degree in sub-urban areas, but are certainly not suited for rural and remote areas. This is because either the service (capacity and performance) degrades as a function of distance or number of users, or because the network roll-out requires existing installations or implies large investments thus they are only cost effective in areas where high revenue potential is available. The optimum solution to quickly start closing the digital divide is clearly a broadband fixed wireless access, as wireless solutions have the ability to be both transitory and permanent technologies at the same time. By strategically placing wireless access points, operators or local authorities enable business and home users across wide areas to enjoy permanent access to the Internet at speeds ten to twenty times faster than a traditional modem. The DVB-RCS (Digital Video Broadcast – Return Channel via Satellite) is a solution totally based on satellite telecommunication (without any terrestrial links involved) typically targeting the broadband access networks. It requires asymmetrical connectivity (forward rates of 1 to 10 Mbps and re-
Turn rates of 0.2-2 Mbps) thus is well suited for suburban and rural regions with the potential to address all users in those regions. DVB-RCS, recently published as an ETSI standard, forms the specification for the provision of the interaction channel for GEO satellite interactive networks with fixed return channel satellite terminals (RCST). The standard, developed under the auspices of the DVB Forum, was created through the cooperation of satellite operators and satellite equipment manufacturers, including system providers, hub manufacturers and terminal manufacturers. Companies from Europe, North America and the Middle East have been involved in this activity. DVB-RCS may well become a global satellite standard that allows equipment manufacturers to focus on the same technical solution, thus providing a healthy and open competitive environment, with enormous benefits to industry and users alike.

According to the recent report “Reducing the Digital Divide in Europe – Competitiveness of satellite among broadband access technologies” (Vista Advisers, October 2003) the answer to the question, “Can satellite be one of the alternative wireless technologies that can help close the widening digital divide in Europe?”, is yes technically, but no in its current form of offering, considered as not cost-effective enough for a mass market deployment. As bandwidth and equipment costs remain the main barrier to a mass deployment of satellite access services, it is essential to look for ways to reduce these costs. Two major possibilities are currently being considered by manufacturers and operators, a) reduce the bandwidth cost by using bigger satellite platforms and b) reduce the cost of satellite equipment per user. According to satellite operators and satellite manufacturers, spot beams and frequency re-use on new generation satellites should make it possible to lower the capacity costs by approximately a factor of five. The lower cost of bandwidth should enable more affordable pricing for the satellite ISP’s broadband access.

According to the same report an immediate way to share satellite access costs among small groups of users is to combine a two-way satellite with a Wi-Fi last mile service. The satellite/Wi-Fi combination brings the cost of broadband for remote locations down to the same level as ASDL or cable broadband in metropolitan areas. The fact that both technologies are standard platforms contributes enormously to the low cost. This hybrid solution could definitely stimulate the process of closing the digital divide, even though the business models are still problematical as of today.

However, much needs to be done and understood about these technologies before they can play a more significant role in providing services in
rural environments. Issues of availability, effectiveness, usability, suitability, reach, network design, cost and authorisation, all have to be tackled and understood, both by potential service providers and potential users. It is important that the potential and implications of satellite communications are understood by the final users, in order to influence the way in which services are made available and also to benefit early on from the exciting opportunities they offer.

The importance of the Human Factor: users needs in rural areas

In rural towns and communities the necessity of telecommunications services cannot be overstated: Where growth and economic development is desired, telecommunications infrastructure and high-speed communications to attract new business and industry are essential. Everybody in a rural community - schools, hospitals, businesses, city and county governments, community groups and individuals - benefit from access to improved communications, commerce and information. Underdeveloped communications infrastructure has a direct impact to the economic and social welfare of rural communities: schools can provide limited access to internet resources, remote tele-workers are unable to transfer large data-files between office and home, the local commercial or civic web-sites cannot be accessed rapidly, discouraging a potential customer or visitor from within or outside the community.

The rural-urban divide has a direct impact not only on the access but also on the creation of knowledge. Without access to broadband for example, a researcher has no access to data-intensive applications that are only available to colleagues connected by urban local area network, and a rural automotive designer needs to relocate to the company headquarters to participate in interactive, real-time, computer-aided modeling of a new vehicle. The remoteness of a rural area leads to massive set-up costs. With poor career training and low literacy rates, it is unlikely that a poor rural individual, who values access to the internet and other technologies, will be able to afford the access costs. Thus, large-scale technology initiatives have little hope of success unless at least a basic level of community capacity is in place. “The social structure of creativity relies on the existence of a milieu open to all forms of creativity – artistic and cultural, as well as technological and economic. This milieu provides the underlying ecosystem or habitat in which the multidimensional forms of creativity take root and flourish” (P. Cohendet (2003), Report for ESA: “The Digital Divide in the European Enlarged Economic Scenario: An Assessment of the Socio-economic Effects”). Thus, it is paramount to offer stimulating and creative
environments to support vibrant communities – educational (teachers and students in schools, universities and training centers), scientific (research and science centers), medical (doctors, nurses, emergency units), artistic, local government, business –. This in turn will help to attract those who create in business and technology and to facilitate the rapid transmission of knowledge and ideas.

The contribution of the Rural Wings project

The Rural Wings project will address how the learning needs of rural communities could be served by satellite communications. The objective will be to select the most appropriate applications and propose a roadmap up to the operational status including demonstrations and technical developments in order to promote and facilitate the use of satellite communications over Europe and beyond. This project seeks to use advanced technology as a tool to foster Human Development, in order to use the great potential capacity the new technologies have in addressing major societal challenges. This project places a great emphasis on the pedagogical, social and human development dimensions, where ICTs only play an instrumental role in order to empower people through knowledge, development of creativity and enhanced concerted action.

The project's approach is aiming at the development of a cognitive based open learning system and environment that can generate creativity and a capacity of learning to learn in the users, through the development of a new learning culture. It will offer to the users (students, teachers, doctors and health personnel, farmers, local administrators and public authorities) ubiquitous access to the learning content. The Rural Wings learning environment will be developed through the effective utilization of a wide range of ICT applications for educational purposes (e.g. WebTV channel for students, virtual visits to museums, science centres, research laboratories) based on a participatory methodology in which users will play a very active role in creating additional components, through the creative use of constructionist principles and related ICT technologies. The Rural Wings learning environment will also support the exchange of material between users and experts, it will allow for easy uploads and downloads of relevant material, it will facilitate the direct communication between the users and the networking activities of all the actors involved. Such a service offers high speed two-way connection that gives the opportunity to deliver content utilizing completely the capabilities of multimedia tools. High quality video streaming broadcasted can be delivered to users at school, at work or at home. Real-time on-line seminars can be realized in this way, while
the users will have the opportunity to download simultaneously educational and training material and supporting documents or software according to their needs.

Overall, the Rural Wings project aims to improve the functionality, usability and acceptability of future information products and services through the development of innovative models for the provision of learning services, fully exploiting the potential of ambient intelligence technologies, enabling ubiquitous, interactive, personalized and tailored access to learning and knowledge on demand. It will develop advanced learning schemes at school, at workplace and at home and will encourage lifelong learning, thus reflecting the needs of a knowledge-based economy.

Specifically the Rural Wings project’s objectives are:

- To perform an extended validation process and a usability evaluation during the development and integration to the final system of the technology, scenario settings and services that will be offered to the users. The goal is two-fold: a) to specify all the tasks (users’ activities within the pilot scenarios) that are relevant to the Rural Wings system and to evaluate the users’ task on job demands in terms of characteristics and context and b) to mobilise a large group of stakeholders to take-up the results and create a sustainable plan for exploit them, and to further explore the potential domains of their application. The objective would be

- To determine how the DVB-RCS platform will need to evolve in order to fulfil increasing user expectations and to compare this with current developments that are under way at the equipment manufacturers. The Rural Wings project proposes to develop innovative ways of implementing the DVB-RCS platform in order to demonstrate the huge potential of communication via satellite to the users in rural areas. The objective will be to select the most appropriate applications, and propose a roadmap up to the operational status including demonstrations and technical developments in order to promote and facilitate the use of satellite communications over Europe and beyond.

- To create of a world-wide network of Learning Hubs in rural areas. These centres (in the initial phase schools, public offices and health centres will serve as Learning Hubs) will be equipped with the nec-
necessary infrastructure in order to support the project’s implementation. These Learning Hubs pilot sites will serve as working models and demonstration sites within which the project’s activities will take place. The Learning Hubs should not emulate traditional training centres. The Learning Hubs will be a place for digital creation, fostering the human spirit, civic development and collective efficiency. The tools available should be wide ranging, from computers, broadband access, digital cameras and a variety of supportive software tools (e.g. for creation of web-pages, video capturing and editing).

