Lifelong e-Learning for Multigrade School Teachers

Proceedings of the First Workshop of the Network of Multigrade Education (NEMED)

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Introduction

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This book presents the main points raised and discussed during the first workshop organised by the Network of Multigrade Education (NEMED).

NEMED is a transnational network bringing together educationalists and researchers from Europe who share an interest in researching, enhancing and supporting multigrade education in their countries and at the European level[1]. The term 'multigrade' describes schools in which teachers work with more than one curriculum grade at the same time, in the same class. Multigrade schools play an important role in providing access to 'Education for All' in many parts of the world – both developing and industrialised. They are also more than a reality in primary education in many parts of Europe, arising through necessity rather than choice. Their role is crucial, as they are meant to provide isolated communities in remote and disadvantaged areas with pedagogy and community service of good standards. Nevertheless, due to geographical peculiarities and other socio-economic oddities, multigrade schools typically constitute a neglected aspect of education systems. Acknowledging the significance of multigrade schools for equality and quality in education, NEMED systematically carries out and supports networking activities at the European level, which are methodologically structured around the concept of dedicated focus groups researching diverse aspects of multigrade education in parallel.

NEMED regularly organizes open events, which intend to disseminate the knowledge and experiences accumulated within the network, as well as forming an integral part of the network's work methodology. NEMED Workshops constitute one type of such events. They aim to allow participants to combine and share experiences of the work undertaken by the working groups of NEMED, and specify further steps to be taken. The first NEMED Workshop took place in Helsinki, Finland, on 21 June 2005, within the framework of parallel sessions at the Annual Conference of the European Distance and E-Learning Network (EDEN) for the year 2005. The Conference, a well-established international annual institution of pan-European significance in the fields of distance education and e-learning, provided

[1] *For the years 2004 to 2007, NEMED is supported by the European Commission under the Comenius 3 Action of the Socrates Programme.*

ample opportunities for NEMED partners to make the results of their work known, and exchange experiences with education practitioners and members of the research community.

The Helsinki workshop, titled "Lifelong e-Learning for Multigrade School Teachers", aimed to examine multigrade school teachers' roles from different perspectives, considering the potential for them to benefit from e-learning initiatives, based on experiences from research and development projects at national, European, and international level. From an overarching ICT-in-Education viewpoint, topics discussed included current policies and tendencies for professional development of multigrade teachers, resources development, classroom management, facilitation of different learning modes, as well as emerging opportunities for broadband internet access through satellite networks for the benefit of both remote schools and the local rural communities more widely. The structure for the discussion was offered by the seven presentations made by network partners, which are presented in this book.

In the following pages, matters of content of professional development for multigrade school teachers precedent discussion about methods of delivery of the training to the remote locations where these teachers are typically found, while the series of papers is concluded with a more general, overarching look at the wider context of policies for multigrade education and ICT applications in it. First, the case of self-regulated collaborative learning in the multigrade classroom is discussed, studying the case of introducing into multigrade classrooms, and testing a game for developing self-regulation of approaches to learning (António Duarte & Selene Fernández). Then, the question is considered about how to best train the multigrade school teacher as an effective classroom manager (Gabriel Dima & Alina Borcos), followed by an account of creating and using ICT-based learning resources in multigrade education (Mario Barajas, Roser Boix & Sara Silvestre). Moving to issues of training delivery, the next paper offers an approach to 'e-training' as a method of support to the multigrade school teacher (Anita Pincas). The following two papers consider the advantages offered and the challenges posed by the availability nowadays of advanced technological solutions for broadband delivery of e-learning at remote locations via satellite, based on experiences at the national (Pavlos Koulouris) and international (Sofoklis Sotiriou) level. Finally, multigrade school education in Europe is viewed from the viewpoint of policies, tendencies, and challenges posed for the role of educational ICT (Costas Tsolakidis).

Self-regulated collaborative learning in the multigrade classroom: introduction and testing of a game for developing self-regulation of approaches to learning

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Introduction

Psychological research focused in describing and helping students to learn stresses two key concepts: approaches to learning and self-regulated learning.

Approaches to learning refer to the way students confront the learning tasks, in terms of the type of motivation to learn and the type of learning strategy they use. There is a congruency between motivation and learning strategies which results in different types of approaches to learning. These have a differentiated effect on the quality of the learning product.

Self-regulated learning refers to how students can act in theirs own learning processes at a metacognitive, motivational and behavioural level in order to cope autonomously with academic demands (Zimmerman, 1994). Self-regulated learning it's especially needed in situations where learners don't have an external control and require being active in the management of their own learning processes. Besides affecting all students, this kind of situation can be typical of certain educational environments like the multigrade classroom, where there is *more than one curriculum grade at the same time*. In a matter of fact, in multigrade classrooms individual variation is higher and teachers must often attend separately to various sub-groups, demanding that students be particularly able to independently self-regulate their learning.

Self-regulation of approaches to learning can then be viewed as a key factor of academic achievement, demanding procedures which might be used in order to develop it.

Approaches to learning

Three main approaches to learning have been discriminated: "surface", "deep" and "achieving" (e.g. Biggs, 1987; Entwistle, 1997).

A "surface approach" to learning involves the combination of an instrumental aspiration (i.e. task investment of minimum effort in order to avoid failure) and passive or reproductive information processing based on rote memorisation. The use of a surface approach tends to result in lower grades and lower quality of learning.

Other type of learning is represented by the "deep approach", which involves an intrinsic motivation (i.e. satisfy interest and obtaining pleasure by a learning task) joined with active reflective learning strategies (i.e. comprehension).

Finally, an "achieving approach" involves a competitive struggle for high grades accompanied by self-organisation strategies.

The deep approach and the achieving approach are more prone to academic success and to a better quality of learning.

Self-regulated learning

Self-regulated learning refers to the process of managing one's own learning.

By self-regulating learning, learners move from being externally controlled by teachers or others to being active in the control of their own learning processes. This means the attempt to self-control cognitive, motivational, behavioural and environmental aspects involved in learning (Pintrich, 2000). Therefore, self-regulated learning involves competencies that allow students to do realistic diagnoses of what they already knows and needs to learn, to develop learning plans (i.e. determine objectives, select strategies, organise actions and evaluate results) and to monitor and evaluate used procedures (i.e. self-test, self-evaluation, self-correcting).

There is not a consensus regarding the terminology that should be used to denominate this process. While most choose the term "self-regulated learning", others use, for instance, "self-directed learning" (Knowles, 1975) or "self-directed motivated learning" (Nenniger, 1999).

Moreover there are several attempts to conceptualize a model of self-regulated learning, with diverse emphasis on different aspects (e.g. Boekaerts, 1997; Nenniger, 1999; Pintrich, 2000; Zimmerman, 2000).

Taking in account the several processes, which are described or prescribed by different researchers and models as being involved in self-regulated learning, we propose a picture of an ideal self-regulated learning process. This process can be conceptualized as happening in three moments: before, during and after the learning task.

The first self-regulation moment, before the learning task, involves definition of the task and its interest, definition of objectives and demands, as well as selection and planning of learning strategies and learning resources. The second moment, during the learning task, implies monitoring and eventual rectification of the coping plan, as well as selection of means that help to maintain the learning process. Finally, the third moment, after the learning task, is concerned with evaluating results and learning process, involving self-reinforcement or an eventual retrying, by going back to the first and second moments of self-regulation. Figure 1 depicts the proposed conceptualization of an ideal self-regulated learning process[2].

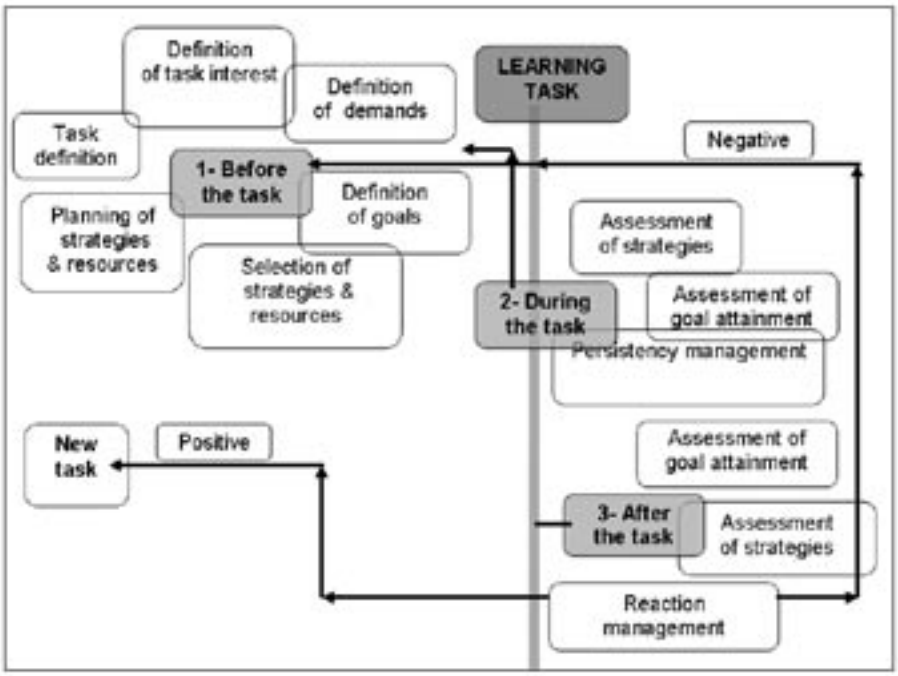

Figure 1: An ideal self-regulated learning process

Self-regulation of approaches to learning

Few authors considered the relation between self-regulated learning and approaches to learning.

In a certain perspective we can defend the need to develop self-regulative competencies in order that students can efficiently use a deep and achieving approach to learning. The rationale for this is that deep and achieving approaches tend to lead to a better learning product (e.g. Trigwell and Prosser, 1991) and that education should be mostly aimed at students developing

2 *Scheme design based on a idea of A. Duarte and J. do Ó.*

comprehension of subjects and demonstrating it.

Students can be then develop the ability to plan, monitor, evaluate and adapt their approaches in order to make an efficient use of them, to achieve better grades and to improve the quality of learning.

In a matter of fact, some evidence suggests that self-regulation is expressed in different degrees in the various approaches to learning. It seems that a surface approach may frequently operate in a non reflective way (e.g. Entwistle, 1988) and that metacognition is more evident in a deep approach (Biggs, 1988), maybe because it demands a more planned organisation of personal resources (Cantwell and Millard, 1994).

Vermunt (1996) detected a relation between a surface approach to learning and an external regulation of learning (i.e. acceptance of an instruction directed regulation). He also observed a relation between a deep approach to learning and the practice of self-regulation. The achieving approach related to both types of regulation.

In another study, Lonka and Lindblom-Ylänne (1996) found that a surface approach to learning related positively with "absence of regulation" and "external regulation". He also detected that a deep approach to learning related positively with self-regulation and negatively with "absence of regulation".

Tait et al. (1998), found a relation between a self-regulation component (i.e. "monitoring effectiveness").and the deep approach to learning.

Sobral (1997) also detected an association between the deep approach to learning and most competencies involved in self-directed learning (i.e. "self-responsibility", "decision making" and "self-monitoring and self-evaluation").

da Silva and Duarte (2001) found a positive relation between "control strategies" (as planning and effort management) and the components of a deep approach to learning . The authors explained the relation between these variables by the fact that they involve a common competence (i.e. reflection) although they are directed at different objects (i.e. contents or learning itself). They also found a positive relation between those "control strategies" and the components of the achieving approach to learning, which they explained by the fact that both imply executive processes directed at learning competencies.

Attending to the results of these studies it can be hypothesised that the development of self-regulation can benefit a deep and achieving approach and vice-versa.

In another perspective, any approach to learning can be useful, depending on the learning needs and the learning context. The specific learning approach a student might use in a learning situation can be seen as depending on the self-regulating mediation between his or her preferred approach and the perceived context demands (Biggs, 1989). Besides, as awareness and degree of planning, regarding the used approach to learning, vary between individuals (Biggs & Kirby, 1984), self-regulation can influence the efficacy of that approach (Biggs, 1987). Intervention would not be then directed to encouragement or dissuasion of any

approach to learning, but towards promotion of its self-regulation (e.g. Blundell, 1995).

This self-regulation means taking into account the situation demands, resulting in the development of a reflective approach, adapted to the learning tasks.

One way or another we can see the importance of self-regulation of approaches to learning.

In one way self-regulation can act as a facilitator of the transition from a surface approach to a deep approach to learning. In this line, some authors propose a self/socio-reflection on approaches to learning, which implies students' awareness of their own approaches and comparison with other students' approaches. Therefore, as well as the clarification of one's own learning process, there is the discovery of alternative processes. This discovery can promote changes by de-centring students from their approaches to learning, by helping them to see the consequences of these particular approaches and by showing them alternative approaches they can adopt (Brown, 1994; Davies, 1995; Gibbs, 1992; Hunt and Beaty, 1995). Duarte (2000), for instance, developed a procedure which involves promotion of metacognitive reflection on personal learning experience (i.e. learning factors, conceptions, motivations, strategies and products) as well as comparison with other people's learning experiences. In a quasi-experimental action-research study, the procedure was conjugated with some learning context modifications and was applied in order to assess its impact on students' conceptions of learning and approaches to learning. Results suggest some changes towards an increase of a deep and achieving approach to learning.

In another way, self-regulation can allow students the selection, monitoring, evaluation and adaptation of the most suitable approach to any kind of learning situation.

Nevertheless, few studies propose how to directly develop self-regulation of approaches to learning.
The purpose of this text is to introduce the structure and the preliminary results of a ludic procedure, "the strategies game", that can be used to develop self-regulation of approaches to learning

The "strategies game"

The game aims to develop self-regulation of approaches to learning. It can be played individually or in a group. Playing in a group allows also the development of self-regulated collaborative learning[3]. Each time the game is played, it involves dealing with a different learning task, which is a pretext for the development of such competencies.

[3] *Normally, self-regulated learning is taken as an individual process. We think that it can also be managed in the context of collaborative learning. Collaborative learning stands for refers to a mode of learning in which students work together cooperatively in small groups toward a common goal, taking care of each other's learning as well as their own. Trough collaborative learning students can discuss and help, share, encourage, explain or teach each other (Johnson and Johnson, 1999).*

The game has a board of 85 places distributed in 14 parts. Each part has a different colour and finishes in a "Card Place" (see Figure 2).

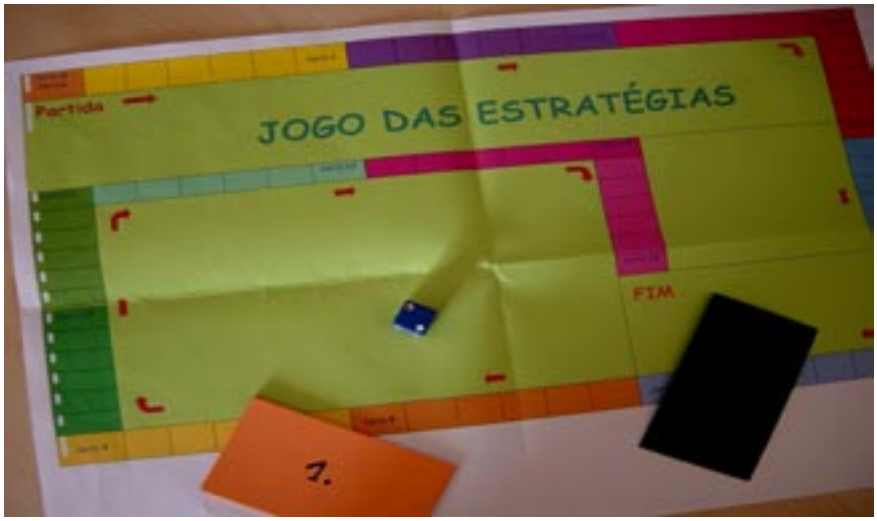

Figure 2: The game board

The game starts in the "Starting Place", where the players have to read a green "Starting Card". There is a different green card for each time the game is played and each proposes a new learning task (e.g. "Read the text 'From the atom to the stars' and answer the questions about its content, in the bottom of the page"). The goal is to confront the task in phases moving a pawn in the board, by throwing a dice, until arriving to the last place. Each time the pawn reaches or crosses a "Card Place" players must read an orange card which is indicated there. Orange cards question players along the journey, until the end of the game. These questions represent the main components of self-regulated learning process through its three main phases: before, during and after the task.

1st self-regulatory phase - Before the task (Card 1 to 7)

These cards introduce players to the habit of preparing or planning before actually trying to do something. This phase, which takes place before the task, can restrain students to act impulsively and in an unreflective way toward the learning task.

Card 1 questions "What is the task?" and demands students to acknowledge and define the task, thus clarifying its nature (e.g. "The task is to read the text 'From the atom to the stars' and to answer the questions in its end").

Card 2 questions "Which is the task interest?" demanding a motivational analysis of the advantages of involvement in the task (e.g. "Knowing what is the atom and discovering something new about the stars").

Card 3 questions "What is demanded?" and asks for a clarification of the external demands about the task (e,g, "To read and answer correctly to the questions").

Card 4 questions "What is the goal?", requiring a definition of personal objectives by using the task (e.g. "Comprehending the nature of atoms and stars").

Card 5 questions "Which strategies and resources to use?" directing players for a selection of the means they find adequate to confront the task (e.g. "Identification of main ideas in the text"). This card also refers players for a helping resource (i.e. the "Strategies File") which introduces them to a pool of learning strategies (i.e. deep and achieving strategies) for different tasks. Card 5 also asks "What will be done by each element?", stimulating a distribution of roles within the working group.

Card 6 asks "How to use the strategies and resources?" demanding the sketch of a first plan ("Plan A") on how to use the selected strategies and resources thus on how to concretely deal with the task (e.g. "Underlining the text"). This card also asks "What will be done by each element?" and "How to share information during the task?", stimulating a distribution of roles and communication within the working group.

Card 7 asks "How to change the environment to achieve the goal?", leading players to use their immediate context as a learning resource (e.g. "Arrange a round table to read the text in a group").

2nd self-regulatory phase - During the task (Card 8 to 9)
This cards encourage players to monitor their implementation of the plan and to check for needed changes in it.

Card 8 asks "Apply Plan A and, during the task, answer: Is there advancement toward the goal and the plan is a good plan? If YES: How not to give up? If NOT: Verify again which is the task (see Starting Card) and answer: Which other strategies and resources to use? (help: see the "Strategies File"); How to use the new strategies and resources? (Plan B)". Therefore, this card directs players to an implementation and assessment of the first plan in terms of goals attainment. The card stimulates persistency management, in case of a positive assessment (e.g. "We will make a break of 5mns and then comeback") and redefinition of the task and plan, in case of a negative assessment (e.g. "Since underlining is not working we will try to write the text key words"). The card extends monitoring and a possible redefinition of strategies to the group work by asking "How is the team functioning?" and "How to meliorate team functioning?"

Card 9 asks "Continue to apply Plan A or change to Plan B and then comeback to the Game Board", thus encouraging implementation of the chosed plan.

3rd self-regulatory phase - After the task (Card 10 to 14)
These cards prompt players for a final evaluation of learning products and learning processes, also directing them for new learning attempts in case of negative results.

Card 10 asks "The goal was attained? If YES (and the teacher confirms): Fill "Self-regulation

Page"; If NOT: Verify again which is the task (see Starting Card) and answer: Which other strategies and resources to use? (help: see the "Strategies File"); How to use the new strategies and resources?" Therefore, this card orients to an assessment of the learning product in terms of goals attainment. The card stimulates a new redefinition of the task and plan, in case of a negative assessment (e.g. "Since writing of key words was not effective we will try to resume the text").

Card 11 asks "Which is the evaluation of the strategies & resources?", directing to an assessment of the learning process (e.g. "Resuming in round table was the most time consuming but also the most effective strategy"). This card also asks "Which is the evaluation of the team work?" extending assessment to the process of group work.

Card 12 asks "If the task was accomplished: How to use, in the future, the applied strategies & resources? If the task was not accomplished: What different Plan can be used to achieve the goal? (apply it and jump to Card 10 Place)". Thus, this card invites for planning the transfer and generalization of successful learning procedures and orients to a cycle of new attempts and assessments, until goal attainment. The card also asks "How to use, in the future, the team work?" inviting to a generalization of collaborative learning.

Card 13 asks "In which activity experiment, in the future, the 'Self-regulation Page'[4] (bring it later for a presentation)", orienting players for the transfer of self-regulated learning competencies. The card also asks "In which activity experiment, in the future, the team work?" stressing the possibility of transferring collaborative learning competencies.

Finally, in the end of the game and after the accomplishment of the learning task, card 14 asks "Pick up an item from the "Surprises List", allowing players to positive self-reinforce from a list of valued objects and/or activities.

The game is to be monitored by the educator, allowing him or her to scaffold, not to evaluate, the players and to stimulate a final discussion on the playing experience

The test

The game was tested with two multi-grade groups.

The first group consisted of three youngsters (a girl with 11 years old, a boy with 12 and another with 8) who played at home in a urban area (see Figure 3). In this case the game was introduced by the first author.

[4] *This is a page with the phases and the self-regulatory questions*

Figure 3: First group

The second group consisted of 4 youngsters (2 girls, 8 and 10 years old; 2 boys, 9 and 10 years old) who played in a multigrade rural classroom (see Figure 4). In this case the game was introduced by the pupils' teacher (the second author).

Figure 4: Second group

Both groups were informally observed while playing the game and informally questioned after it.

We summarize the anecdotic results in terms of the advantages and problems detected.

Advantages

- students reacted in a motivated way to the game;
- students hypothetical developed self-regulation of approaches to learning and collaborative learning competencies by playing the game;
- by introducing the game the educators learned a practical scenario for developing these competencies.

Problems

- after reading the starting card (which states the learning task) students tried immediately to solve the task, possibly due to impulsiveness;
- students had difficulties in "going away" from the game board and "back to it" (e.g. cards 8 and 9), which possibly reflect a difficulty in reintegration of reflection and practice;
- students neglected an important helping resource, the "Strategies File", which introduces them to several learning strategies; this is possibly due to a lack of alternative thinking regarding ways of learning;
- students manifested difficulties in discriminating different questions (e.g. strategy selection and plan);
- students perceived an "unneeded redundancy" in some questions (e.g. task definition and goals definition).

Conclusion

The main question that the test of the game provoked in us was if learners must employ all the sub-processes involved in self-regulated learning, when trying to self-regulate their own approaches to learning. Moreover, are all learners able to use all of these sub-processes? Specifically, must students already have some competencies of autonomous and cooperative learning in order that they can play the game? These questions relate to another problem: when we speak about self-regulation of approaches to learning are we describing how students actual self-regulate or are we prescribing how should they self-regulate? In our view, we should do both and relate our "prescriptions" to the knowledge of what students are actually "able to perform".

Authors like Boekaerts (1997) have stressed that the components of self-regulation can be seen as specific types of prior knowledge which, despite being all potentially available to a person, aren't all accessible and usable when confronting a specific task. Moreover, Boekaerts

differentiates between novices and experts concerning this prior knowledge.

We think it's probably not always necessary to use all these sub-processes in every learning situation. Second, we think that the amount and selection of which sub-processes to use should be informed on the characteristics of the learner (e.g. age, cognitive ability, culture) and of the learning situation (e.g. complexity, difficulty).

Based on this, we then propose a simplified manageable self-regulated learning process, which involves just the definition of the task, a coping plan, monitoring and evaluation. This simplified process is depicted in Figure 5.

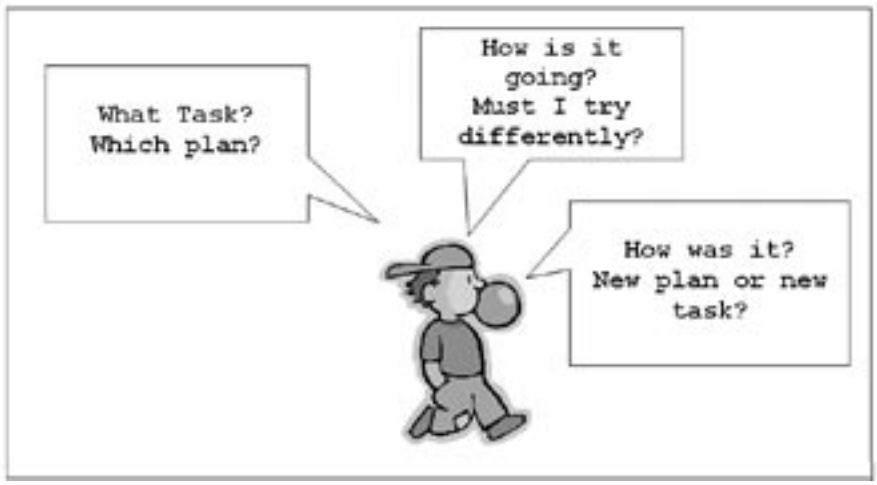

Figure 5: A simplified manageable self-regulated learning process

The test of the game implementation suggests it is a promissory way of developing self-regulation of approaches to learning and collaborative learning in multi-grade groups.

Nevertheless, the test allowed pinpointing some problems which suggest the need of a possible reformulation of the game.

The starting card (which states the learning task) might include a warning that students shouldn't try to solve the task immediately, but that they should keep throwing the dice and advancing until the proper time to do it.

In the 2nd card, which demands an analysis of the advantages of involvement in the task, players can be invited to analyze three case profiles which depict the three motivational orientations to learning: instrumental, intrinsic and achieving.

The educator should prompt the use of the "Strategies File" (card 5), which introduces players to several deep and achieving learning strategies they can select to confront the tasks. This is an opportunity students have of enriching the repertoire of such strategies.

The 'Self-regulation Page', which orients players for the transfer of self-regulated learning competencies (card 13) might be simplified, including just the following self-regulatory questions: What Task?; Which plan?; How is it going?; Must I try differently? How was it?; New plan or new task?

Questions which students perceived as redundant might reformulated (e.g. strategy selection and plan; task definition and goals definition), possibly reducing the number of cards. Furthermore, it might be considered to simplify the content of cards with more than one question.

The educator should have an active role in orienting the game, helping students to answer the questions and follow the instructions in an appropriate way. Problems like the difficulty in "going away" from the game board and "back to it" can be possible solved in this way.

With these reformulations we hope to develop a resource that can help students and educators to develop self-regulation of approaches to learning, thus contributing for the prevention of academic underachievement and for the improvement of the quality of learning of multigrade groups.

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Training the multigrade school teacher as an effective classroom manager: issues to consider in professional development

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Introduction

Managing a multigrade classroom is difficult because there is more than one grade level in the classroom. Sufficient planning time must be available to meet the needs of both teacher and students. Hence, the teacher must be skilled in managing instruction to reduce the amount of 'dead time' during which children are not productively engaged on task. This means that teachers must be aware of different ways of grouping children, the importance of independent study areas where students can go when they have finished their work, and approaches to record keeping which are more flexible than those prevalent in the monograde classroom. Students may need to be taught the value of independence and cooperation by involving them in classroom decision making.

The multigrade classroom appears to be more labor intensive and requires more planning, collaboration, and professional development than the conventional graded classroom (Cushman, 1993; Gaustad, 1992; Miller, 1996). Insufficient planning, staff development, materials, support, and assessment procedures will have an impact on the success of the multigrade program. Despite these constraints, there are special benefits to multigrade classrooms, both for learners and teachers:

- Flexible schedules can be implemented and unique programs developed to meet students' individual and group interests and needs.
- Combined classrooms also offer ample opportunity for students to become resourceful and independent learners.
- Students learn to set personal learning goals, assess themselves and reflect on their own learning
- Multigrade classroom provide opportunities for students to gain self-knowledge as they interact with older and younger peers.

- Teachers have more time to develop a deeper understanding of each student's strengths and needs over tow or more years and can plan instruction at the student's level of development
- In planning programming for two or more years, teachers have opportunities to be more flexible with curricula, planning projects around student interests

Classroom management strategies

Placing students from several grades in one classroom does not in itself create a successful multi-age classroom, however. Multi-age classrooms are based on a student-centred, subject-integrated approach to learning. Managing the multigrade classroom is an essential element in successful instruction and requires good organizational ability and consistency. Students come into the classroom expecting the teacher to give them guidance and direction about rules and procedures and how the classroom is organized for instructional use. Having a uniform and predictable set of rules and procedures simplifies the task of being successful. Having clear and efficient routines makes classroom life run smoothly. Because there could be many different levels in a multigrade classroom, the need for clear, consistent rules and procedures is even more critical than in traditional, single-grade classrooms.
A literature review conducted by Wang, Haertel, and Walberg (1993) found that classroom management had the largest effect on student achievement (Marzano, 2003). Effective multigrade teaching involves the use of a range of strategies that can be followed to help create an effectively managed classroom, with the aim of successful pupils' instruction:

Be Prepared

- If you are getting a new class of students, learn their names and a little bit about them before school starts.
- Establish several classroom rules with the students. They will be more apt to follow them since they have helped develop them.
- Establish procedures
- Explain to the students what is expected of them.