- **To introduce a new learning culture.** *The aim of this project is not to impose solutions but rather to empower people in all the stages of their life to invent their own solutions.* The project is going to demonstrate the use of a new generation of technologies and applications that enable people to design, create, and learn in new ways, helping them to become more active participants in their communities. The aim is to empower rural communities to both use and generate knowledge that is relevant to their basic needs by developing their local capacity to use ICTs in a creative way that allows them to create sustainable rural livelihoods and improve their quality of life. The Rural Wings consortium will test these ideas and technologies in pilot sites around the world, helping individuals and communities to develop new strategies in their daily activities ranging from commerce to agriculture to health care—and, more broadly, to transform the ways they learn and evolve. The proposed applications are supporting a "constructionist" approach to life-long learning, by helping people take charge of their own learning throughout their lives.

- **To provide a range of learning methods that will enable users to become independent learners.** The Rural Wings project targets several types of users. As each person has different ways of learning and understanding, the proposed competence-based scheme should provide a wide variety of instructional approaches. The proposed methodology has to support learners to work independently, co-operatively and in an increasingly self-organizing way. This will be achieved through the development of different educational scenarios (educational pathways) that will cover different contexts (Learning at School, Learning at Work and Learning at Home), users (students, teachers, doctors and health personnel, farmers, local administrators and public authorities) and will touch upon several subjects from different perspectives. The scenarios will attempt
knowledge construction at several levels: (a) access to information, (b) adaptation of learning material, (c) knowledge sharing and (d) technology potential (depending on the usability and the features they offer) and they will enhance a factor that guarantees success in every educational approach: the “fun factor”. The users will be involved in a series of “learning to learn” situations. As research in pedagogy demonstrates, successful learning can be achieved in authentic situations. Furthermore, very much related to constructivist learning theories, the learner should be encouraged to actively explore “the world” by himself/herself instead of adopting teacher-oriented approaches which are often based on the idea of “knowledge transmission”. In the framework of the proposed activities, the users will be able to personalize a set of resources for reference and problem solving.

• **Provision of eLearning tools that can be used by all members of the local community who are in need of continuous training, education and support.** Apart from the students and teachers, the local community members in need of such support include farmers, people in the tourist industry, small/very small businesses, etc. The key to the proposed framework lies in the decomposition of knowledge into independent, reusable “eLearning modules”. This can be achieved by an efficient representation of knowledge in reusable modules by means of semantic mark-up and by devising algorithms that can efficiently match the requirements of prospective trainees to a sound combination of “eLearning modules”. Professional Development Portals (PDP) will also be created in order to support the proposed activities and to act as stimuli for further communication between the user groups. These portals will be linked to relevant annotated documents, databases and interaction forums and will serve as a repository for locally produced materials, including archives of presented streaming sessions.

• **Utilization of the ICT capabilities for promoting the local community’s interests.** Special attention will be given to the use of ICTs to serve the local community’s goals. The use of ICTs is expected to contribute strongly to the connection of the young people’s education with real life in their community and the transformation of the Learning Hubs to communication centres for social and economic development. This will be achieved with the active involvement of the users (teachers, students, farmers, health personnel, local administrators) in the organization/materialization of activities (sce-
narios) that will demonstrate the benefits of the use of ICTs (self-training and learning, virtual and collaborative applications) for the local community and economy (e-shops for agricultural products, e-newspapers, weather forecast etc).

- **Enhancement of the communication between rural communities.** The aim of Rural Wings is to create a virtual learning community where people will be encouraged to communicate and will get familiarized with the idea of cooperation and networking. The Rural Wings learning environment will be, among others, an integrated communication tool. People will be able to participate to video-conferences, to have electronic discussions with their partners on the problems, to learn about other countries and cultures.

In order for the Rural Wings project to meet its ambitious objectives a multidisciplinary team (satellite communications’ providers/operators, software experts, telecommunications companies, experts in distance and life long learning methods as well as a large number of users’ communities in Europe, Canada, Latin America and Africa) has been established. The consortium is bringing along significant expertise gained from the application of many related research and demonstration projects worldwide (RCST\(^2\), TWISTER\(^3\), ZEUS\(^4\), MUSE\(^3\), SCHOOLSAT\(^2\), AMERHIS\(^2\), BARRD\(^4\), RIA\(^4\), NMB\(^1\), VERDI\(^2\)).

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1 The Rural Wings project is co financed by the European Commission (FP6-IP-516161), the Canadian Space Agency and the National Science Foundation (USA).
2 ESA projects
3 EC projects
4 National Initiatives
References


7. Vista Advisers (2003), Contract No.:17516/03/F/IZ “Reducing the digital divide in Europe. Competitiveness of satellite among broadband access technologies”


According to Mark Weiser, “The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.”

Starting from this point, a really successful project or innovative technology, is the one that succeeds to be part of a solution and not of the problem.

Research Project DIAS, has three axes:

- Advanced Technology. Satellite communication is a perquisite for DIAS project in combination with the Usage of DVB platform for multicast application. Additionally, the project aims to integrate the pre-existing means of communication, specifically ISDN lines that already exist in typical school infrastructure. It is evident that, satellite communication systems offer the major advantage of serving a very large geographical area. Services can be quickly introduced
since coverage is available for everyone from day one. The greek area, with a lot of isolated geographical points, is a characteristic example of difficulties in telecommunication access. Additionally, the satellite digital platform offers the possibility of fast developing new services in efficient way. The success of these services, depend heavily on the acceptance of the end-user. Testing the advanced services is a major issue for a telecom operator before their commercial exploitation.

- **State-of-the-art educational methods.** Teaching Methods for multi-grade schools. On-the-job distant learning for professionals, using all forms of educational material. The participating teachers will be trained in designing and implementing cross-curricula applications, projects and activities. Teachers, in the end of the project, will be able to design multidisciplinary and multigraded learning activities accessible to students functioning at the different levels. The training programme includes extended presentation of case studies and examples of good practice on how teachers can use ICT to face the particularities of the multigrade school environment. Teachers will be trained in order to facilitate positive group interaction and to teach social skills and independent learning skills to individual students.

- **Investment in the rural local society.** Rural schools are important for the local society. The digital divide is a reality, investments have to be made to bridge the gap. The DIAS partnership has set as one of the main objectives of the proposed project to train teachers to become facilitators of social development of the rural community. This is strongly related on developing a training framework that will support teachers to obtain the role in the society that they should possess in the first place. The DIAS project aims at the preparation of the multigrade school teacher to become the facilitator of the transformation of the multigrade school to a core node in its community. The school as a community center serving as both a resource for life long learning development and as a vehicle for the delivery of wide range of services. School resources such as facilities, technology equipment, and well-trained professional staff could provide a range of educational and retraining opportunities for the community.

The DIAS Consortium is comprised of different market stakeholders, each of them conveying its expertise and commitment for the successful deliv-
ery of an integrated solution in the conclusion of the project. Namely, OTE, the Greek incumbent operator, specifically focused in innovative telecom services, providing state-of-the-art technological solutions. University of, Aegean with extensive field-work in multigrade primary schools. Ellino-germaniki Agogi, specifically oriented to implement new technological approaches to education. Intracom, the software provider of educational platform MENTOR. HellasSAT, the greek satellite operator. Q-PLAN, focused in developing and implementing the DIAS handbook guide.

The project started in the 1st of December 2003 and it will end in 31st of May 2005. It is an 18 months research project, with a round budget of 1 million Euro.

The main issues addressed by DIAS approach, aiming to be answered are:

- Greece has many isolated areas due to the geographical morphology of the country. Mountainous country with many scattered islands.
- Information technologies are not widely accepted in education and internet penetration is low (11% for Greece).
- There exist 2.558\textsuperscript{1} multigrade schools in Greece (43.5% of all schools).
- The teachers of multigrade schools are usually inexperienced and stay only for a year in this school.

The main focus of the DIAS project is to deliver a unified solution for professional education to primary multigrade school teachers by developing an advanced learning environment. It includes the development of a training scheme specifically designed for multigrade primary school teachers. This encourages the teachers to overcome the difficulties caused by the fact that they have to use methods and implementing curricula in multigrade schools designed for mono-grade schools.

The multigrade schoolteachers will be trained on multigrade teaching methodologies and instruction strategies so as to be able to meet the requirements and demands of high quality teaching throughout their career. Also, they are trained on the

\textsuperscript{1} Data provided by University of Aegean
application of incentive-based strategies aiming at increasing the primary school completion levels and mainly they could act as facilitators of the local community development.

Additionally, DIAS project will serve as a driving force in:

1. The development of a training scheme specifically designed for multigrade primary school teachers, based on the continuous interaction between theory and practice.