Be Planned

- When planning your day, provide as much detail as possible.
- Ensure that you have enough work and activities planned for the day. Begin teaching at the beginning of the class and stop when the class is finished.
- Vary the activities throughout the lesson.

Be Organized

- Assign each student a number at the beginning of the year to help keep track of books and assignments.
- Have a large envelope on the bulletin board to place extra copies of assignments. If any students are absent, missed assignments can be easily accessed.
- Keep important information and papers in a binder that can be easily accessed.
- Mark and return student work promptly.

Effective teachers have been consistently observed by researchers to engage in three distinct phases of classroom management and discipline:

- planning before school begins,
- implementing plans, and
- maintenance (Emmer, 1987).

Preparing for the beginning of school

It is expected that effective teachers make their expectations explicit through clear rules and procedures that are consistently taught and enforced. The first two or three weeks of school are used to establish teacher's expectations. In this respect, early planning and preparation is critical for starting the school year right. Before the students arrive, the teacher must develop a vision of classroom life: how students will behave and relate to one another, where they will work, how resources will be organized, etc. During these phase, teachers focus on planning the arrangement of the classroom, organizing supplies and materials, and planning instructional activities for the first few days of school.

Key areas for teacher attention:

- Arranging the classroom
- Identifying expectations for behavior
- Planning consequences (rewards….)
- Student participation

Beginning the school year

During this phase, the teacher tries to put into practice the plans that have been developed before the start of school. This is the time when norms are established and students develop a view of how "their particular class will operate."

Key areas for teacher attention:

- teach students to behave
- consider students' concerns
- lead the class
- the teacher as a model

Maintaining good discipline

Once the school year started and positive student social and academic norms have been established, the teacher must seek to maintain these norms. In this phase, the teacher's role shifts toward keeping high levels of student engagement and preventing disruptions of the learning environment.

Key areas for teacher attention:

- **Monitoring and handling inappropriate behavior, by:**
    - o focusing the students' attention;

- direct instruction (telling the students exactly what will be happening);
- monitoring /check on the students' progress)
- use active participation methods
- encourage empathy

• **Organizing and conducting learning activities, by:**

- clearly sequenced and presented activities
- encourage pupils to ask questions
- focus on understanding of concepts
- encourage cooperation and understanding,
- avoid "closed" questions
- don't be afraid of noise when it comes from the working pupils
- organize the learning environment

Activities that are well-planned, clearly sequenced and presented, and provide for high levels of student success tend to produce a high degree of student engagement. When students are actively learning, they are less likely to become involved in inappropriate behavior. Effective teachers also organize the learning environment to reduce the amount of influences that can disrupt the flow of instruction, whether in teacher-led groups, small workgroups, or during independent seatwork.

Classroom organization strategies

In the typical multigrade classroom, where multiple activities are likely to occur at the same time, **classroom organization** is a critical factor in developing smooth, predictable routines. It is known from research on effective classroom practice that when students have a clear understanding of classroom structure, procedures and rules, they are more likely to follow them, especially if they have had some involvement in decision making.

The main aim of any classroom organization is that pupils have a clear understanding of classroom structure, as well as procedures and rules.

Activity center - an area of the classroom that the teacher has designated for a specific purpose):

- individual desk/seatwork, where students work independently at a desk.
- pairwork, where two students work together
- groupwork where three or more students working together
- areas designated for art, audio-visual equipment, computers, and other instructional resources.

Learning center - are independent stations set up throughout the classroom where children can go to actually engage in some learning activity. Children choose the center they will go to and decide on the amount of time to spend there. The learning center approach provides a time when children explore and practice skills to their own satisfaction. These centers provide children with opportunities for hands-on learning, cooperative learning, social interaction,

real-life problem solving, autonomous learning, and open-ended activities. "Open-ended activities allow for each child to successfully engage in the activity at whatever skill level the child happens to be," notes Stone (1995). Learning centers should reflect the goal of active learning; they must not be workstations full of worksheets for students to complete. Learning centers offer an opportunity for children to be responsible for their own learning; this responsibility is the foundation for lifelong learning (Stone, 1995).

Subject area resource center - where student resources relating to a specific subject are located.
Types of activities that can be found in classrooms:

- individual study
- group work
- whole-class instruction
- brainstorming
- audio-visual and reference work
- testing/assessment

Furniture and equipment should be arranged to create activity centers appropriate to the type of activity you intend to occur.

Designing the classroom – guiding principles:

- organize the classroom as a center of learning activities
- furniture and educational materials have to support the types of learning
- organize the classroom resources within subject-area resources center(s)
- assure the flexibility of the classroom arrangement in order to accommodate new learning activities
- involve the children for the room arrangement
- place a picture chart of the sequences of daily activities so that the pupils can see what come next
- separate quiet and noisy activities areas

Examples of seating arrangements have been presented in annex to indicate the flexible approaches that can be adopted.

Conclusions

The paper presents the findings of a literature review aiming at highlighting the main issues related to the multigrade class management and organizational strategies. Managing the multigrade classroom is an essential element in successful instruction and requires good organizational ability and consistency. Furthermore, the typical multigrade classroom, where multiple activities are likely to occur at the same time, classroom organization is a critical factor in developing smooth, predictable routines.

While the ICTs is penetrating within the rural remote areas where most of the multigrade schools are located, the class management and organization strategies need to be reevaluated in order to take advantage of the use of software tools such as virtual classrooms and communication channels like satellite links.

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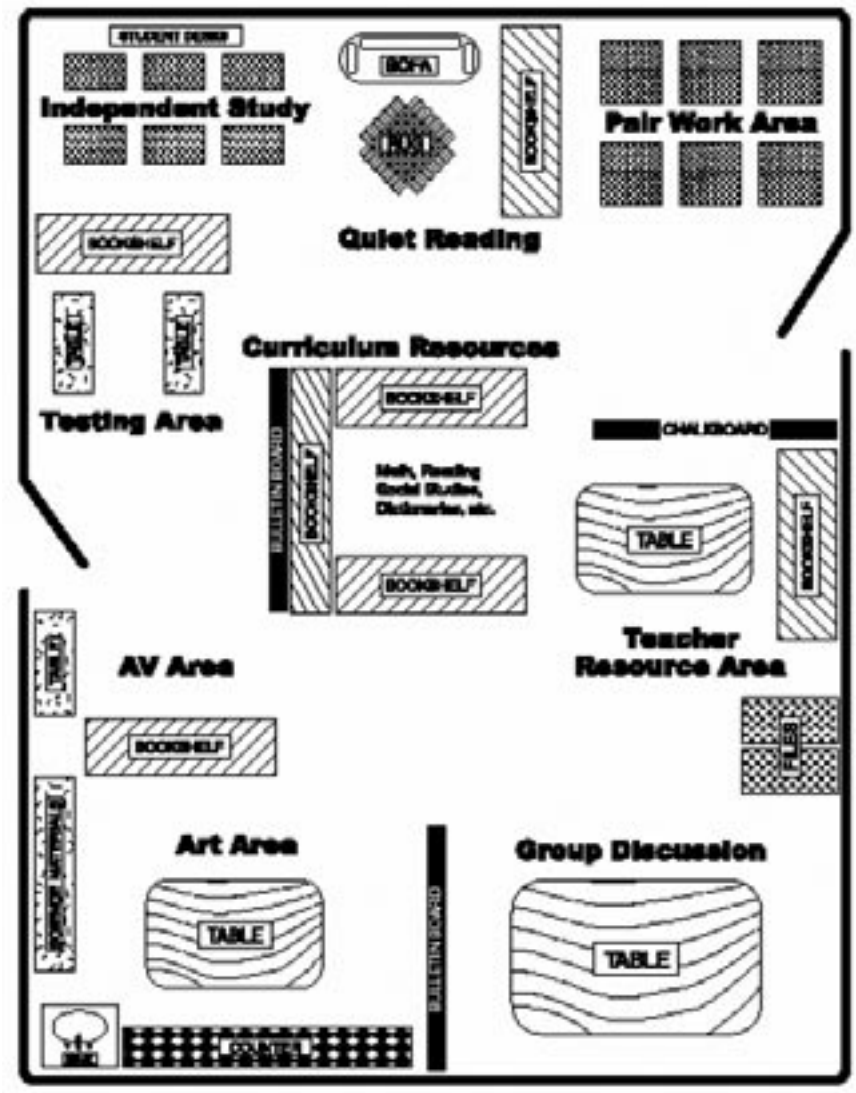
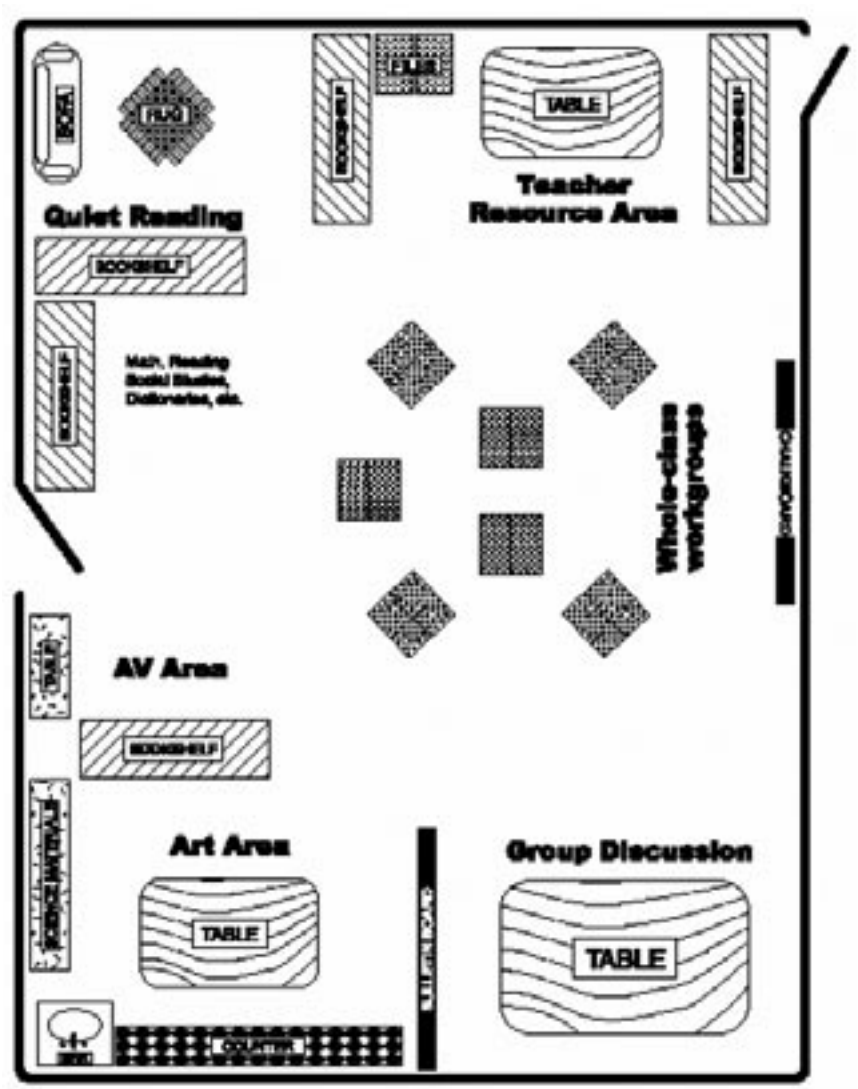
Annex 1: Self-Contained Classroom (Organized by Areas of Activity)



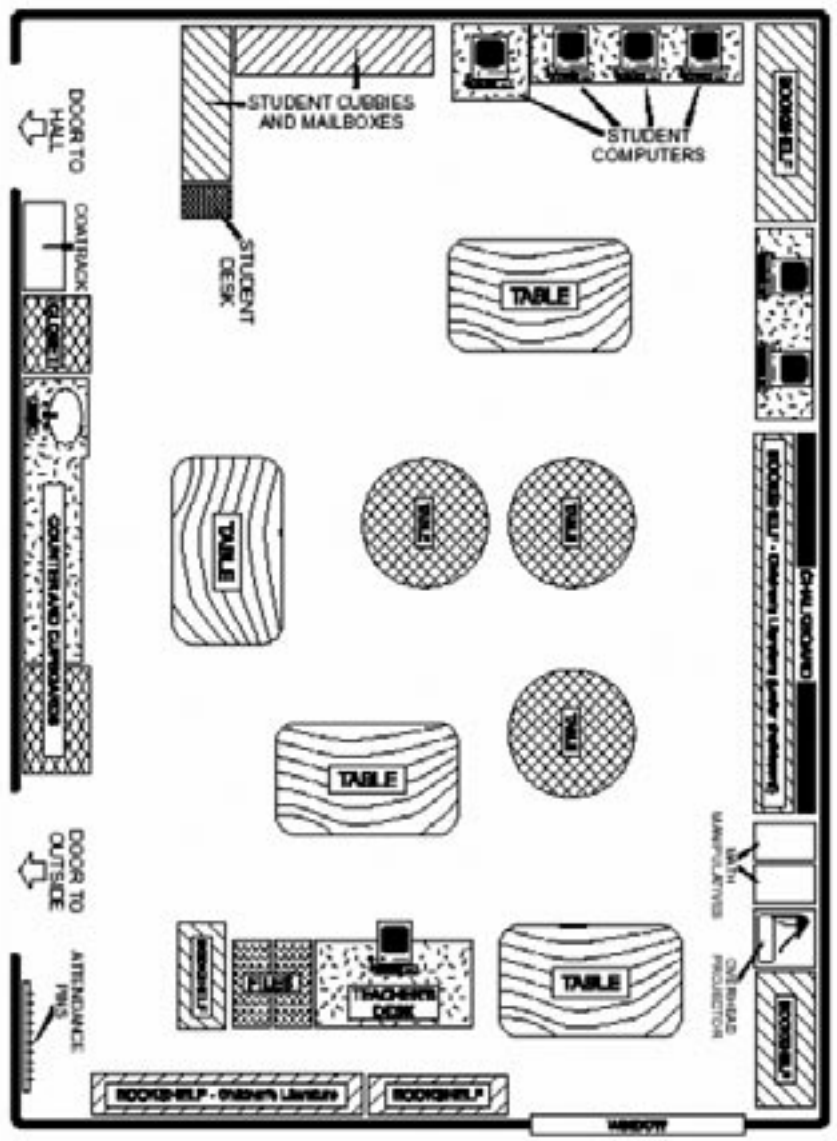
Source: "The Multigrade Classroom: A resource handbook for small, rural schools/Book 3: Classroom Management and Discipline", Susan Vincent (ed.), Northwest Regional Educational Laboratory, Portland, Oregon, 1999