2. The familiarization of multigrade teachers with the use of new technologies and the new roles that are assigned to them in the new school practice.

3. The continuous evaluation of the training scheme and the adoption of a teacher centred approach in the training program’s evolution.

The technological approach of DIAS project, has four main elements; OTE’s Digital Broadcast Platform, the Mentor software for content delivery, the usage of telecom existing infrastructure for the return channel and the IT infrastructure at school classes.

The OTE Digital Broadcast Satellite (DBS) platform is operating on a commercial base 8 months now

The basic concept of Elearning software (MENTOR) is to deliver interactive computer-based training sessions through collaboration and content presentation tools, namely shared whiteboard, text editor, HTML browser, application sharing etc.

In DIAS project, the main characteristics of elearning approach are:

The instructor of each session has total control over the shared applications and resources of the system. He/she may allow participants to communicate with him/her or each other, access the shared applications or restrict them from doing so, should he/she believe it is necessary to do so.
Synchronous and asynchronous training sessions and presentations.

A real-time video stream is broadcast from the instructor’s site to all participants and is visible to them at all times. The source of this stream can be a camera pointing to the instructor, or a VCR, or multimedia rich content.

All students have the capability to submit their questions or comments, either by typing in the public chat utility or (should they obtain permission to do so) by speaking to their microphones and letting the platform broadcast their comments to all other participants.

Concluding, DIAS project with its strong partnership (diverse fields of expertise) conveys the promise of delivery the “real” service. With state-of-the-art technology solutions that hopefully will “disappear” for the end-user and business considerations concerning the deployment of the service the DIAS Implementation Guide will serve as a practical handbook for all potential stakeholders.
A critical review of the role and the usage of Information and Communication Technologies in Education

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1. The traditional teaching and learning model and the need for changes in education.

The scepticism developed concerning the role and mode of using computers in education can only refer to the issue of the notional definition of fundamental pedagogical terms as those of teaching and especially of learning. Until recently, learning was considered to be a process in which students accumulated knowledge mechanically. Founded on the principles of behaviourism and on operant conditioning learning, this approach ignored the meaning of the role of the mental functions in learning and in the principles of cognitive psychology. Therefore, students, according to the well-aimed expression of Soloway, could be compared to empty vessels in
which knowledge is channelled\textsuperscript{1}.

The conventional teaching and learning model was the inflexible Analytical Programme (curriculum) and the quantitative evaluation performance. The cognitive subjects included in the Analytical Programme were fully limited and clearly distinguished. The evaluation of students’ performance in these programs consisted in the quantitative expression of the students’ ability to reproduce knowledge.

The educational reality which has just been described is in full opposition to the attitudes and practices of contemporary Pedagogy. The conventional teacher-centered education model is ineffective and old-fashioned. An innovative change is therefore required to the structure and character of the whole educational process. This need for change is based on two main reasons\textsuperscript{2}:

Firstly, the failure of the conventional model, because of its qualitative as well as in the quantitative results and on its weakness to amplify learning abilities. Both these assertions have repeatedly been reconfirmed in Greek and international research. The second reason relates to the rapid social changes occurring nowadays. Our world is changing at a very fast pace.

Our society is moving from the industrial period to the period of informatics\textsuperscript{3}.

It seems that mobilization of all social and educational factors is necessary for the dynamic modification and evolution of the educational process. The new information and communication technologies constitute one of these factors due to the new potentials they offer. Before examining the possibility of the contribution of these factors to the upgrading of the educational system, and to the improvement of the teaching and learning process, we consider it necessary to refer to a series of fundamental issues, which concern the mode and the assumptions of introducing and using them in education.

\textsuperscript{1} Soloway E., Quick, Where do the computers go? p.29
\textsuperscript{2} Kynigos Ch. The Opportunity that must not be lost: The Computer Technology as a tool of expression and investigation in General Education. p.1-2
\textsuperscript{3} Soloway E., p.30
2. Models in the use of computers in the framework of education.

The models for the use of computers in the school environment are three⁴. The first model is encountered in international bibliography under the term: “isolated technical approach”. It focuses on the provision of knowledge regarding the way of function and use of programming especially of BASIC. The skills provided according to this model are considered as constituent elements of a special, private lesson and have pure technical character. Theories and research findings on significant issues on pedagogical process, such as the teaching methods and the modes of learning are not included in the speculation of the model. Also, as regards the issue of the relationship with the remaining cognitive subjects of the Curriculum, this model is based on the practice of a clear division of cognitive subjects. The use of this model is increasingly declining particularly in the developed countries.

The second model is expressed with the term: “factual approach”. This model focuses on the diffusion of teaching the use of computers in all the cognitive subjects of the curriculum. In the framework of the model, emphasis is placed on the cognitive and social parameters of the use of computer technology in education. The strictly technical knowledge, as is the knowledge of the way computers function or the skills of programming are significantly reduced in the framework of this model.

The third prototype is expressed with the term: “integrated approach”. It concerns the most recent prototype of the three. The teaching of using new technologies and computers is allocated in different cognitive subjects of the Analytical Programme. In the framework of this model emphasis is particularly given on teaching the use of simple educational programmes. The model also focuses on the socio-economic and cultural dimensions of the use of computers, specifically through all the subjects of the Analytical Programmes. The knowledge relative to computers must not be offered to the student in the framework of a separate and independent lesson.

The last model is the most widespread model in the last years in the European countries and especially in the European Union countries. The two previous models echo older perceptions on the role of computers in Education. Therefore, the first model prevailed in the 70s while the second prevailed in the 80s.

⁴ Kontoyiannopoulou-Polidoridi G., The Educational and Social Dimensions of Using New Technologies in Schools p.3
3. Speculations connected to the way of using computers.

Technology and its achievements are ethically neutral meanings. They do not contain intrinsic ethical categories. The ascription of ethical characteristics, such as good, bad, beneficial, harmful etc is the result of the way of evaluating their use. Therefore, the role of computers in Education depends on the way they are used in pedagogy and other theorizations on which this use is implemented.

At this point we will briefly report the speculations emerging from target less and unsuitable approaches in the use of computers in Education. Later, in a special chapter we will refer to the specific problems in the mode of using computers in Greek schools.

The introduction of new technologies of information and communication in the educational process was made in many cases, unwisely, without programming and mainly, without the necessary foundation on the principles of cognitive psychology and on contemporary pedagogical theories. Hence, computers were used as methodology tools of amplifying the traditional model of knowledge accumulation. With computers the student can treasure more desultory knowledge in very little time. This approach does not appraise the significance of the role of the cognitive work in the learning process. In other words, it ignores the contemporary attitudes of cognitive psychology. At the same time, it does not take into account Piaget’s theory on knowledge structuring and the importance of structuring new knowledge in the student’s previous cognitive equipment.

The absence of dialogue, however, together with the pedagogy and psychology, led to speculations related to the mode of learning. The use of computers as media, which facilitate the collection of knowledge in the framework of the traditional mode, amplified the student’s passive role in the teaching and learning process, which continued to be boring and sterile.

Speculations are also encountered in the content of teaching computers. So, when teaching computers is carried out according to the principles of the first model aforementioned, that is to say according to the model of isolated technical approach, it was proved that all the females and the financially weak students are discouraged with this teaching and in the end

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they become isolated⁶. Also, the thought of teaching the use of computers as teaching an independent lesson and not in the Analytical Programme, deprives the students of the opportunity of experimenting with the possibilities offered by their use in different subjects of the Analytical Programme. It is also possible in the future for such a subject, to be marginalized or even to become optional resulting in the de facto exclusion of the female students and of the students coming from the lower income families⁷ and in the long term transformation of a selective group of graduates.

Other problems can arise as regards the kind of computer tools selected for use in Education. A characteristic example is multimedia. Their entry into schools was enthusiastically accepted. However, a careful study of their way of use leads to the formation of certain preservations and speculations, the most significant of which are the following⁸:

a) The pedagogical framework in which the use of multimedia must be integrated is not often specified and neither is the educational purpose in which it must aim at. The programme designers for multimedia, influenced by their enthusiasm in the great technical abilities of multimedia and without the valuable advisory guidance of scientists from the Pedagogy environment, produce work adapted to the multimedia demands. On the contrary, what is required is the multimedia use in order to serve the teaching-learning targets and needs.

b) Multimedia is able to pose other restrictions, specifically in relation to the use of video. Very good videos are difficult to come by and are often costly. To produce such videos, highly specialised technical personnel is required. An interesting alternative proposal is to give students themselves the possibility to experiment with video. In the framework of an active learning process, students plan and use the programmes themselves making use of the camera. In this way, the solution to overcome difficulties that relate to the use of multimedia, probably lies in self-activated learning. However, it must be stressed that such an approach has had very few applications until today. This is due to the particularly expensive equipment required for the production of such project by students, as well as to the lack of specialised teachers and other personnel, who must

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⁶ Kontoyiannopoulos-Polydoridi G., page 3
⁷ Kontoyiannopoulos-Polydoridi G., page 3
⁸ Harvey B., Against multimedia, page 1-3
offer, whenever required, their advisory support for the students’ project. Even if all the above preconditions are met, it will still be difficult for students to continue their efforts and the most probable is that they will resort to professional video.

c) Another noteworthy aspect of the multimedia use, still compared to the video, is the similarities it shows to the way events are presented on television. So, the use of video, as in the presentation of television news, can be focused on events with striking dramatic effect, as is for example violence and various forms of disaster, the brief duration of presenting each event and of course celebrities. Therefore, the use of video in the framework of multimedia use reproduces the television model, where knowledge sought through printed matter is abandoned and it promotes a new kind of education of informative character.

d) Multimedia can in fact, limit students’ freedom. They provide the illusion of interaction of the user with the computer, which allows the first to freely exert his control on the second. In essence, however, the alternative options for the user are already assigned by the programme and the only possibility of control the user has extends to the choice of one or more of these options.

Concluding we must emphasise that some of the speculations detected in relation to multimedia, are possible to be observed in other computer media, too. What is needed is a programming language with the help of which students can discover their own tools.

Following the negative approach of the use of computers in schools as described above, we will attempt to refer to some basic principles, which must govern the use of computer technology in the school environment.

4. The use of computers and contemporary social reality.

One of the main purposes of education is man’s promotion as carrier of culture. This assumes knowledge in the cultural happenings and the creation of an educational system harmonized with the needs and demands of contemporary times. Today’s school must equip students with suitable skills and knowledge which will allow them to successfully respond to the

needs and demands in their work and in the wider social environment.

In tomorrow’s working life, today’s students must have the ability of continuous learning of new things. They must know how to apply new information and knowledge; they must have the ability to set goals and to make choices, to collaborate in competitive competition as well as in intensive communication. Schools, therefore, must teach students to set goals, to evaluate, to choose and to make use of information. In other words, schools must not focus on “teaching materialism”, but on shaping people who know the ways of seeking knowledge and of how to acquire knowledge.

In the framework of this approach, computers can prove to be suitable means of expression and of students’ self-active learning, within conditions of fertile co-operation.

The specific activities, in which students can perform using a computer – and which are on the one hand especially useful for the future and successful confrontation of problems in the working environment and on the other hand for the reinforcement of their learning abilities- are the following:

a) The symbolic expression and the investigation of logistic and mathematical intelligence levels in the subjects of Physics and Mathematics, with programmed applications.

b) Experimenting with workshop simulators or with different situations.

c) The expression in written speech, with word processors.

d) Filing, classifying, organizing, process, analysis, seeking and presenting of information with systems of handling database.

e) Communication with computer networks and telecommunications.

f) Free and linear design with design applications.

g) Devices and control technology (robotics)

10 Kynigos Ch., p. 5
11 Soloway E., p.30
12 Kynigos Ch., p 5
5. The use of computer technology and contemporary pedagogical and psychology theories on cognitive development and learning.

Everyday educational process aims in the unwise and unsystematic transmission of knowledge. Its theoretical background as well as its practical extent is grounded in the theory of learning with classical substitution and on the theory of operant conditioning deriving from behaviourist psychology. Students are regarded as “tabula rasa” where knowledge is recorded and is acquired without their active involvement, through a complex of continuous links of stimulations without reactions.

However, the functional evaluation of the use of computer technology in Education presupposes the abandonment of out-dated and unilateral approaches of the psychology theory of behaviourism. It presupposes mainly the theoretical and practical grounding of this use in the theory of Cognitive Psychology regarding information process and Piaget’s and Vygotsky’s views on cognitive development and learning process.

Cognitive Psychology focuses its interest on investigating the question of how we learn. First of all, as regards Cognitive Psychology, learning has a dynamic character and is unbreakably connected with a person’s active involvement. Learning is “the result of a series of compound and interrelated cognitive functions”. During these functions the information process obtained takes place. Information process consists of transformation- in other words coding- of information, of comparing and contrasting them with the already stored in memory data, of rejection and use of information.

Based on this model of processing information, suggested in Cognitive Psychology to describe and interpret the phenomenon of learning, man’s role of cognitive mechanisms become obvious. These mechanisms mobilize in order to codify, to analyse, to classify, to evaluate and to select the information to be stored and evaluated.

Piaget’s and Vygotsky’s theories on the other hand, provide pedagogy and Education with two very important views:

a) With the description of the stages of the cognitive development, Piaget indicated that thought in a child is evolved and shaped qualitatively.

b) On the other hand, besides the feeling of pessimism that his view brought, regarding the time priority of learning against maturity\textsuperscript{16}, Piaget demonstrated the importance of personal experiences acquired in the framework of social environment.

c) Based on the above points we can deduce that the use of computers in schools must offer students the possibility of expression, investigation and independent experimenting. Since learning has proved to be a dynamic active process, which is reinforced and enriched in the framework of conditions of cooperation and communication of students, computers must be used by students in an environment of self-action and group work.

6. Teaching the use of computers and the Analytical Programme.

In the previous chapter we referred to doing away with the model of isolated technical approach, which adopts the approach of teaching the use of computers in the framework of a private, separate subject. The consideration of computers, however, as means of expression, which reinforce the student learning abilities renders their extent of use necessary to all cognitive objects of the Analytical Programme. All subjects of the Analytical Programme can— with the suitable modification and reformation— be enhanced and become more effective from the aspect of teaching methodology, with the assistance of personal computers.

The most significant positive consequences of the widespread use of computers in the various subjects of the Analytical Programme are the following\textsuperscript{17}:

a) Securing the continuation of reasoning between school and new technologies. If the use of computers constitutes a component of every cognitive object of the Analytical Programme, then in future, this use cannot but continue to be an inseparable part of the educational process as well as of the whole school life.

b) When the use of computers becomes part of the everyday educational process in all subjects, then equality among students can be achieved. The computer is a device, which offers equal access to

\textsuperscript{16} Kynigos Ch., p.6
\textsuperscript{17} Kontoyiannopoulou-Polidoridi G., p.7
all, regardless of gender or their socio-economic situation (we re-
mind that research proved the distancing of female and of the finan-
cially weaker students from using computers when this is taught as
a separate cognitive object).

c) The diffusion of the utility of computer technology in various sub-
jects will constitute the driving force for enhancing the initial training
as well as for the post-education of educators of all specialities. The
issue of teachers’ training and post-education will occupy us with
more detail later. What we wish to underline here, is the importance
of teachers’ familiarization with computer technology and its poten-
tials regardless of their speciality. If teaching the use of computers
is real and specified in the framework of an independent separate
cognitive object, then only graduates from schools of computer sci-
ence and teachers of mathematics will be able to have access to
knowledge regarding computers.

d) Educators of the remaining specialties are hence excluded from
such skills and are discouraged from occupying with them result-
ing in adopting a negative attitude towards new technologies and
their social dimension.

e) The spread of utilizing computers in all subjects will assist to the
upgrading of the quality of these subjects and the reinforcement of
their participation of students in the educational process.

f) The use of computer technology in everyday educational practice
and in a variety of learning situations facilitates the transfer of com-
puter literacy to other curriculum and extra-curriculum circumstanc-
es, which require implementation of this knowledge. Acquisition of
everyday experience with the utility of computers in all cognitive
objects makes students able to use in a creative and flexible mode
the knowledge obtained on computer technology in order to solve
different problems.

Computer technology and the initial training and life long learning of educators.

No educational change can be achieved without the teachers’ participation.
The effective and pedagogically grounded use of computers in education
requires educators with suitable cognitive equipment and of inter-discipli-
nary character.

Educators’ preparation for the appropriate teaching of the use of comput-
ers must begin from the time they are undergraduate students. It is essential that future teachers acquire knowledge not only of the technical features of the computer but also of the pedagogical potential offered and to the social dimension of its utility. More specifically, the initial training of teachers should involve\(^{18}\):

a) To provide knowledge of all skills that the utility of computer offers in teaching. Only in this mode will tomorrow’s teacher be able to take advantage of the computer and use it as an audio-visual medium for teaching.

b) To incorporate knowledge from the Pedagogy domain required for the use of computer as a teaching tool in educational programmes.

c) To offer knowledge deriving from the Cognitive and Elective Psychology on cognitive and psychological characteristics of students’ age groups, so that the teacher will use the suitable teaching method in teaching the use of computers.

The above points lead to the formulation of the need to augment the research activity of Universities and specifically of the departments of science training in the field of pedagogical foundation of the use of new technologies.