Annex 2: Self-Contained Classroom (Organized for Cooperative Learning)



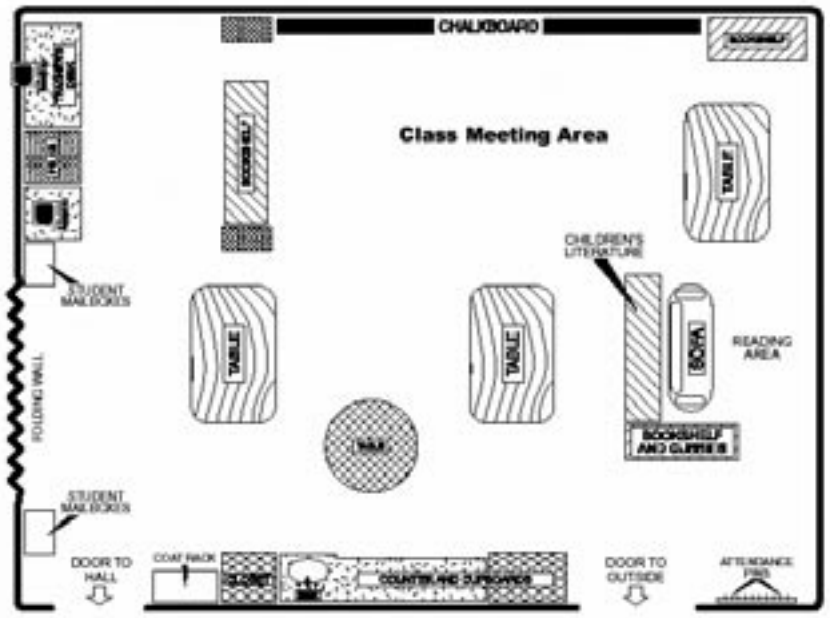
Source: "The Multigrade Classroom: A resource handbook for small, rural schools/Book 3: Classroom Management and Discipline", Susan Vincent (ed.), Northwest Regional Educational Laboratory, Portland, Oregon, 1999

Annex 3: Comprehensive Classroom Layout



Source: "The Multigrade Classroom: A resource handbook for small, rural schools/Book 3: Classroom Management and Discipline", Susan Vincent (ed.), Northwest Regional Educational Laboratory, Portland, Oregon, 1999

Annex 4: Self-Contained Classroom (Organized for Flexibility)



Source: "The Multigrade Classroom: A resource handbook for small, rural schools/Book 3: Classroom Management and Discipline", Susan Vincent (ed.), Northwest Regional Educational Laboratory, Portland, Oregon, 1999

Creating and using ICT-based learning resources in multigrade education

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Introduction

At the present time digital technologies are rapidly penetrating all aspects of life across much of the Western world. Whether in the workplace, the home, the street, the museum or the school, computers, handheld PDAs, mobile phones, the Internet and a raft of other digital toys and tools are becoming increasingly familiar, almost ubiquitous, features of our daily lives. Some commentators have argued that the very speed of communication afforded by digital technologies means that we now live in 'speed space', an environment in which the speed of new information technologies distorts the ways in which we view and interact with the world, affecting social relations and psychological processing (Poster and Kruger, 1990).

Moreover, othersoargue that it is not only with respect to accessing and processing information that new technologies have impacted on our relations with the world. The very nature of our interactions with the cultural landscape is said to be changing as interactive media locate the user as central to and in control of the cultural experience – shifting us away from the supposedly 'passive' role of viewers, to the 'active' role of players and makers (Barajas et alt, 2004). These new resources, then, are seen by many as responsible for transforming not only our working and educational practices, but our experiences of time, of space, of knowledge, of narrative and of social relations.

There is no doubt about the impact of learning technologies in the school system in Europe. Still, the paragraphs above refer most of the time to the reality of the information society in cities and other urban areas. But what if we think about rural villages lacking infrastructure and services with tiny isolated schools?

Though we may think that the official discourse does not apply to this sector in our society, we argue that, in fact, the information society is also breaking into the rural world and the rural schools steadily but at different pace. In fact, the promises of ICT are quite fulfilled in places where people are willing to fight isolation and promote innovation.

There is no doubt that the digital gap affects generally the rural areas and the rural education system. This situation has been tackled in many European countries through governmental programs helping private companies to implement the services and infrastructure necessary. However, the pace of the change is slower than in heavily populated areas.

In this paper we are going to present different experiences that have been identified in the Spanish rural school system, but could also be found in other countries around Europe. Nevertheless, before presenting these experiences it is necessary to understand how children learn in the rural classroom to put the second part of this article in context; for that reason it is essential to detail the characteristics of the basic learning structure in the multigrade classroom and the essential role of the multigrade teacher. This is the main aim of the first part of this article, which will situate the reality of the teaching-learning process in the multigrade classroom, recalling its special features and its differences from the regular metropolitan school.

Basic structural features of children's learning in the multigrade classroom

The multigrade classroom, and even more the one-room schoolhouse, is composed of students of very different ages, interests, capacities and expectations. It is a diverse heterogeneous group, which is sustained by collaborative[5] learning parameters, positive interdependence among all of the students, and the establishment of some shared social values necessary for the well-structured and organized operation of the multigrade classroom. It is actually a microcosm of society.

Diversity is the norm in the multigrade classroom. The students' grouping has to respond, then, to the guiding principle of respect towards this natural heterogeneity, and it has to be organized so that it favors the classroom and centers individuals' social and personal equity. Diversity is the situation in which a wide range of interpersonal relationships occurs, and at the same time, it is the starting point for the multiplicity of opportunities to learn.

But diversity also entails a characteristic learning structure, different to the found in the homogeneous classroom, the most usual grouping in the ordinary urban school, where children are grouped by age and, consequently, by school year.

Multigrade students have to be autonomous to be able to make learning progress, and the degree of autonomy has to be higher according to educational level and, obviously, according to the diversity of the classroom itself.

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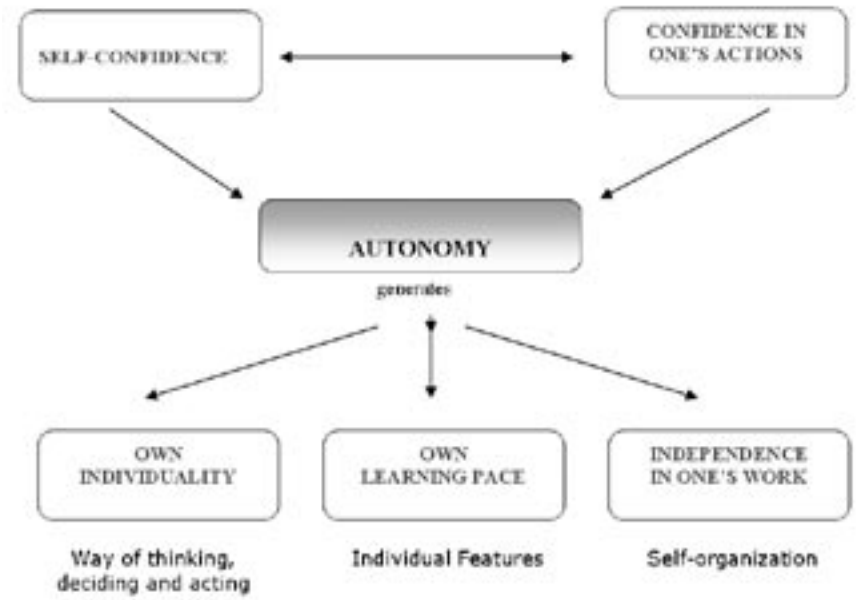
5 *For collaborative learning we understand a learning philosophy, not just a technique, ability and/or strategy and, opposite to cooperative learning, we define it as the learning situation in which the participants goals are closely related, in such way that each one can only achieve his/her goals if the rest achieve theirs (Jonhson, D, Jonhson R p. 14., 1999)*



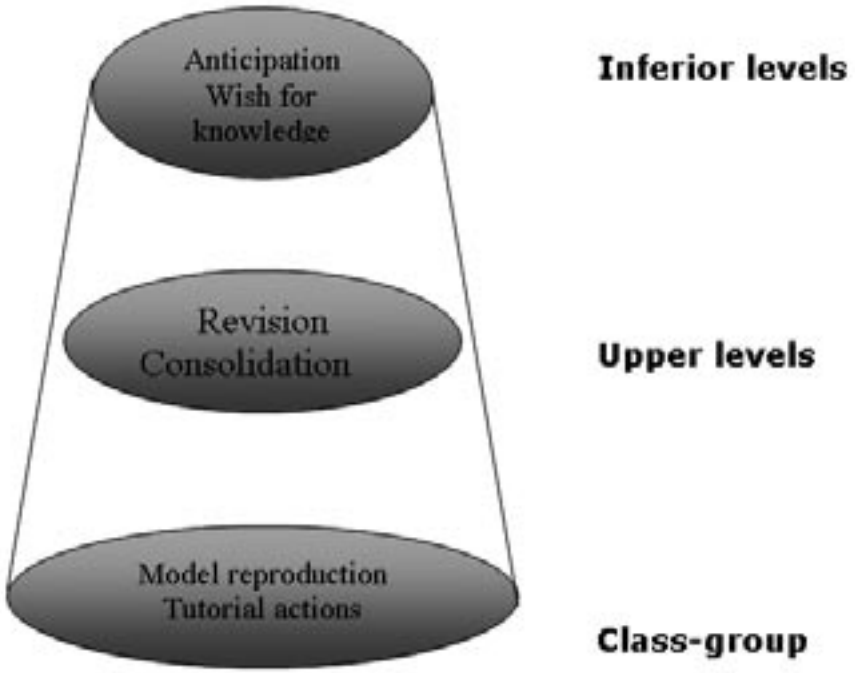
Autonomy generates to the multigrade students an individuality that allows them to think, decide and act by themselves, without the help of the teacher; as a matter of fact, they can not always count on her/him, since the classroom diversity itself pushes the teacher to dedicate more time to the children of the lower levels (i.e. nursery school and the first years of primary school); therefore, the students of the upper levels develop their own strategies, skills and talents to be able to carry out their school tasks.

This situation is important since it respects the children's learning pace to the utmost; they are the owners of their time and they have to learn to correctly organize and use it in order to be able to achieve the proposed goals. Thus, self-organization of work and time as well as optimization of the class resources and materials increase the autonomy of the multigrade student with respect to the teacher.

However, autonomy is not enough to understand the basic learning structure of the multigrade students. We must also consider the cooperation among the students who have some common aims on a medium- and long-term basis; that is, the direct and active children's participation and the mutual support among them.

Concentric circles are a cognitive structure that the multigrade students use to help themselves learn and help their peers. They consist of children of the upper levels helping those of the lower levels in the acquisition of curricular content (concepts, procedures, attitudes, values and social rules). During this process, the older students revise, consolidate and/or discover new knowledge, while the younger ones are taught new; the children of lower levels want to know as much as those of the upper levels, while the older peers want to tutor the younger ones. This situation facilitates learning, both if the instruction is given by the teacher or by

the peer-tutor.



- Concentric training circles -

It is important, then, to highlight this role of tutorial action that the peer-tutors play. It is a role of mediator between the teacher and their peers, generally of lower levels, who need of their help. They never substitute the teacher's role in the classroom but complement it.

The peer-tutors develop and apply procedures of task and conflict resolution that they have been acquiring during their own experience in the multigrade classroom. That is, they develop self-teaching skills; they can identify their peers' problems and act accordingly; they use social and communal-life skills basic for the resolution of the demands; and, at the same time, the process enriches them. This has effects on their self-esteem and self-confidence as individuals and as students, and it constructs the basic foundations of the value of solidarity that is so deep-rooted in the rural classroom.

In spite of the possibility of a large age difference among the children in the same class, it is clear that the same content taught by a class peer is easier to integrate than if taught by the teacher. However, in order that peer teaching be effective, it is necessary to implement metacognitive and/or cognitive strategies to achieve the goals: deducing rules, raising hypotheses, taking decisions, searching for interpersonal and/or group techniques, remembering the content sequences, repeating by heart, searching for precise descriptions, etc.

Peer-tutors develop various learning methods, making them more and more autonomous; **they learn how to learn;** all the children in the class can become tutors.

The multigrade classroom is a fishbowl where everything can be heard and seen. The teacher has to be conscious of this privilege and act accordingly; the challenge is in the implementation of interdisciplinary and/or globalized methodologies that are founded specifically on diversity, in an open and flexible space/time. Its application is based on a contemporary view of pedagogy in which innovative strategies are used and dialog, collaboration, and critical thought, as well as proposition and solution of problems related to the several knowledge branches are promoted.

In this way, the collaborative work, the research in the environment, the project methods, the case studies, the globalized programming units, and the interest centres are didactic strategies typical of the interdisciplinary methodologies and respectful of the multigrade classroom reality. What matters is to agglutinate disciplines and set aside disciplinary organizations that facilitate neither the child's collaborative learning and autonomy nor the peer-tutor emergence.

The teacher in the multigrade school

Rural teachers generally come from urban contexts, and because of this may have viewpoints on development and progress that are different from those from rural settings. The social group that they belong to has characteristic values, attitudes and behaviours. Therefore, the urban teachers, who may not have been adequately prepared in their teacher training, need to learn about and adapt to the rural setting.

Multigrade teachers are responsible for their classes, but they can also be organizers and managers of their own school or group of schools. In the paradigmatic example of the rural school, which is a one-teacher school, all the tasks relating to the direction of the school fall on the same teacher, though they can be lightened by the presence and intervention of the itinerant specialist teachers. As we will see further on, the functions of these teachers go beyond the specialization itself.

But we must also rethink the teacher's role as an educational agent and as a mediator between the rural community and the school and, of course, to specify where they can find their performance and intervention limits. Rural teachers have to assume a particular role between the school culture and the local culture, together with the teaching and management of the school centre and/or group of schools; for that they must be able to interact with many educational components inside as well as outside the school.

Using ICT in the rural schools: Some examples of developing learning resources

ICT-based educational resources in multigrade schools should help students to work with other students with different ability levels, and learn from older students. The development of resources and the organization of learning activities involving ICT, pursue this general aim.

On the other hand, the specific needs and, some times, ICT limitations, of both the rural schools and teachers' competencies, demand new approaches for classroom organization and new teacher's roles.