Particularly important for the issue of teachers’ training and post-education we consider the following two formulations\(^{19}\):

a) What is essential for the appropriate use of computer technology in school is the review and the redefinition of the teachers’ role. The teacher cannot rely on the teaching authenticity model. The teacher’s role is not that of the wise, exclusive knowledge carrier, as it happened in the teacher-centered school.

The teacher should maintain the role of the intellectually mature and cognitively co-assistant of students in the research route to seek truth and knowledge. He does not order students but encourages them in their project for active self learning, learning with them at the same time. We could say that the teacher’s contemporary role should echo some of the fundamental characteristics of the peda-

\(^{18}\) Kontoyiannopoulo-Polydoridi G., p.4
\(^{19}\) Kontoyiannopoulo-Polydoridi G., p. 8
gogical model, which Socrates embodied. As the great philosopher and teacher founded his “midwifery procedure” on his faith in the ability of his conversers and students to discover themselves – with the appropriate power of the dialogue- truth and knowledge in the same way does the contemporary teacher encourages the self-action of students and their experimentalism with new technology, developing equal conversational relations with them. At the same time, based on the research data, which proves the enhancement of learning ability in the framework of group work, he should encourage cooperation and communication among students during working on computers. On the whole, we would say that the teacher must create an atmosphere of freedom and self-action in which students will be encouraged to investigate the potentials of the use of computer and to use it as a tool of creative expression.

b) Teachers’ further education on new technologies and on pedagogical and social context must not be a mere change. On the contrary, it must be a continuous process. A mechanism of teachers’ continuous education must be developed to support their teaching work and to equip them with the essential technical and pedagogical skills, which relate to the use of new technologies in Education.

7. The use of computer technology in the Greek school: problems and prospects.

The introduction of computers in the Greek education system was decided on a central level. The teaching of the use of computers is approached based on the strictly technical model, which foresees the creation of a specific lesson for computers. Integration of this subject in Education started in the Technical and Vocational Education. Therefore, the targets in teaching this subject were of a technical and professional character. They reflected the orientation of the Technical and Vocational Secondary Education to equip students with skills necessary and useful for their future professional role and their successful response to the demands of their working life.

This kind of targets is certainly quite unsuitable for Primary and Secondary General Education. What is required here is to reset the goals concerning the teaching of the use of computers in General Education and the specification of the pedagogical framework from which this teaching is sourced. In other words, a transformation of a new educational strategy is required
concerning the use of computer technology in the Greek school, which must pursue\textsuperscript{20}:

a) the radical change of the teacher’s role in Primary Education and in Secondary Education and his becoming a pedagogue with his participation in continuous processes of further education,

b) the reinforcement of learning processes of a creative structure of knowledge of critical choice and collection of information from a collaborative learning environment,

c) the development of a permanent technical infrastructure for the support of computer systems of schools

d) the continuous evolution of pedagogical technology, software and the required technological tools for all the subjects of the Analytical Programme,

e) Prevalence of a decentralized perception regarding the educational process, which presupposes activities, such as the development of many sources of information, decision making based on the processes of decentralization regarding teaching methodology issues and analytical programmes. All this of course entails efforts to secure a continuous education for teachers.

8. Brief conclusive thoughts.

The use of computer technology in Education is a must and the imperative need of our times, an essential response to the demands of social happenings. The mode of this use, however, is an especially critical and multidimensional problem, which must be confronted with caution. Computers can be used in education as tools to improve teaching and teachers’ work as well as students’ capabilities in all subjects of the Analytical Programme. Indeed, for some of these subjects as is for instance Environmental Education, which has a pioneering and interdisciplinary character, the use of computers is probably the most suitable factor for their most effective teaching.

In general, the use of computers, in the framework of suitable social, peda-

\textsuperscript{20} Kontoyiannopoulou-Polydoridi G., p.4
gogical and institutional conditions, can constitute a basic driving force for the radical restructuring of education as a whole.

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The view of teachers for the function of multigrade schools

Polyzois Babouras
General Secretary, Teachers Union of Greece

Teachers Union is very sympathetic about multigrade schools. This is not irrelevant with the distance that separates multigrade schools from the main urban centers and with the depopulation or Greece’s rural areas. Everybody has in his mind pictures of empty schoolyards, pictures of one teacher with just a handful of students and these pictures in the minds of people in the cities are reinforced from time to time only with TV shows about the Greek periphery.

Our experience is very emotional when we recall these few children’s faces looking at their teacher and absorbing every word, every motion.

A teacher in a multigrade school faces isolation and the lack of infrastructure. He or she also has the obligation to reduce this inequality between rural and urban schools. But teachers of multigrade schools alongside
with students are neglected too. Further education seminars are scarce and with limited scientific weight.

Apart from the teaching problems, bureaucratic procedures regarding the way a school operates, add up to a rather unclear picture of an administrative system that is questionable for its effectiveness.

There are not many solutions to the above mentioned problems. A teacher can educate him/herself by using books. One can also use the Internet in order to exchange information, ideas and opinions with other teachers. Even though there is legislation for special centers for teachers’ training, these centers were never materialized. Even many school advisors lack the necessary skills to use the computer or the Internet.

Teachers were supposed to be trained in the use of computers through the “Information Society” initiative. But this initiative was rather segmental and still remains the only attempt of the state to introduce the use of ICT to teachers. It must be noted that the majority of new teachers -the ones that serve in remote and multigrade schools- have the necessary computer skills because they were familiarized to their use during their academic studies. This fact is quite hopeful and promising for the future of ICT in education.

The cost and the quality of ICT is a cause of some concerns. It is true that the cost of hardware and software today is significantly lower than in the past. But it is also true that the cost of upgrading both hardware and software can not be met by the limited amount of money a school is funded. This problem is more intense in small schools.

Recently, teachers from the secondary education were given the right to teach informatics in primary school. This act is a derailment from the prime objective to use ICT as a tool for the students to better understand a lesson. We could add that Teachers Union Of Greece and all the Departments of Education of the Universities, agree that teachers specially trained in ICT must have the right to teach computer related matters.

After all these, efforts like the projects MUSE project and DIAS seem the only solutions that are capable in providing high quality teachers’ training in ICT, we dare to say far more advanced than the one provided by the state curriculum.

This kind of projects can undoubtedly function as “windows in the world” and it is impressive the fact that they were designed for students and
teachers in the most disadvantaged areas. With this kind of initiatives, their disadvantage may -after all- turn out to be an advantage.

Teachers Union of Greece actively supports such of projects. We believe that ICT can be an important tool in order to upgrade quality in education, without adding further load in school’s timetable. Furthermore, ICT can upgrade the role of the teacher, as long as the working rights are respected.

We are interested in knowing the opinion of the Ministry of Education in this matter. We also look forward for the continuation of the “Information Society” initiative. At last we expect the official opinion of the Pedagogical Institute in the above.
Evaluating distance training programmes for multigrade school teachers: The case of the DIAS project

Evaggelos Tsiopoulos
QPLAN

Introduction

DIAS project (Satellite Network of Isolated Schools) aims to exploit the advanced satellite communication networks, so that multigrade schools of Greece will be multiply supported. The main idea is to qualify these schools so that they will not only provide Primary Education, but they will be upgraded so that they will function as training and qualification centers for the population of the geographically isolated areas in which they operate.

For the specific case of multigrade schools, distance training is probably most suitable, compared with other forms of training. In spite of distance, online training can be cost effective in comparison to other training schemes. Teachers do not have to travel to participate in training programs, so that school may remain in full service. In addition, distance online training has
the advantage that allows teachers to pick their own rate of training.

The guide that was developed for this effort aims to provide the necessary instructions so that the effort invested in the project will be continued and multigrade school’s problems will be tackled and distance training will be further developed and used. For that reason, main tools and methodologies to be implemented are included in the guide, describing how the satellite can be used as a distance learning tool. In addition, the relevant tools and methodologies used by the partnership are included so that project’s development will be achieved.

Finally, for DIAS project a complete evaluation and improvement plan has been developed, based on details and crucial parameters for the success for such a project, aiming on the definition of its advantages and disadvantages and on the proposed actions for the projects improvement. This plan was presented during teachers meeting with the scientific team and partners, evaluation and project’s improvement after implementation plan was presented by Q-Plan. Critical parameters and dead lines were also declared. In details:

Evaluation plan will focus in three fields:

a. Technological aspect: for the evaluation of the technical matters of the program (software, hardware, accessories, communication etc), and parameters such as friendliness of use, functionality, reliability.

b. Educational material: for the evaluation of the educational material which was used for training of the teachers (structure, cover of teaching needs, clarity, variety, integrity, attractiveness)

c. Educational procedure: for the evaluation of the manner that educational material was handed to trainees (organization / design of educational procedure, educational method that was selected and degree of its implementation success)

Ad hoc, DIAS project aims to the following:

- Development of specialized training program for multigrade teachers
- Improvement of teacher’s professional skills and development of their abilities to design their own lesson plans according to the traced needs of a multigrade school environment
• Presentation of a model providing constant training and support in multigrade school’s teachers.