Both specificities should be seen also as new opportunities for the multigrade classrooms, as we will see below. The following sections show specific examples on how Spanish rural schools are dealing with the needs of supporting teachers in organizing ICT-based projects. Specifically, we review practical examples of developing ICT-based projects, classified in five different models. But, first, we must briefly see the profile of the two key participants in the educational use of ICTs in multigrade schools: the ICT teachers and the students.

Helping the local teacher: The ICT "traveling" teacher

Besides the multigrade teacher, there is another teacher whose role is essential for a good functioning of the rural schools: the ICT teacher. The work of these teachers is crucial in order to break the inherited isolation of the rural schools, to break the technological gap between urban and rural schools, and to implement new technologies in rural areas. They coordinate all teachers in a group of rural schools; their tasks are diverse and of key importance.

First of all, the ICT "traveling" teacher (named also as the nomadic teacher) organizes the ICT work of all the multigrade teachers and/or teams of teachers in the groups of multigrade schools. In most rural regions, the schools of the same area form a group called CRA or ZER, in order to share the pedagogic project, material and human resources. As a result, the ICT itinerant teacher will be in charge of coordinating the several grouped schools in their ICT-based work.

Secondly, the ICT teacher promotes the participation of students and teachers: both should share responsibility for the projects undertaken in either the school or the group. As we will see below, one of the methodologies used is the project work, in which the students are upstaged in deciding what is learned and how. The ICT teacher's role in this area is one of a facilitator and trainer, both for the students and for the rest of the teachers if necessary.

Thirdly, he/she must be open to innovation, experimenting with new ICT tools, promoting new methodologies to learning. This open attitude is fundamental in the field of the new technologies, and it will be the basis of the change which is taking place in the multigrade school, not only passing from isolation to being connected with the rest of the world, but also becoming a leader in using innovative pedagogic methodologies.

Eventually, the ICT teacher must be a comprehensive user, not just an "expert" in computing, since his/her role will be much wider than that of teaching how to use a computer.

Responding to the multigrade needs: students' design of learning materials by the school groups

One of the key methods that the teacher should master is project work. This method is approached by the school group (CRA/ZER) as follows: all the classroom chooses in a participatory way. The children decide a theme to work on according to a calendar of activities. The children discuss in the classroom what they know about it, and what they want to know afterwards. The next question is about how they will do it, and here is where ICT plays a key role. Searching for information on the Internet is the first step. Communication through the Internet with the other schools is the next step, in order to exchange information, discuss results and give responses to the questions posed by each school. Both individual and school dossiers are the outcomes of this strategy. The result of this process is a radical change; not only in the production of learning resources, but in general, the substitution of text books by the shared dossiers. The content of these resources are varied, from traditional to digital media; they usually contain multimedia materials, such as pictures and video clips.

Some models of using ICT learning resources in the rural school

Schools designing, distributing and using resources for preserving local traditions and local events

Beforehand, we must underline the effort carried out up to now in the rural school to stay updated in the use of new technologies. Nearly all the rural schools or the grouping of schools (CRA/ZER) have their website. Through the website and other ICT-based means, schools promote the recovering of their cultural roots, claiming the value of the differences with respect to the regular metropolitan schools. Thus, we can find Christmas cards,

Fig. 1: ZER El Moianès, Catalunya
http://www.xtec.es/centres/a8056729/

Fig 2: CRA de Castellote, Terol,
http://adigital.pntic.mec.es/~castello/

Fig. 3: ZER Vinyes Verdes, Catalunya, http://www.xtec.es/centres/a8056808/)

announcements of feasts, contests, diplomas of local prizes, pictures of the main celebrations, etc. The students' works can vary from simply scanning and uploading the drawings of the parties and traditions celebrated to the task of manipulating their own carnival pictures, writing texts for explaining the acts, or uploading traditional music from their village or region onto the web page. Doubtless, this contributes very much to improving the digital literacy of children.

Depending on the attained technical means and on teachers' and itinerant teachers' ability, we can find a variety of web pages. In most of them we find pictures of the traditional parties that have been celebrated in the school and of the works that the students made about them.

Fig 4: CRA de Castrillón-Illas, Astúries, http://web.educastur.princast.es/cp/castrill/

However, the tasks shown in some web pages are, not only pictures or scanning of craftworks, but also multimedia productions prepared by the students with ICT resources in order to deepen the traditions in question as well as their computer skills. Thus, we find school work made with several applications such as Paint, Word, PowerPoint, Paint Shop Pro, Flash, audio, and even video (Mavica, Studio 8).

Finally, some web pages display activities of tradition research in which an intergenerational exchange is given; an older person of the village goes to the school and offers a remembrance of childhood or a popular legend to the children or teaches them to prepare a typical meal for them, and at the same time the class offers him or her something, such as a workshop on computers. In the Asturian school group, Castrillón-Illas, we have found an example of this type in the project titled "Teaching to learn – the adults go back to school."

Schools using telecommunication tools for fighting the problems of rural isolation

The Internet has made a revolution in the way teachers and children of different schools work and learn. The Internet is the tool that has actually broken the rural classroom geographical barrier and has granted its opening to the world, democratizing the access to information, but also allowing, for instance, for classrooms scattered in different schools to follow a common curricular learning programme. Therefore we find a second model of ICT use, specifically focused to overcome the problems derived from the isolation inherent to the rural world.

An interesting case of how to struggle against the multigrade school isolation through the new technologies has been found in the utilization that some teachers, especially but not only the itinerant ones, make of several ICT resources. Teachers produce educational ICT-based

material and use the Internet to put these exercises or other information, models, links, etc. at the disposal of the students from every school coordinated by this teacher (see an example at http://www.xtec.es/centres/b7007622/itinerants.htm). Furthermore, some other web pages, such as http://www.educa.aragob.es/craarino/weduca/ by the Aragonese CRA of Ariño-Alloza, are specifically designed for self-sustained multigrade classrooms, and it should be mentioned that many of the exercises that they contain have been created by the students themselves and are also used as educational material. In addition, compilations of telematic materials exclusively produced for multigrade schools use and relating to all the Primary School curricular subjects can be found on the Internet. They have been designed by experienced teachers and are available to all teachers so that each subject can be studied at the different paces that the multigrade classroom imposes, though without losing the capacity to study in depth that the student needs at each level. In this area, it is interesting to point out the work gathered on the website http://pie.xtec.es/~jsors/ierural.htm, which includes curricular activities, electronic mail activities, information research activities, activities for an electronic journal and activities for parents and teachers, among other things.

Fig. 5: http://pie.xtec.es/~jsors/ierural.htm

Another way that multigrade schools face their isolation problems can be found in the shared creation of learning resources among different multigrade schools, which urban schools can use. For instance, there is the project Interconte, which consists in creating a tale among a group of multigrade schools, or the project Conte Telemàtic in which multigrade classrooms and urban classrooms can take part.

As a final point, we can include in this model the creation of Electronic Journals. In them, schools show the daily activities, parties, trips and the students' schoolwork in several curricular areas. As the Electronic Journals are created by a school group (CRA/ZER), they contain works of different origin and, consequently, they can become a vehicle for the students from different schools of the same rural group to know each other while they study curricular contents and improve ICT competences. Here we also find very different levels in the use and performance of the ICT resources, going from those which copy a traditional magazine format that is periodically published up to those which are completely electronic and multimedia, even incorporating a room for a students weekly Chat. Here are three examples: http://www.educa.aragob.es/revlapic/lapiz7/revista7.html http://www.xtec.es/centres/c5008081/20022003/htm/revista.html http://www.xtec.es/centres/c5008066/revista3/revistazer.htm

Schools using media and ICT tools for knowing, learning and sharing the local environment with different classrooms

Most schools study the rural environment and display on their websites the results of the children's study. These exhibitions can be very simple, just reporting the contents of their trips and learnings about nature; they can also include pictures and handiwork by the students. Or

Fig. 6: ZER Alt Pallars Sobirà, Catalunya: http://www.xtec.es/centres/c5007803/htm/activitatsanteriors.htm

Fig. 7: CRA La Marina, Astúries: http://web.educastur.princast.es/cp/lamarina/html/_primer_trimestre.html

they can be more elaborate, being part of a more extensive project. The first type is strictly a sample of the work about the natural and social environment that is carried out in the school, in which the ICT-resources are used as a means to set forth, beyond the school, the activities and research that have been achieved. On the right we can see illustrations of how most schools study the natural environment (see fig. 6). Though many times this use of ICTs is very simple, this schoolwork is essential in the multigrade school field since it reinforces the aspect of the rural identity from its more positive features.

The second type of webpage aimed at learning and sharing the environment is the global project which the school joins and which, through the Internet and several ICT-based resources, drives the students towards the discovery of the environment, either local or global, and towards an exchange with other groups or people who will be found during their virtual journey. Our first case is the Telematic Project "L'Hugot", in which the multigrade teachers prepare electronic cards with information about the rural environment; throughout the school year, a virtual character visits the different schools and makes proposals for gathering information on new topics.

Fig. 8: Telematic Project "l'Hugot" http://www.xtec.es/crp-bergueda/hugot/index.htm

A second example is the project to discover the world through the Internet and Jules Verne. Here, the experience does not consist in investigating the local environment but in traveling around the world following the stages on the journey made by Phileas Fogg in Jules Verne's novel. In order to cover each of the stages on the journey, the students have to pass through a series of tests as the protagonist of the novel did, and the participants act as virtual tourists through the Internet. The children have to reply to a series of questions related to the reading and have to do research using the Internet.

Schools using ICT tools for helping to build learning communities that involve not only teachers and students but also the whole village or area

Fig. 9: Proj. La volta al món de Jules Verne http://www.xtec.es/centres/c5007815/vol01/index.html

The arrival of the Internet and the new information technologies to the multigrade classroom has many times implied the opening of the whole rural world, beyond the school, towards these technologies. In the last years' institutional initiatives, such as the Aldea Digital Project or, afterwards, the Telecentros, the new technologies have become integrated, first in the multigrade school and later in the entire rural society. Some of the schools report the experience of how, through the Internet and thanks to the electronic mail obtained due to these programs, the students share vital experiences, musical preferences, queries, etc. with students from other groups of multigrade schools and even from other regions. In any case, the impact of these projects, added to the global educational work of the multigrade school, has been wider since, besides inverting the traditional situation and placing the multigrade school at the head of the teaching innovation process, it has meant an increasing interest in the knowledge and use of the new technologies among the different members of the rural society (many students' parents have requested training in these tools, the number of computer equipment in the area has increased, etc.). The school has been transformed into a resource centre for the village, in many cases the only access point to the Internet that exists.

Hence, we find the will of some schools or groups of rural schools to become **learning communities** that involve, obviously, students and teachers, but also the parents and other community members. The main goal is that the families share the centre's life and decisions while they enjoy its training facilities, as well as that the grouped schools work de facto in a coordinated way and enrich each other. At the same time, the creation of virtual teaching staff meetings has been carried out, spaces where the teachers of a group of multigrade schools can communicate through e-mail, a forum and a chat room in order to share experience, to plan, to evaluate and to accomplish all the usual tasks of the school staff meeting. The paradigmatic example of this creation of global learning communities mediated by ICTs is the ARIÑO-ALLOZA school group, from Aragón: http://adigital.pntic.mec.es/˜arino/. In our opinion, this is an unquestionably innovative and very promising experience since it not only continues to make use of the new technologies to provide the tasks of traditional education but it innovates and promotes new spaces, methodologies and experiences that broaden the possibilities of education and increase its quality.

Schools using ICT tools for sharing knowledge about their environment and traditions with schools from other countries, aiming at improving their own knowledge about other European cultures

A fifth model of ICT use in multigrade schools, deeply related to the third one but with broader geographical and cultural perspectives, is that of schools using ICT tools for sharing

knowledge about their environment and traditions with schools from other countries. This type of project has a double aim: on the one hand, learners study their natural and social environment; on the other hand, they can learn about their foreign partners' natural and social environment, traditions and language. Therefore, a cultural exchange and an improvement of their own knowledge about other European cultures occur. These projects involve schools from different countries which generally share the condition of being multigrade schools in rural areas, so that the student's background is similar (apart from the curriculum organisation differences) and the contribution put up by each school is similar too.

These projects allow the teaching staff and the students from at less three different countries the opportunity of working together in certain subjects linked to the common curriculum. Through the experiences exchanges, the students increase their general knowledge, discover the differentiating elements of the cultural, social and economic diversity of Europe, and learn to better comprehend and to appraise the other's opinions.

Fig. 10: ZER Baridà-Batllia, Catalunya, Proj. Comenius http://www.xtec.es/crp-cerdanya/comenius/index.htm

In the first project analyzed (see Fig. 10), schools from four different countries (Catalonia, Andorra, France and Wales) use a website to upload and share the information and resources that the students have prepared during the school year. The website is accessible in four different languages, thus the students can read and learn everything from their partners. This project studies the wildlife in the different protected areas where the centers are located. During the development of the project, the students produce several written compositions, drawings, paintings and other artistic works, pictures, etc., and through the new information and communication technologies, they introduce their protected area to the students from the other countries. Each centre's teaching staff and students select the information to update this web page in the five languages of the participants: Welsh, English, French, Catalan and Spanish. But along with this, field work is also done: concrete actions are also carried out in the protected areas, such as the marking of some stretch of path or the cleaning of an area, in collaboration with the institutions responsible for each protected area. As a conclusion of the work and a reference for the web page, a CD-ROM will be edited as the project broadcast. The main aim is to share the information to enrich the participants' knowledge about other European cultures through the promotion and utilization of the information and communication technologies.

A second example of ICT use to learn from and work together with classes from other countries is the one called "A Window on Europe" (see Fig. 11), whose goal is favoring the knowledge among the students from different countries about their living and culture through the exchange of materials produced by the students of the participant schools. Multigrade

schools from Astúrias, Finland, Wales and Italy take part in it. Around the subject of spare time, the students produce ICT-based materials as a calendar of school's events and electronically exchange ICT-based material related to their games, likes and preferences. In fact, very interesting multimedia tasks by the students are shown on this website: video, modeling works, PowerPoint presentations, etc.

Fig. 11: Proj. A window on Europe http://web.educastur.princast.es/cp/lamarina/html/a_window_on_europe.html

Our last example is a project carried out by three schools from Catalonia, Italy and Belgium called "Arte, Amicizia, Ambiente" (http://www.xtec.es/centres/c5008054/html/projecte.html), a project of acquaintance and exchange through letters, schoolwork and other conventional means of communication together with videoconferences. The exchange given among the schools is improved by the use of the video-conference for the children to get to know each other and to deepen the communication. Thus, children learn how ICTs can provide instant communication in an educational environment which allows them, not only to learn about different cultures and curricular topics, but to experience relationships with the other children. To conclude, these are only a few examples of this kind of intercultural exchanges, most of which are culminated with an eventual actual visit to one of the participant schools. Nevertheless, even though this kind of cultural exchange could be and has been carried out without the support of the ICTs, it is undoubtedly certain that the arrival of these technologies, and especially the Internet, has broadened and will continue to broaden the multigrade schools' barriers in a way that was unthinkable just a few years ago, disregarding the geographical isolation or the economic level of the rural areas.

Conclusions

While the extent to which this so-called 'digital revolution' in fact constitutes a distinct break with the past or the emergence of a new era remains contested (Webster, 2002), and the implications of these new resources for social well-being remain unclear (Feenberg, 1998), what is evident is that the presence of ICT tools provides both a new arena of opportunity and a new set of challenges for educational systems, for curricula and for teachers across Europe, including the rural school.

Beyond these statements, we claim that multigrade schools participate also of these opportunities, are able to evolve and adapt to the new era, and, moreover, other non-rural schools can learn from them. In fact, the multigrade school is a model which could be followed by regular urban schools; the educational approach of the multigrade school definitely implies a constant adaptation to the environment, but also, to the children's learning and maturation needs. The multigrade teachers' collaborative work, the organization and management of

the grouping of schools are ways to optimize the schools' human, material and economic resources, which can be adapted by regular schools.

In the learning processes, ICT resources are of key importance in the progression of pedagogic renewal attained by the school system, so as by the multigrade schools in recent years. ICT resources allow the multigrade teacher to heighten respect for diversity, so important in the multigrade classroom. Moreover, as we have exposed, the ICT resources allow for breaking the barriers and the endemic isolation of the multigrade school while they contribute to strengthening local traditions and specificities; that is to say, ICTs allow rural students to access the globalized world without losing their roots.

In this scenario, the creation of learning resources is a process involving teachers, traveling ICT coordinators, and students. The creation of educational ICT-based materials cannot be left (only) in the hands of multimedia designers and programmers that do not necessarily have a suitable concept of the children's learning processes. The rural school shows us that this task can also be accomplished by the school itself, which is indeed completely conscious of the education-learning processes; it can be achieved not only by the teachers, pedagogues and ICT teachers, but also by the students themselves as a part of their school task or in their role of peer-tutor.

The local rural community inspires and many times uses the resources created by the multigrade schools, which, in turn, are integrated into the curriculum. The multigrade school contextualization frames us in the historical, social, cultural and linguistic reality of the environment and allows us to incorporate it into the school curriculum. It is a matter of having at our disposal enough competences to be able to apprehend the local knowledge, to value and respect the school's physical and social environment, and to encourage the participation of local people in the curricular project accomplishment and/or revision, without neglecting the educational system's goals and policies. It is a matter of encouraging a "natural meeting between the school and the rural children's life".

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Interpreting lifelong e-learning experiences offered to remote multigrade school teachers in Greece over satellite

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Introduction

This paper describes the experiences and first findings from the implementation of the ZEUS (Satellite Network of Remote Schools) project, which aims to show how good-quality distance e-training, enriched with broadband applications, can be delivered to teachers working in multigrade schools in remote areas of Greece, overcoming the deficiencies in terrestrial telecommunications infrastructure through the use of satellite telecom systems. Following some initial background information on rural multigrade schools and the increased need of teachers working in them for in-service training and support, the concepts and tools of the ZEUS project are presented as a response to the challenges posed, and are followed by a discussion of first findings and conclusions.

Multigrade schools: the 'borderers' of the education system

In many primary schools of the Greek provinces there is not one teacher available for each of the six grades: the low number of students statutorily justifies the employment of less than six teachers –even of one or two–, who nevertheless are expected to cover the needs of a full school. These schools, known as multigrade schools, fulfil a function of national importance, as they provide the children of remote and less accessible areas with the access to education which all children of Greece are entitled to.

Teachers in multigrade schools: need for, and obstacles to, continuous professional training

Teachers of multigrade schools are confronted with significant challenges. In particularly promiscuous classes, they simultaneously teach two or more age groups and possibly more than one subjects. Teachers' initial professional training does not suffice: indeed little if anything about multigrade settings is included in the formal preparation of a teacher. The need for continuous training becomes evident – especially in the light of the fact that typically inexperienced, newly-appointed teachers are posted to remote schools for a short term service.

Providing teachers from remote areas with in-service training is not easy. A teacher's round trips between their remote school and an urban training centre tend to be costly, if not virtually impracticable, given that there may not be a colleague available to replace them during their absence.

At the same time, teachers at remote schools suffer the consequences of the digital divide between rural and urban areas. Broadband access to the technologies and services of the Information Society still remains unachievable for the inhabitants of remote and less accessible areas with deficient telecommunications infrastructures.

Greece: a case reflecting international trends

The above described difficulties of multigrade teachers working in remote areas are not unique to Greece. Internationally, the shortage of teachers in rural and remote areas, and the weaknesses of the education systems in the provision of training and professional support to these teachers, have been well-documented in the literature – particularly with respect to rural districts of the USA and Australia. Forbush & Morgan (2004) point out that shortages of teachers in rural communities relate to problems with recruitment and retention endemic to rural areas (Helge & Marrs, 1982). Among such challenges one may identify social and cultural isolation, limited mobility within the system, lack of personal privacy, diversity-related issues, and other issues (Ludlow, 1998; Miller & Sidebottom, 1985). With reference to less-developed countries, too, Ankrah-Dove (1982) provides a similar account of the problem, and suggests that four interrelated features of contemporary teacher education programs should be developed if good teachers are to be attracted to and retained in remote rural schools: field-based preparation, teamwork in training, community support of training and the recruitment and preparation of local teachers. Coldevin & Naidu (1989) also provide an interesting view to issues relating to Third World development through in-service teacher education at a distance.

Multigrade teachers' pronounced need for in-service training is also particularly highlighted. Benveniste & McEwan (2000), analyzing conditions under which implementation of multigrade schools might be successful, identify the lack of in-service training as a major constraint to the implementation of educational innovations in multigrade schools. Most interestingly, they conclude that capacity building through in-service training is an important

determinant of the way teachers approach their task.

All these problems appear to be in sharp contrast with a growing recognition of multigrade schools as not only a necessary, but indeed a good-quality option for education systems. Multigrade settings are believed even to have some advantages over single-level classes, arising from the interaction among children of different ages and abilities and the powerful social development and learning dynamics generated by this. Cook (2000), for instance, describing her experiences in a small school in rural, central west New South Wales (Australia), stresses as positive points community and parent involvement in the school, the benefits of multigrade classes, the close relationships of students and staff, and extracurricular activities. As Lloyd (2002) points out, research on classes that are mixed age by choice, not merely multigraded, has found positive effects on student achievement, mental health, social development, and liking for school. Multi-age classes generally have more parent support, but teacher continuity is also necessary for success. Indeed, such recent trends in education as peer tutoring and project-based learning have always been practiced in small rural schools (Boss 2000).

The use of ICTs

The need to support multigrade education thus becomes obvious. As a response to the obstacles described earlier, the use of different forms of technology-supported learning and distance education models have been advocated for the enhancement of quality and accessibility of teacher training programs (Squires, 1996). Distant delivery of instruction through the use of technology has appeared to be a viable approach for addressing the problems and issues associated with providing effective and efficient teacher training in rural areas (Ludlow, 2001). The literature reflects this focus on the role of technologies enabling distance training of remote teachers, generally following the technological trends in the field of computer-supported learning. In the early 90s Kendal (1992) offers an appreciation of the benefits of a computer-based telecommunications network used for delivering telementoring and teletraining for educators in rural areas. Ludlow & Duff (2002) describe the use of webcasting technology in a personnel preparation program for rural special education practitioners. Falconer & Lignugaris-Kraft (2002) report on the use of two-way conferencing technology for the provision of teacher training in remote areas, while Forbush & Morgan (2004) focus on delivering two live internet-based real-time video and audio teleconferencing courses to special education teachers in rural areas in the USA, which they claim has successfully overcome some of the training obstacles inherent to rural school districts, including access to skilled trainers, college/university training, and quality curriculum. Generally, the content of training delivered via the different technologies to the remote rural teacher varies greatly, from conventional seminar-type lessons to more imaginative uses of technology-enabled remote access, such as classroom observations at a distance (McDevitt, 1996).

Importantly, however, beyond technological concerns and novelties, international experience has also pointed out the importance of an adequate strategic and organizational framework, such as the one reflected in the direct outreach of universities and teacher training providers to the rural areas, and the development of university-school partnerships, which are believed to help alleviate isolation and the several disadvantages (e.g. Menlove & Lignugaris-Kraft, 2001).

Building the Knowledge Society without discriminations through satellites

Knowledge is a fundamental and strategic resource of society. In recognition of this, 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. To achieve these objectives, widespread availability and usage of broadband and high-speed Internet throughout the EU is necessary. It is becoming more and more evident that the vision of Lifelong Learning and 'Education for All' will be realised through 'Broadband for All' (cf. for instance Scottish Executive's recently launched –in May 2005– 'Broadband for Scotland's Rural and Remote Areas' initiative).

However, the digital divide in Europe remains large, and for more than fourteen million European households in remote areas the digital divide is actually growing. Teledensity is lower outside urban centres, and the rural and less favoured regions lack the same access and supply of internet access and broadband connection as the urban areas have. It is estimated that more than thirty million people in the Community inhabit remote rural areas, which account for some 30% of the territory. The proportions of rural populations living in geographically disadvantaged areas and suffering from the digital divide are significantly higher in the new Member States and accession countries, which results in significant socio-economic effects and challenges (Cohendet 2003).

It is a stated strategic priority for Europe to use to the full the potential offered by all available broadband technologies, including satellite communications, to bridge the digital divide (European Commission 2003). Satellite telecommunications can indeed play a crucial role in the creation of a balanced Knowledge Society without discriminations, as they can secure broadband access to the Information Society for those who geographical and other adversities have kept in digital isolation. In recent years there have been several initiatives in the field of satellite telecommunications applications addressing the needs of rural communities. As Cartheron (2003) shows, under certain conditions, satellite solutions prove competitive among other broadband access technologies, for the reduction of the digital divide in Europe.

Distance education: a case for satellite telecommunications

Distance education is one of the major fields of application in this area. Littman (2000) describes satellite telecommunications as an innovative delivery option for distance learning, and offers an account of different educational initiatives that facilitate access to new student populations in distance locations, sustain trans-border collaboration and research, and promote curricular enhancement and enrichment. Significant experience has already been gained internationally, particularly in the United States and in Australia, where e-learning via satellite networks has been tried mainly for adult learning, but even with children in primary education (e.g. Boverie et al, 2000; Boylan, Wallace, & Richmond 2000). In the last couple of years many other less developed countries with populations distributed over large geographical areas have been exploring the potential of satellite telecommunications for e-learning. Al-

Sharhan (2000), for instance, discusses the developments in satellite communications and educational applications, with a focus on the possibilities of adapting satellite technology for instruction in developing countries, and recommendations for the adoption of satellite technology in Saudi Arabia. Cohen (2002) describes how the University of the South Pacific has created a satellite-based computer network aimed at greatly expanding its offerings to students on remote islands. Interestingly, also, from an international perspective Lorenzo (2002) describes the Global Development Learning Network (GDLN), a satellite-driven global communication system developed by the World Bank to help developing countries fight poverty and share in a global exchange of information, through Distance Learning Centers that are used by private and public organizations and institutions for distance education and knowledge-sharing programs.

ZEUS' response to the challenges: a high-quality learning environment over satellite

This growing mass of international experience clearly demonstrates that emerging technologies offer promising solutions to the challenges of providing accessible and appropriate training to rural educators. Making this its central concept, the ZEUS project has come as a mature cooperation between technological and pedagogical experts, who have joined forces to offer a genuine response to the above-described challenges through the provision of distance e-training for multigrade school teachers via the use of broadband satellite networks. The recent launch of the Greek satellite, HellasSat, has given ZEUS an excellent opportunity to highlight the existing potential for the provision of state-of-the-art e-learning in remote and less accessible territories of Greece.

The project has provided educationalists and technologists with an interdisciplinary collaborative framework for the development and exploitation of an advanced, content-rich e-learning environment based on satellite telecommunications. Synchronous and asynchronous e-learning technologies delivered over broadband satellite internet have been integrated into a unified e-training framework, which has been designed and developed based primarily on pedagogical rather than technological grounds. The output of this procedure, and main deliverable of the project, is a distance in-service training programme, which was piloted with multigrade school teachers in diverse remote and disadvantaged locations throughout Greece.

The ZEUS training programme

Based on analysis of teacher needs, that was conducted at the outset of the project through the administration of questionnaires completed by multigrade teachers as well as through literature research, the ZEUS training programme aims at helping multigrade school teachers to develop their professional skills along two main axes:

- Use of ICT in their work, both for teaching/learning and administrative purposes.
- Application of teaching and learning approaches which are most appropriate for the

multigrade classroom, with some special interest in the advantages that cross-curricular approaches can offer.

Through satellite/ICT installations at schools delivered by the project, the training programme has become available to teachers at ten locations in the extremities of Greece: Thrace in the Northeast, Pindos mountains in the mainland, the Aegean Sea, Crete, Southwest Peloponnesus, and the Ionian Sea. The selected pilot sites reflect the diversity of conditions and circumstances in which a remote school may be found to operate in Greece. The sample includes schools from mountainous communities with little interaction with the rest of the country, to other disadvantaged rural areas in the mainland, and to schools located on islands which, although tourist destinations in summer, revert to being almost isolated territory during winter.

Technological environment

The ZEUS e-learning environment is based on technologies which exploit satellite telecommunications for broadband delivery of rich educational content, including good quality video, 'heavy' web-based applications, exchange of large files, multipoint conferencing, etc. Due to some limitations in the technological possibilities offered by the Greek satellite at the early stages of the project, the architecture of ZEUS (DVB - Digital Video Broadcasting) foresees the use of broadband satellite links for downloading data to user workstations, while uploading and feedback is sent by the user through existing terrestrial infrastructures (typically ISDN lines, available to virtually all schools). It is noted, however, that recent developments in the telecoms market in Greece already allow for two-way broadband satellite connections (DVB-RCS - Digital Video Broadcast – Return Channel Satellite).