• Exploitation of ICT for the support of local community issues.

• Formation of quality indices of multigrade teachers’ training

• Contribution to the communication of multigrade schools with the broader educational community.

• Assessment of advanced technology systems and services for educational purposes.

To examine the value of the training program and the degree of achieving the above targets, a number of evaluation parameters were defined with respect to the three aforementioned fields: Technology Used, Educational Material, Educational Procedure.

In details, the evaluations parameters will examine the following three fields referring to the structure of the project’s material:

A. Technology used

1. User friendliness parameter
   • Pre-required knowledge so that trainees will be capable of using the software
   • Difficulties that occurred during use

2. Effectiveness
   • Data connection speed
   • Technical obstacles that occurred during the project
3. Functionality
   • Quality of provided video, images, sounds etc
   • Simplicity of repair, possibility of distance repair, sending instructions for in situ repair, solving the problem

4. Reliability
   • Frequency of appearance of a problem
   • Types of presented problems
   • Possibility of alternative solutions – development of scenarios

B. Educational material

1. Structure
   • Coherence of content
   • Simplicity of navigation

2. Integrity, cover of needs
   • How much information did trainees receive?
   • How much of it will they use?
   • How easily will they use what they were taught?
   • How effective is the material? (in relation to the pupils of the trained teachers)

3. Clarity
   • Is content clear?

4. Variety of material - attractiveness
   • Is content interesting?
   • Is it flexible? If circumstances vary, can it be adjusted?
   • Does it cover a variety of fields?
C. Educational Procedure

For the satisfactory provision of the educational material, its clarity and its adequacy to support trainees to develop these attributes that will allow them to implement the freshly attained material in class, it is necessary that an effectual educational procedure will be developed supporting educational material. This procedure was developed from the scientific team participating in this pilot implementation of the project. To evaluate procedure’s efficacy and to propose improvement actions, the scientific team had in mind the following parameters:

1. Organization - design
   - Adequacy of project’s thematic areas (Are they proper and useful for achieving the targets of the project? Are they structured with this criterion in mind?)
   - Designing the lectures
   - Flexibility of project so that it will serve trainees’ needs and facilitate the teaching procedure (e.g. timetable)
   - Organization and structure of the project according to trainees’ capabilities

2. Educational method
   - Use of project’s capabilities (To what degree trainees use the capabilities of the training program?)
   - Educational tools
   - Subject’s structure

3. Materialization
   - Effectiveness (materialization of aims in C.1)

Evaluation tools

For the implementation of project’s evaluation three tools will be used, for which is believed that in combination, may offer an overall picture of the project and the pilot implementation and may unfold possible mistakes, omissions and fields that the program admits improvement:

1. Questionnaires filled by both trainers and trainees during the pilot
project’s implementation. Questionnaires include open and closed questions, as well as free fields in which trainees may record their opinions, add an observation which is considered to be crucial or deposit a proposal which is expected to ameliorate the project.

2. **Video recording** of the teaching procedure, of the teacher’s outside class action regarding implementation of the educational material in which they are trained and of the teacher’s inside class action regarding implementation of the educational material in which they are trained. Video recording will take place, during teacher’s training procedure, but also after training procedure is over and during the offline possibilities that the training platform provides. Finally, another object of video-recording will be the duration of multigrade in-class, real conditions teaching. In that way the evaluators will be able to judge whether teachers have altered their teaching techniques, consolidating new techniques taught from the project.

3. **Conversation** with teachers regarding matters relevant to their multigrade teaching training. It is all about an open and constant conversation during the visitations of the scientific team to schools. Teachers will have the chance to record their opinions regarding the project, the obstacles that popped up and any relevant, additional observation. Via these discussions, the scientific team will have the chance to comprehend in depth teacher’s needs and to develop more concrete improvement strategies.

Educational procedure with which educational material will be delivered to the trainees is divided in two phases. Each cycle will be a separate, self contained scenario of educational procedure and is developed to be evaluated independently. After the completion of both phases, and after data is all collected and improvement ideas formed, final evaluation and comparison of both training cycles will be materialized in order to detect whether correctional actions were achieved, whether project was improved compared to its initial form and which are the alternative improvement scenarios for future implementation of distance training in isolated areas. The process for the evaluation of each of the two training cycles will take six stages:

1. Dispatch of Questionnaires to the teachers

2. Filling in and submitting Questionnaires to the evaluating partner(s)
3. Editing of Questionnaires – Definition of Critical Points
4. Visit to schools, conversation and video recording
6. Improvement suggestion and their implementation in the following stage of the project

The procedure to be followed appears in the following figure:

Critical dates for the evaluation of the project are:

a. September 2004: Submission of Questionnaires for the evaluation of the existing situation
b. 15.10.2004: Start of the first cycle of Pilot Educational Implementation
c. 24.11.2004: Deadline for submitting Questionnaires for the first cycle of Pilot Educational Implementation
d. 02.12.2004 – 12.12.2004: Visits to schools
e. 15.01.2005: Start of the second cycle of Pilot Educational Implementation
f. 24.02.2005: Deadline for submitting Questionnaires for the second cycle of Pilot Educational Implementation

g. 05.03.2005 – 15.03.2005: Visits to schools

The above actions and delivery dates appear in the following Figure:

Figure 3: Timetable of Project’s evaluation
Experiences from the MUSE project

J. Paasimaki

Chydenius Institute - University of Yuvaskyla Finland

Chydenius Institute is a university centre located in west coast of Finland. Our administration is under University of Jyväskylä. At the moment there are five departments in Chydenius Institute:

- Teachers Training
- ICT- Department
- Continuing Education
- Research Department
- The Open University

My unit is continuing education and I like to tell you few words about teachers’ continuing education in Finland.

We provide continuing education for individuals and organizations. We try to cope with the changing demands of working life. Useful methods for us
are multimode teaching and collaborative learning. Important for us is to use good development ethics.

Continuing education of this kind is available in the fields of teaching and education, social work and health, and for both companies and corporate bodies of other kinds.

In Finland the national board of education gives the guidelines and funding (2-5 study weeks) for teachers continuing education. We are following the national education policy which basically means life long learning for teachers. The most important target is to help teachers occupational development. Long programmes (like MuSE training programme) are more effective than shorter ones. As we are working in the university the scientific background for training programmes are the most important aspect. That means that we are using the newest knowledge and methods in our training programmes.

The Finish school system is well-known and works quite effectively. First step is Pre-School Education which is not compulsory at the moment. Basic Education is compulsory (grades 1-9) and it can be divided in the Primary schools (1-6) and lower secondary (7-9) school. Then comes Upper Secondary Education and Vocational education. Higher Education in Finland can be divided to universities and polytechnics. Adult Education and Training is also important and is a continuously growing sector in Finlands school system.

In Finland every teacher and school has to follow our national curriculum. It also gives guidelines for multigrade teaching as following:

“In multigrade teaching, there can be a different number of hours per week in some subject areas, within the same classroom, to cater for different year groups. It is also possible to rearrange the teaching hours for different subjects over the school year. It is also possible within the curriculum to define learning hours for a multigrade teaching class as learning units, without stipulating for which year group. However, this must be in accordance with section 11 subsection 3 of the basic education statute 30% of our schools are small schools, but there is still not enough teachers training in our universities”

At the moment the leading authorities in Finland believes that we have too wide schoolnet (too many schools) so it means that we have to shut down more small schools and make bigger ones in order to save money. You could think that it also will decrease multigrade teaching in Finland. The
situation in the future could become opposite what we think now. As there will be less schools there will be also less pupils because of low birth rate. There is a chance that we have to increase multigrade teaching even in schools that are big now.

As the MuSE project started in Finland, we made evaluation about multigrade teachers needs. The results were as following:

Teachers needed co-operation between the preschool education and the first grades of the primary school. Also they wanted to know more of the learning methods which are suitable for multigrade teaching. Social growth and teacher’s possibilities to influence it was one area where teachers needed more knowledge. The didactical aspects of multigrade education and teaching, materials, new ideas and exchanging teaching tips were important for them. Seminars by sociologist or psychologists were also in the list of needs. Our new curriculum was raising questions: how to do it and how to deal with it. Teachers felt that there should be more appreciation of multigrade schools and they hoped more possibilities with continuing education and the international co-operation.