The applications mainly used for the delivery of training are: a) the MENTOR software, a synchronous e-learning suite developed by the project partner by Intracom S.A., which is specifically designed for use over the satellite platform, and which supports videoconferencing, application sharing, and chatting, all integrated in the same interface; and b) a specifically designed asynchronous e-learning environment, a dedicated web platform developed within the project, which provides secure and structured access to a rich pool of educational content.

Focus on pedagogical design

Although technical specifications do play a crucial role in a distance-education-via-satellite scenario, the success or not of the effort mainly depends on the underlying pedagogical design. Literature offers ample evidence for this. Lim (2002), for instance, underlines instructional strategies and instructional design as factors which affect students' higher learning and application of learning in a satellite-based delivery setting. Taking the primacy of a rigid pedagogical design as a rule, ZEUS has produced a training programme which aims to cater for flexibility and guidance, interaction with others and self-paced learning.

To this end, a central event has been put in place for each lesson. This is a live videoconferencing session, using the synchronous e-learning suite, which covers the need of isolated teachers for communication and real-time interaction with colleagues and instructors. The importance of interaction is similar settings has been stressed in the literature, as it has been found in connection with program effectiveness and particularly with the levels of cognitive, affective, and behavioral acceptance by the learners of programs delivered via satellite (Shrestha & Sutphin 2000).

Both before and after the live session, however, the pedagogical approach adopted by ZEUS foresees learning activity which takes place independently in the working environment of the teacher trainee. Through the use of web-based instruction techniques applied in the ZEUS e-learning web platform, course participants are offered on-the-job training opportunities through tasks and materials that allow them to work at their own pace, interact with the instructor and other practitioners as needed, and receive individual feedback as they apply information to their classroom settings. For each lesson, there are introductory information on the topic covered, preparatory activities, the outcome of which is then reported by participants in the web environment and during the live session, as well as post-session consolidation and conclusion activities. The broadband link permits the use of large-size files (e.g. video clips).

Evaluation methodology

One of the major aspects of the ZEUS project is the evaluation of the piloted solution for e-training multigrade school teachers via satellite. The aim of evaluation is to assess the appropriateness of the choices made during the design stage of ZEUS, and the overall effectiveness of the solution, at three levels:

- at the level of the technology used (user-friendliness, functionality, reliability, efficiency);
- at the level of the content of training offered (structure, completeness, clarity, variety; attractiveness); and
- at the level of the procedures followed (planning and organisation; educational methods; implementation).

The views of users (teacher trainees and instructors) on these aspects of ZEUS are collected through a variety of tools, including online questionnaires, interviews, as well as field observations and video recordings in the schools and classrooms of the participating teachers. Questionnaire responses are analysed statistically, while data from the interviews and observations are analysed qualitatively, making use, among other tools, of specialised software for the demarcation and analysis of video data.
For evaluation purposes, as well as for the introduction of improvements at a middle stage of the implementation, the course offered is organised in two consecutive cycles. As a result, evaluation activities cluster around three main points in the timeline of the project: before the outset of the course, after the completion of the first cycle, and after the completion of the whole course, at the end of the second cycle. In this way, the evaluation methodology seeks to take record of the conditions prevailing in the participating schools before the programme,

after its first cycle, and after its eventual completion, so that any changes effected by ZEUS can be spotted and hopefully interpreted. In particular, the outcomes of evaluation at the end of the first cycle are useful for the introduction of any necessary improvements in the second cycle.

Initial findings

As the ZEUS project is currently approaching its completion, there are already some interesting findings and conclusions that can be reported at this stage. These will naturally be further enriched when the analysis of the significant amount of collected quantitative and qualitative data is completed. In the following lines, some of the most important research findings, as well as some more general appreciations of the experiences gathered during the project, are presented.

The attitude of the participating teachers towards the training programme has always been very positive. In their majority, they have been dedicated to the course, and prepared to withstand any difficulties arising out of technical or other problems. According to the views expressed by the teachers of the remote schools, this interest in ZEUS is due to such factors as a decrease in their feeling of isolation and increased opportunities for communication with colleagues, new opportunities for access to up-to-date information, as well as the good relations and rapport developed between the trainees and the staff supporting them.

In addition, given the situation recorded by ZEUS before the beginning of training, multigrade school teachers in Greece are in real need for training in the use of ICTs, as well as in new, less conventional pedagogical approaches, which would help them better respond to the particularly high demands and challenges posed by multigrade classrooms. All observations made in schools at the pre-course stage revealed a very low level of use of ICTs, as well as traditional methods of teaching and classroom management that did not appear to offer best solutions for the particularities of the multigrade classroom.

Concerning training content, too, the experiences of ZEUS has shown that rural teachers' training in the use of ICTs can have effects reaching well beyond the school, proving to be a useful tool for boosting local development. The central position of the teacher in an isolated community, and the significance and prestige of the school as one of the few public establishments, can be used in an attempt to instill a new culture in rural communities promoting digital literacy and reducing resistance to the use of new technologies. Trained, knowledgeable teachers can act as the change agents who will disseminate the new potential offered by ICTs and encourage its uptake by the local workforce.

Another very clear outcome of ZEUS was a corroboration of the predominance of the appropriate pedagogical design over mere availability of new e-training technologies via satellite connections. The different media, tools, and contents need to be orchestrated, according to clear pedagogical planning principles, into frameworks enabling substantial learning experiences and maintaining learners' interest unabated, so that specific training goals and objectives are achieved. The analysis of data so far has shown that clearly a specific

procedure can be proposed for the preparation, realization and support of e-training, which structures a series of asynchronous preparatory, connecting, and consolidation activities around a central live session.

As far as technology is concerned, the ZEUS experience has clearly shown that satellite data telecommunications can effectively support the provision of training and professional development at a distance, particularly to professionals such as teachers who work in remote and isolated areas. Nevertheless, ZEUS has also clearly indicated that significant technical difficulties, which in some (limited) cases even caused obstacles to the smooth running of training, would have been avoided if a more advanced model of satellite internet provision (DVB-RCS) had been available, not demanding the use of non-broadband terrestrial infrastructures.

Overall, running ZEUS has been a rewarding experience, which, on the one hand has confirmed the usefulness of satellite telecommunication systems for the development of remote and isolated communities, starting from teachers working in such communities; and on the other hand, has suggested ways for introducing improvements into, and furthering our work in this field.

Note: More information about the ZEUS project can be found at www.dias.ea.gr. The ZEUS project is partially funded by the General Secretariat for Research and Technology of the Greek Ministry of Development, within the Concerted Programme for Electronic Learning of Measure 3.3 of the Operational Programme Information Society (Community Support Framework 2000-2006).

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Linking remote multigrade school teachers across the continents: educational uses of satellite telecommunications at the global level

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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

Intoduction

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[6] 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 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

6 *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 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).

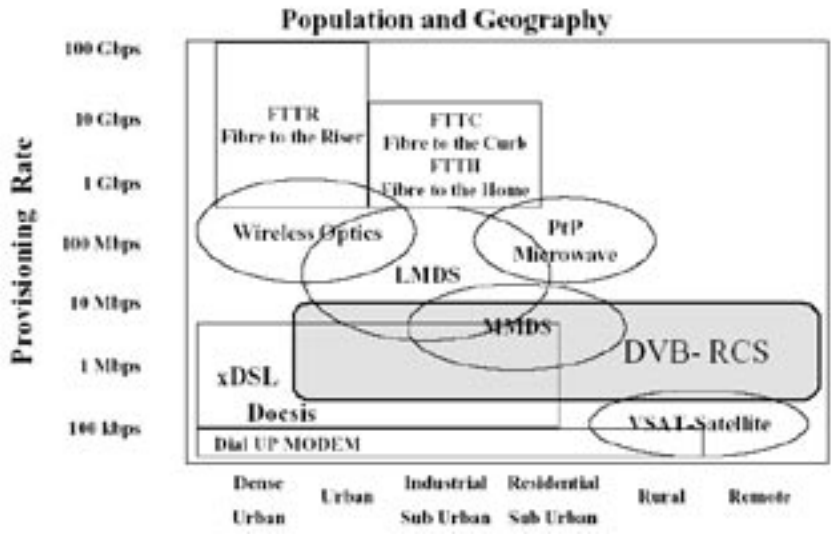

Figure 2: Access Technologies (S. Boom & G. Adams (2001): "2 Way-Sat" by Newtec).

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 return 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 f**unctionality, 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 stake holders 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 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 (scenarios)** 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[7], TWISTER[8], ZEUS[9], MUSE2, SCHOOLSAT1, AMERHIS1, BARRD1, RIA3, NMB3, VERDI1).

7 *ESA projects*

8 *EC projects*

9 *National Initiatives*

E-training the multigrade school teacher

Anita Pincas, Institute of Education – University of London, United Kingdom

Introduction

This talk highlights the daily classroom problems faced by the multigrade teacher, and relates these to methods of training. The term e-training is being used in the same way that the UK Department for Education & Science uses the word e-learning, namely to include all uses of Information and Communications Technology (ICT).

It is proposed that teachers in training or further professional development will benefit most from sharing ideas a structured environment where input from a tutor is balanced by collaboration with peer teachers. An important goal is to develop for them an accessible bank of teaching ideas that can be used flexibly for a wide range of delivery methods. Such methods are rapidly changing, as new technology becomes ever cheaper and more familiar to teachers.

UNESCO – importance of teacher education

At the UNESCO world conference on Capacity building for ICTs (May 2005, linked with the World Summit on the Information Society), according to an internal report by Niki Davis, Visiting Professor to the Institute of Education, University of London, eight critical issues were identified for enhancing the positive social effects of Information and Communication Technologies (ICTs - Figure 1). She pointed out that delegates at the conference linked these closely to the high importance of teacher education.

I will focus on those issues in a general way while proposing appropriate methods of harnessing ICTs to train multigrade teachers and offer them ongoing support for their continuing professional development.

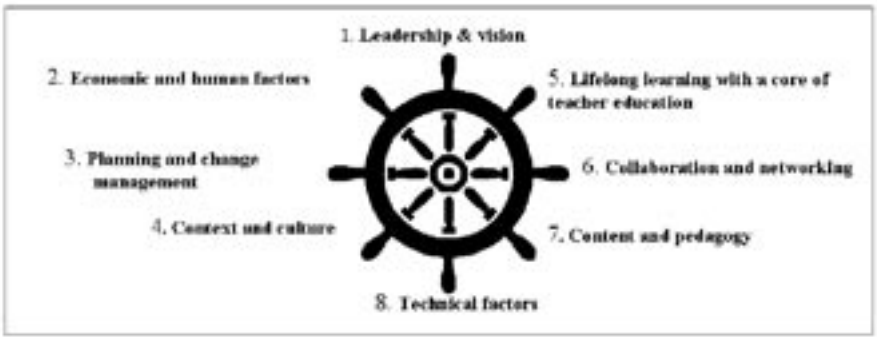

Figure 1

Summary of the multigrade teacher's problems

The term multigrade teaching is not used in the UK, where it is common to use expressions like: mixed classes, mixed level teaching, mixed age teaching, vertical classrooms. Further, in the UK, such classes – though relatively common especially in rural primary schools – are not recognised as needing special teacher training. What training there is, tends to be included in the basic initial teacher training courses subsumed under mixed ability teaching, which, though not totally distinct from multigrade teaching, nevertheless has a lot in common with it. The teacher of any class normally finds some variations in the level of abilities, ages, and interests,and backgrounds among the learners, and therefore always needs to make a number of strategy decisions that will influence her classroom teaching. But it is superficial to believe that multigrade classrooms do not need special consideration. When pupils are different in all these factors, the problems are qualitatively different largely because the potential for pupil collaboration may be severely reduced and has to be considered in different ways.

Some of the key issues that multigrade teachers have to ask themselves for every class are:

1. Will the class be organised a whole class, in groups, pairs, or individuals?
2. If there will be pairing or grouping, will these be determined by factors of age, level, ability, gender, or others, or will the groups have a mixture of these factors?
3. Will one class arrangement be permanent for a whole term, week, day....? Or will groups change from one lesson to another?
4. If pupils are in groups, will they actually work collaboratively, co-operatively, or as individuals merely sitting together?
5. What kind of whole-class teaching can be made suitable for all learners of different age, level, ability, gender, or other factors?
6. How can the teacher best manage the class time?
7. How much autonomy should be given to individuals?

8. Are all pupils working on the same subject at the same time?

...and so on.

Within an overall strategy, the teacher may have different beliefs that influence her answer to these questions. Or, she may wish to try out different hypotheses, for example:

- Group work is easier/harder than whole class teaching or pair work;
- Children can teach each other;
- Younger children can even teach older children something;
- Personalities have to be taken account of;
- Some children will need raising of self-esteem more than others;
- Over dominant children may have to be punished/distracted/given special tasks/ talked to quietly;

...and so on.

There are no grand, universal solutions to these problems, any more than there are for any dealings among human beings in the family, at work, or in society in general. In an ideal world, we would like to offer definite answers but we are limited to practical, workable methods that, we hope, will succeed much of the time for as many classrooms and pupils as possible.

The major help will not, therefore, be to tell multigrade teachers what to do, but to provide them with ideas for possible solutions, and then to give them scope to mingle with others and share these and other ideas of their own. ICT therefore will have a dual role:
a. It will assist the classroom teaching and learning
and
b. It can bring remote and busy teachers together with each other and tutors and other specialists in more convenient ways that collecting them in a training college at fixed times. As we know, it enables cross-national collaboration.

Thus, the role of ICT can be significant in any effort to help teachers develop their personal, independent ways of coping with problems

Training with ICT

In asking our specific questions we need to consider how we you train teachers and initial training level in traditional college/school teaching practice, and also later for further professional development, or as it is still called in the UK, for inservice training (INSET).

In the traditional method, teachers spend a period at a college, dealing with theory – or principles – which, of course, make reference to practice, but in a general way that is abstracted from the actual classroom context. At some stage, they move to schools to practise teaching. There, they are normally left alone in classrooms for considerable, probably the major, parts of the time. The hope is that the other teachers in the school will help them, and one or two

will be nominated by the school todo so. Somebody from the training college might visit them on occasion and watch a class or two, and offer feedback. There are many ways of doing this, including video's of their own classrooms so that they can watch themselves.

But what facts is it possible to present to trainees about teaching during the college training? Any training that deals with human behaviour is quite different from training, for example, to use a computer or drive a car. In those cases we have facts to impart because there are few choices, for instance about how to start a car or a computer. But there is an infinite number of unpredictable factors that can change the human, and therefore, the teaching situation. This, we normally leave to that catch-all "experience".