I believe that MuSE-project has helped a lot solving these needs multigrade teachers had in our project schools. We had the same MuSE teachers training programme than teachers in Spain and Greece. Then we had additional ICT-training to get a little further. I will tell feedback of that training later.

MuSE has built networks between schools and educational departments of universities.

It has increased the way multigrade teachers think about pedagogy and teaching methods.

We believe that MuSE has build the platform for the work in the future where we are expecting more and more multigrade schools and classes.

The most important is in this project that we have been working and creating possibilities for new innovations for multigrade teaching. There are lot of possibilities for more innovative teaching.

Teachers and schools can make individual study plans and curricula for pupils that will lead to totally nongraded teaching. In Finland we have experiences for that kind of a teaching even in bigger schools. The new E-learning environments are tempting solutions to use ICT-based learning more in multigrade school teaching. Distance education is possible way to give lessons for instance from the training schools to small multigrade school.
It can be also one way to give teachers training in the rural areas. New teaching methods like inquiry learning can be used in multigrade teaching. (What is inquiry? Inquiry is a dynamic approach to learning that involves exploring the world, asking questions, making discoveries, and rigorously testing those discoveries in the search for new understanding. However, inquiry is a tough concept to pin down. It is complex, multifaceted, and looks different in different classrooms and contexts).

New teaching materials and books could give the easiest solution in order to follow the multigrade curriculum. All these things could be innovations to individualize and differentiate teaching in a multigrade teaching.

Evaluation of the output of the MUSE-project, Veikko Vionoja Primary School and Vintturi School Finland

- The need of multigrade-teaching education is realized
- It is important to prove new methods
- In-service training is a good possibility to improve professional skills
- You can develop new teaching methods and encourage to use them to cross-curriculate subjects
- ICT-skills and language
- Inquiry learning –method is convenient in multigrade teaching
- Methodological approaches for multigrade teaching are complete and good
- Cross-curricula applications and projects are easy to apply in our (Finnish) schools
- The project has given economical help to supply ICT - equipments
- Distance learning by videoconference from Chydenius Institute was a good experience
- Enriched pupils normal schoolwork
- Increased professional confidence in multigrade teaching
- Professional international teamwork has been very interesting and rich
• To become aware of systems of other countries has increased professional knowledge
• Muse web platform is a useful tool
• E-mail is absolute and good in communication between partners
• Some difficulties with languages
• We should have been more active (for example using Forum)
• More communication between other teachers in project

A few words about our additional ICT-training from Chydenius Institute to our project schools teachers in Finland.

Contents of the training were as following:

• The basic information how to plan net-based learning. Teaching in the net.
• Different didactic methods. How to use these methods in a ICT/net-based learning
• Teacher’s and pupils roles in a ICT/net-based learning
• Evaluation
• Making WWW-pages with Front page
• How to use video conference as a tool in a learning process

About the feedback: The connections worked well most of the time. A couple times the picture and voice stopped. Teacher’s felt that it was hard to follow the teaching and order’s from Chydenius Institute time to time. It was interesting to see that it is really possible to give high quality teachers training with ODL. In general teachers were very satisfied what they learned and it helped them also that we were able to order training by Finnish language. It was very important that we tested the connections before the sessions. Also both ends needs person who is well prepared and knows enough about technical matters. We sent material well before training and also during the training there was a need to send more material to Vionoja school. For the multigrade teaching this period and contents gave new ways how to differentiate teaching and lessons. They learned much about different web-based materials as well as didactic methods.
We have made dissemination about MuSE projects results. The basic information has been all the time in the Chydenius Institute’s website.

Then there were articles in pedagogical magazines and newspapers.

(The Classteacher - magazine article 11/04
Keski-Pohjanmaa newspaper article about Juha Paasimäki and MuSe-project
The Teacher-magazine article about Pekka Lehto and MuSe-project)

We held seminar in Chydenius Institute about multigrade teaching and MuSe project.

We have disseminated information about MuSe-projects to Universities: teachers education departments in Finland. We gave information to national board of education about MuSe-projects conclusions. For instance the national board of education will hold two day training period for the small schools teachers in September 2004.

In that camp there is also possibility to get information about MuSE-project in Finnish language.

Finally we hope that we can keep these small multigrade schools in Finland (at least most of them). After all they give the best possible education and atmosphere for children in rural areas.
Discussion

Nicolaos Raptis  
Teacher and headmaster of a school in Rhodes. Elected president of teachers in the region of Rhodes.

To start with, I would like to express my gratitude for the interest you show to multigrade education. My small experience as a multigrade teacher and my position as a president of Primary Teachers of Rhodes authorize me to express some opinions that represent us all. I think that what is crucial in that type of schools is communication. Communication needs to be facilitated. This type of school often suffers from isolation. Therefore, communication among schools as well as communication between schools and General Educational Community needs to be reinforced.

External communication is a major issue for our region. Multigrade schools in our region are nearly 40% of the total number of schools. In spite the big percentage referring to school units, multigrade students are just covering the 10% of the primary education students).

Multigrade schools present geographical and social peculiarities, such as isolation. Hence, it is obvious that school is an important parameter that will keep population in its place. ICT promise to copy with the great obstacles of isolation and offer a strong means of communication.
Historically, I remind to you that educational technology’s development had a positive impact on education. Educational movies make the starting point. Then projector and transparencies followed and educational TV arrived. In Greece these evolution delayed a couple of decades. At 1980 educational software arrived and in the ‘90s the educational community is referring to the revolution of internet. Pedagogical community is referring to three Cs theory: (Children, Computer and Communication).

From the above and in the case of Multigrade schools one concludes that ICT basically performs the role of a communicational tool. Teachers, students can communicate with other schools, with central educational organizations etc. ICT can be an open window to the rest of educational community. Colleagues may exchange opinions, ideas, solutions and material. ICT can also increase dramatically educational resources and educational material (via internet and relevant software). Last but not least, ICT can be of great help with administrative demands. It is worth mentioning that multigrade teachers are in many instances the headmasters of their schools, meaning that they are pressed even more with their already pressed time schedule.

School correspondence is facilitated greatly by email. Financial and administrative software have simplified a lot headmaster’s tasks. ICT reinforce access to educational seminars, in-service training, self-learning procedure and more. Distance learning and life long learning is easily practiced by all, using ICT tools. For isolated communities, distance learning via ICT can be the only viable solution that will help local population to keep up with the urban centres.

As a conclusion we may accept that ICT can facilitate multigrade teaching a lot. What needs to be examined is our relationship with technology. ICT has to be a means, an instrument serving teacher’s needs. With the help of a correct guidance ICT can maximize teaching results and desirable learning aims.

Father Kalli Nikos:
Teacher and priest in a single teacher multigrade school in Pyles, Karpathos island

How should we conduct the distant lessons? You must describe the whole procedure to us, because we don’t know for instance what the demands are and because at this time of year we make the school year’s plan. This dates that you presented should be given to us, because all of our col-
leagues need to know the most important factor of all which is when the lessons are going to take place. Are we going to have lessons during working hours or in the afternoon? Are we going to work overtime or not? These elements should not take us by surprise.

Furthermore, do school advisors know about this project? I think they don’t. It’s something that happens frequently, I mean teachers to brief school advisors about the projects they participate.

C. Tsolakidis:

First of all, all lessons rely on notes. We can print them if you like, but you can also view them at the project’s site. The whole process works as following: Each lesson is going to have notes and some activities related to these notes. Certain activities are related to the school’s curriculum for each grade, others they are not. The first kind of activities is about informatics: how to communicate with each other using for instance a forum or e-mail, how to teach informatics in an elementary school, how to participate in a videoconference, how to chat, how to store and use files, etc. Everything is going to be presented as easily as possible, but one needs to pay some attention to it. You are also going to be instructed in the techniques for teaching in multigrade schools, through the use of specific examples. These examples will be accessible through the Internet and resemble the usual teaching schedule. We also encourage the sharing of ideas and the dialogue on the techniques you use for multigrade teaching. We will be glad to adopt them in our project. All these can be done through asynchronous communication. You see, the strongest element of distance education is asynchronous tutoring. That is because it’s very difficult for all the people involved (trainers and teacher – trainees) to coincide in time.

S. Sotiriou:

We can use an example. Let’s say Mr. Tsolakidis is going to give a lecture in a predefined time. This lecture is going to be videotaped and uploaded to the Internet. Anyone who wishes, will be able to see the lecture in real time. Someone else will be able to view the lecture whenever is convenient to him/her. The improvement is that downloading this file using the satellite link it is almost instantaneous.

P. Babouras:

I used to work in a multigrade school, but not any more. The multigrade school is an unavoidable necessity for all of us, teachers, students and
parents alike. The 40% that was mentioned earlier is much larger from the teacher’s percentage that work in multigrade schools and much larger than the pupils attending multigrade schools.

C. Tsolakidis:

The percentage of teachers is 17%, but is decreasing. The proportion of teachers per students is 1:12. Maybe there are even less students in multigrade schools. The second fact is that schoolteachers prior to their appointment, do not have any kind of training regarding their teaching duties, not to mention training for teaching in a multigrade school. Responsible for this situation is not just the state; the Universities have to be blamed too. I know for sure that there isn’t even a single University in Greece that has in it’s curriculum a lesson regarding multigrade schools. Because of the “Kapodistrias” initiative (local authorities of villages are merged into larger ones resulting to creating one thousand local authorities out of six thousands in Greece the last few years) there is an effort to merge small schools and that is also a problem. Also, for the educators, the computer is a necessary tool, as the commonly used BIC pen. It is an irreplaceable tool for multigrade schools. We should also consider the possibility to use multigrade school teaching methods in ordinary schools. During the 80’s there were many schools with few students. In my opinion, there are 2 kinds of teachers in multigrade schools. The ones that live near the schools and the ones that want to serve there for a year and the get transferred somewhere else.

M. Loudaros:

Teacher of a three teacher multigrade school in Amorgos island in Cyclades

I have served for many years as a schoolteacher in remote schools and I feel the obligation to thank OTE, the Aegean University and Ellinogeramniki Agogi for embracing this effort. My school through the project SXEDIA, was involved in one of the ongoing efforts of Mr. Tsolakidis to spread the use of computers in education. We had a computer lab long before the state introduced computers in elementary schools. Students in my school are very interested in computers. I can say that a child that doesn’t know much about fractions can solve problems with this type of numbers just by playing/using computer software. Has the University of Aegean developed such a software? (maths drill). We participated in an on-line drawing contest, videoconference with another island and many more. Yesterday, been in a company of writers and journalists from Cyprus, I noted the same interest for computers in education. So I propose that a school from Cyprus will
also join the project. If the Ministry of Education also embraces the project, then there will be considerable progress. The details of the project DIAS will come later. As for now, many thanks and best wishes for the project.

**M. Orfanakis:**

Research fellow in Ellinogermaniki Agogi specialising in multigrade schools

There is a considerable interest for the teaching model in multigrade schools, both in Greece and abroad. Even in the secondary education. Your experience will help in the formation of the final model. Models and techniques used in multigrade schools are systematically studied. Should one group students according to their age or their knowledge? Should a teacher use as assistants the most capable students? For instance, in England, in the suburbs of London, where there are considerable inequalities among students, special schools use the above mentioned techniques. This project gives us the chance to use different paradigms, to make a productive use of each ones experiences, to systemize the results in order to be used by the Ministry of Education or any other institute involved in education.

**E. Tavlaki:**

I will speak for the pilot projects from the 10th of October, till the 10th of December. Then, the whole project is going to be evaluated and every one of us will be judged. I would like to answer some of the practical issues that were raised earlier. First of all, in project DIAS there is no allocation of money for teachers’ overtime. However, what we can do is ask the state to cover these expenses, but there is no guarantee that we will succeed. The Ministry of Education is willing to support DIAS, so we are going to ask for this extra money. Another problem is how to notify school advisors about the project. This can be done by the Ministry of Education.

**M. Loudaros:**

School advisors must be informed by the Ministry of Education.

**Dimitris Zorzos**

Teacher and Headmaster of Salakos multigrade school in Rhodes (Partner of MUSE)

Multigrade schools face a great number of problems. To start with, they are fully abandoned by the state. The only concern of the ministry of education
is to appoint teachers in multigrades schools. Apart from that, there are no special books for Multigrade teaching, there is no special curriculum for Multigrade class, and there are no seminars to train freshly appointed teachers to deal with Multigrade difficulties using appropriate techniques.

Neither Primary Education Departments seem to see into Multigrade teaching in spite Multigrade schools are the 40% of the total number of primary education schools in Greece. Most of the teachers are not trained for this type of school from the faculties they attained their degrees.

We ought to accept that it is a request that all have access to equal terms of education. Therefore, multigrade schools need to provide education of the same quality as the education provided by conventional schools.

Multigrade schools are social institutions. The solution is not to merge multigrade schools with conventional schools or between them. Multigrade schools need to survive because that way society is reinforced.

I work in multigrade school for 16 years now. My school faces serious problems, such as all multigrade schools are facing, in both Greece and worldwide. Teachers that are placed in these types of schools are not specially trained for this kind of teaching. This has as a result important school hours to be spent on training the new personnel, so that they will adjust better in that special teaching style. Multigrade schools are obliged to follow the general national curriculum, which is created to serve conventional school’s needs.

As I’ve mentioned before, teachers very rarely are qualified from their university studies to cope with multigrade schools. When teachers have already worked in a multigrade school for a year or two and they become gradually qualified, they prefer to be transferred in a conventional school, nearer to an urban centre.

There are solutions and measures. There are initiatives, like MUSE project that offered an insight to sufficient number of multigrade school problems, such as a specific curriculum, cross-curriculum applications and ICT supporting multigrade teaching. ICT equipment via MUSE project was also crucial for schools participating in MUSE project. I’m confident that all multigrade teachers may benefit from this project.

We all came to know some innovative forms of teaching. MUSE offered a well structured training in both using ICT in teaching and in shaping specially adjusted cross curricula for multigrade class.
One of MUSE’s really important achievements was the development of an internet platform in which trainees and trainers could inform themselves, exchange information and opinions, find all the training material, enrich it and communicate. MUSE also managed to offer teachers a new prospective regarding new teaching techniques and new teaching environments.

As a conclusion, I would like to state from this position and officially that MUSE project made me reconsider some of my opinions regarding multigrade teaching. I was encouraged to implement new teaching theories and strategies and to combine old and new teaching methods. So I suggest to all multigrade partners to attend programs like this one.

After I will have worked on MUSE’s material a bit more, I will be in position to further express my opinions on possible changes, adjustments and enrichments of MUSE material. I think that MUSE can be applied massively, on a great number of schools. If the necessary equipment exists, I can’t see a reason why more multigrade schools will not attend MUSE project.

A. Karidi-Pirounaki:
Teacher in a kindergarten in the village of Kaparelli in mainland Greece

I am a kindergarten teacher for 25 years in the area of Biotia and I feel as a teacher in a multigrade school. I have heard that a nursery school from Finland participated in one of your previous projects. So, is it possible for my school to join DIAS also? We are involved in ICT in education for the past 12 years.

P. Tsoumanis:
Teacher in a multigrade school in mainland region of Ipeiros. transferring in a non multigrade school

I would like to say that every year there is a new teacher to our school. Even myself, although the headmaster, I will also ask for a transfer in a bigger school. Can we find a solution so that I would still be able to participate in the project, because it’s something I wish for?

Fotis Gousias
Primary School teacher - President of the The Scientific Union of Primary Education Teachers, aiming to the Dissemination of ICT in Education

Good Day. The Scientific Union of Primary Education Teachers, which aims to the Dissemination of ICT in Education, is a non profit educational
organization, legally recognized and represents teachers of primary education with common interest regarding the dissemination of ICT in Primary Education. Union’s members are in their vast majority Primary Education teachers.

General aims of the Union is to contribute to the dissemination of ICT in Education, to ICT tools development, to provision of cooperation and aid to the state referring to educational issues and technologies and strategies of enrolling these technologies into the educational procedure.

Unions aims are also propelled with the publication of the scientific magazine “Education and New Technologies” which is circulated every 4 months. This magazine is podium for innovative educational approaches and fertile educational scientific dialogue and many Greek schools are subscribers of this magazine. Very often the union deposits its reports and conclusion / proposals to the Ministry of Education and the relevant educational institutions. In addition, the Union participates and contributes with its views, when invited to scientific organizations.

The Union was very delighted to attend Project’s DIAS presentation daily conference, which took place in the administration building of Organisation of Telecomunications of Greece (OTE).

We appreciate that DIAS project can minimize the disadvantages of multigrade schools. Not only educational drawbacks (such as equality of educational opportunities) but also administrative obstacles can be handled with ICT tools support. ICT equipment and network, access to the internet, use of educational software and hardware supporting teaching procedure can facilitate a great lot multigrade schools environment.

We salute with satisfaction this project and we are confident that direct and observable beneficial results will emerge after the implementation of the project in multigrade schools. We honestly hope that this project will be expanded in all the multigrade schools of our country, since the existence and reinforcement of multigrade schools are of a great importance for social, educational and political reasons.

We desire to be informed about the evaluation’s results, the implementation phases and the relevant results. We are also very interested to participate in any future meeting referring to the project.