Further professional development, or inservice training (INSET) might therefore be the best way to improve matters as far as approaches to multigrade teaching are concerned, since our teachers will already have experienced the problems. It is normally suggested that we:

- Encourage teachers to reflect on their own practice.

  The problem here is that we need to to give them something to reflect about, and we should do this systematically. We need to give them new ways of seeing teaching, especially their own. Crucially, we should give them alternatives to consider: Could you have done X instead of Y?

- Stimulate teachers with new concepts.

  The problem here is that there are not so many readily available about multigrade teaching. On the other hand, in the UK literature, mixed ability teaching, which does not necessarily involved mixed ages or mixed levels, is well covered. Much of it may be very relevant to multigrade teaching, but distinctions need to be made.

- Encourage teachers to experiment.

  The problem here is that we urgently need some methodology handbooks to present teachers with alternative scenarios for their teaching activities. A set of templates, or easy lesson plans to follow, that they can adapt quickly for their own classes would be ideal.

- Challenge teachers to do their own critical thinking – helped with ICT

  The problem here is that this is difficult to do on one's own. We need to organise collaborative groups of teachers to stimulate each other. This is difficult where teachers are both isolated and unmotivated, and technology for remote communication can be organised. But it needs to be well structured and effectively managed or it may fail and leave teachers even more dissatisfied. What it should incorporate is:

- Occasional days for live meetings so that a sense of personal involvement can develop;
- Simple ICT so that teachers are not daunted;
- Strategies for discussion that will fulfill the requirements and not become irrelevant;
- a great deal of peer collaboration so that teachers who need help do not feel either

isolated, or totally dependent upon one mentor.

- ICT adapted to many delivery modes. These may be highly variable. We see a huge range of technology being used in richer and poorer countries. The UNESCO conference gave examples of a range of ICT initiatives: e.g.

1. Virtual University of the South Pacific, which has increased access to education with satellite communications that are blended in with lower level ICT.
2. the initiative to produce the $100 educational computer, started by Nicholas Negroponte.
3. China where ICT trainers visit millions of regional farmers to provide demonstrations and materials in the local context.
4. Other cases show how important it is to train young people and women who belong in the community, so that they themselves can become change agents making use of ICT.
5. Intel's 'teach to the future' initiative where the preparation of teachers is recognized as a major critical success factor. In Germany, Turkey, and Brazil, Intel collaborate with the ministry of education, and work through regional providers who interpret the program. 21st century skills are interpreted into local curriculum standards and pedagogy becomes more interactive so that teachers become master teachers who educate others.
6. Jordan shows collaborative strategies to develop content and pedagogy with the assistance of Cisco, Microsoft and other multinationals who have supported the development of basic mathematics curricula in Arabic.
7. Afghanistan for rural villages + community radio station in Kabul
8. India - internet kiosks
9. One mobile phone by a whole community of rural people

We propose for our training courses creating both content materials and methodological suggestions for teachers to adapt in ways that suit them. We will create these so that they can be delivered in many different ways, ie combinating e-learning with traditional methods, such as live meetings, and also with older technologies, depending on what is most suitable for each context.

Underlying everything will be the core concept of bringing remote teachers together, in two different ways. First, it is well understood that the use of local and national languages develops human capacity locally while upholding cultural identity. Following the model of the training course that I have run for many years [Online Education and Training], we should take account of local needs by grouping students into regional sets for some period of time, during which they can communicate with each other in the mother tongue.

Second, it is equally necessary to enable cross-regional contacts and sharing, so that teachers mix across European state boundaries so as to deal with more generic, common, issues. For this, they clearly need a lingua franca, but even imperfect knowledge of other languages need not impede remote communications.

There is a wide range of technology options, ranging from the old familiar methods to the most up to date.

1. Old, familiar methods

a. paper/post
b. fax
c. telephone
d. radio, especially when interactive with phone-ins from listeners
e. TV

2. More recent becoming commone

a.recorded audio and video
b. satellite radio/TV
c.mobile telephones including SMS/text messaging

3. More recent but limited/ expensive in rural areas – the internet:

a. Email
b. WorldWideWeb

4. Most recent and still expensive technology:

a. More advanced mobile devices, e.g. palmtops, that have full computing facilities.
b. Video-conferencing, by satellite and/or through the internet.
c. Virtual Learning Environments [VLEs] on the WWW.
d. Blogging on the WWW.
e. Podcasting on the WWW.

For instance, a training course for multigrade teachers could be a mixture of paper-based materials and group discussions by simple email. This could be supplemented with video cassettes of talks by tutors. Where suitable, it can also include videos of model lessons taken from existing multigrade classrooms. The same materials can also be up-graded to make a simple advance from email to non-website platforms like FirstClass. Discussions could be partly by mobile phones and SMS. If appropriate, however, higher technology such as full use of the WWW, including video conferencing, instant messaging, audio files, video-streaming will also be taken account of. The training course itself would be presented at whichever technological level was most suitable for the cohort being trained. Actual face to face meetings can be incorporated easily as required.

A flexible format is recommended for the design of e-training courses for multi-grade teachers, so that different regions can adapt it to their own needs. Since the problem is likely to grow rather than diminish, we should attack these strategies as a matter of urgency.

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The conference may still be accessed at

http://www.unesco.org/wsis/meetings/capacity-building

WSIS

http://www.unesco.org/wsis

Online Education and Training

http://www.ioe.ac.uk/english/OET.htm

Multigrade school education in Europe: policies, tendencies, and the challenges for educational ICT

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Defining the term

What is meant by the term "multigrade school"?
Multigrade school is the type of school in which the teacher has to teach in one classroom students of more than one grade and more than one age. The curriculum and educational material differs for each age group/grade, hence the multigrade school teacher is obliged to address his/her teaching separately to each group, while the other groups in the classroom are involved in other tasks.

Where are multigrade schools instituted?
MS are a European and a world phenomenon. They are usually found in isolated, low-populated, remote rural areas, small islands and villages i.e. MS exist in places where the number of pupils is very small. They form a sole educational solution in these areas since any alternative is unaffordable. Although MS compared to single grade schools can be considered as providing an alternative educational and pedagogical system, very few attribute MS existence to the attempt to apply alternatives. Among their common negative qualities, the educational and research community mention: pressure of teaching time, unfair learning time per student compared to conventional schools, weak antagonistic learning environment, absence of specialized teaching subjects (music, foreign languages, sports, ICT, arts etc).

In spite of these disadvantages, there is a range of positive qualities that have to be pointed out, such as: highly coherent relations between students and teacher, faster and more effective socialization, stronger bonds with the local community, development of self adjustment and self –learning skills, and adaptability to a more demanding environment and to an alternative pedagogical practice. These and in particular the adaptability is considered as a highly significant advantage that gains grounds amongst pedagogues nowadays.

In Europe, MS can be found in the two vertical edges, the south and north of Europe, i.e. in places where geographical conditions are more difficult (rural areas, Mediterranean islands,

dispersed population villages of the north, islands in the north sea and areas of difficult access. Central Europe does not need to apply the MS solution.

Through out the world, MS appear in both developing and under-developed countries; in the latter the available budget for education usually is not sufficient and does not allow the operation of a single grade school irrespective of the number of pupils.

Why do they exist?
The need for MS arises from the "must" that all the citizens in a country should have equal opportunities in education. Apart from this general, there are many other reasons why MS exist worth mentioning are the following.

Social reasons. Population should be kept in remote and isolated areas for these areas' survival but also in order to avoid further expansion of urban centres.

Geographical reasons. Access and transportation is difficult in some areas and this makes necessary for education to be offered on the spot.

Pedagogical reasons. It is not considered pedagogically correct for students to travel everyday in order to reach a school, since this means tiredness and loss of valuable time. Parents also would find unsafe and wrong for their young children to leave home and be transported to school.

Some parameters on MS operation / MS problems

Teachers are not sufficiently trained as multigrade school teachers.
MS teachers are usually young and inexperienced (if they do not live in the area permanently). In many cases they are not trained for MS while at university. They rarely receive any special MS training while in service and they have very limited opportunities to achieve training during the school year, unless distance training makes in situ training feasible.

There are no schoolbooks especially designed for multigrade teaching.
Multigrade school's teacher uses the same books that are used in conventional schools, in other words, the Ministry of Education has not produced specially designed books to cope with the special needs and conditions of multigrade schools.

There is no multigrade curriculum especially designed for them
In a multigrade school, the curriculum followed is the same with that of a conventional school with a few changes. In particular, multigrade schoolteachers teach the same objects as in a monograde school differentiating only the parameter of week time per subject.

Synchronous teaching of more than one grade
As already mentioned the main characteristics of MS are the coexistence of more than one grades (age and level) in the same classroom and the fact that a multigrade teacher is

expected to address his/her teaching to more than one grade at the same time. Under such circumstances there are two realistic ways of teaching: one is synchronous teaching of more than one grade. In that way, a teacher treats the grades that he co-teaches as one homogeneous grade. The second is to teach each grade one after the other in a time-sharing mode.

Time pressure
Time is one of the most crucial factors during multigrade teaching. Since a MS teacher has to address to more than one student-group, he/she should schedule teaching time so that while teaching in one grade, students of other grades are working efficiently in various ways. There is a range of theoretically accepted methods of "occupying" effectively MS students, such as self –learning activities, peer-learning etc

Dead time
Related to the above, one of the greatest difficulties of multigrade teaching is to deal with what pedagogical theory is referring to as "dead time". That term is eloquently mentioned to the situation emerging when a MS teacher teaches one group of pupils and does not address another. The "excluded" group then faces the parameter of "dead teaching and learning time", unless the teacher is adequately prepared to guide these pupils to alternative learning procedures.

Multigrade teacher's opinions about the institution of multigrade schooling

The majority of primary education teachers are women; however the majority of MS teachers are men. MS teachers often need to cover great distances to reach the school unit. They tend to believe that a position in MS is not sufficiently motivating.

Some of the motivations that multigrade Greek teachers suggest are the following:

- Increase of MS teachers' salary.
- Improvement of multigrade working conditions
- Coverage of extra expenses that MS create.
- Provision of extra bonuses related to personal and professional development such as teacher's transfers, career's progress, hierarchical improvement etc

Multigrade schoolteachers confirm certain outstanding positive qualities

- Natural environment in the areas where MS are situated is good, usually with no traffic and pollution problems. This makes MS teaching healthier and less tiring than that in urban areas
- Relations between students are more cordial and sincere.
- Relations between students and MS teacher are more cordial
- Links of the entire school community and the local community can be stronger and effective if a problem emerges.

The main disadvantages that MS teachers report are the following

- Teaching time that corresponds to each student is limited
- There are frequent changes of teachers
- There is lack of competition between students

Studying Multigrade Schools

There are three groups of issues that can work as criteria for evaluation of MS and as parameters that influence their efficiency and operation. These aspects are:

A. Organisational criteria

These are:

a) School administration

b) Communication of the school with the rest of the educational community

c) Teachers' opportunities for in service training.

It is essential to mention that in one-teacher-MS, teachers are operating also as MS headmasters. That has a heavy repercussion on the load of administrative duties and increases pressure on teaching time. For the teacher's administrative duties ICT can be of capital importance. Archives, student's files, grades, statistics, annual curriculum, scheduling holidays and other can be handled successfully with the help of specially developed software.

Communication seems to be impossible if not conducted using digital means. Since multigrade schools exist usually in harsh access areas, isolation is an inevitable result. After the introduction of ICT in education, communication experiences a revolutionary era. Tools like NetMeeting, MSN Messenger, Forum, email, voice mail etc support synchronous and asynchronous communication in a totally efficient, easy and cheap way. Educational material, opinions, ideas are exchanged daily in a digital form. Projects are conducted successfully with no need for the teachers to leave school and teaching, digital libraries and educational portals are daily developed to be used by the educational community.
With ICT in the educational system, and especially with the development of distance education methods, trainers can be miles away from trainee. That results in that teachers may receive in service, in situ, training without spending money and time for transportation and, equally important, without harassing school's operation. There are several training projects that aim to train multigrade teachers in situ. The University of the Aegean has participated and completed a number of distance multigrade teachers (MUSE, DIAS, NEMED, RURAL WINGS). In that way multigrade teachers can be trained so as to get adequate knowledge to teach using best practices in methodology and ICT implementations. The analysis of Greek multigrade teacher's needs, reveals that it is very important for teachers to be trained in the use of software that will allow them to develop their own digital educational material. The significance is easily understood if it is reminded that there are no specially designed books for multigrade schools in Greece.

B. Pedagogical crieteria

In multigrade teaching and learning there are two kinds of practices in use: (a) **Improved**

old pedagogy practices, which are diachronic and of well established educational value and (b) **newly added (innovative) pedagogical practices** mostly springing from the enrolment of ICT tools in education.

Time management is a very crucial issue in multigrade teaching. Unless the MS teacher is well prepared and inventive the "dead" time is not efficient at all. Also, regarding time management, the MS teacher has to deal with administrative issues, an obligation that further shrinks teaching time.

Educational material can be originally developed using common or specially designed software. It can also be uploaded and accessible in educational internet portals, exchanged through digital libraries, developed by pupils themselves as homework, bought, offered to schools from Ministries of Education; they can also be created as the deliverable of a project. ICT has transformed educational material into a dynamic, easily developed, exchanged and accessed digital material

C. Social criteria

These are analysed along the following axes:

a) Multigrade school and local society
b) Multiracial and multicultural aspects
c) Policies for multigrade schools

Cooperation with local institutions, services and organizations is essential for an optimum function of MS. Municipality can support multigrade school with funding for maintenance, additional personnel, ICT infrastructure etc According to the teachers' opinions regarding this issue, central funding from the Ministry of Education is not sufficient.
Since a multigrade school is most of the times located in isolated areas, multigrade teacher is expected to function as an institutional subject, representing one of a few institutions of the area. Hence the teacher's social role in the area is important for the local community. Often, ,ultigrade teachers organize competitions, training seminars in ICT for adults, theatrical plays with the contribution and participation of locals, sports activities etc, in an attempt to offer the community education and culture.

MS, as most schools in general nowadays, are more or less multicultural. Among pupils there are children originated either from emigrant families or from foreign parents that work temporarily in the country. These pupils need to be the object of special care at school, since their culture and mentality may be different. Differentiation needs to be respected and should not act as an obstacle either for the pupil's adjustment to the new environment or for the classroom's efficiency. Cultivating a holistic identity of European citizenship and identity is a healthy way to help foreign student to adapt easily and efficiently. Explaining to the rest of the students the unique contribution and characteristics of other cultures to humanity helps foreign students to feel welcomed.

It is understood that the above basic ideas are particularly important for the developing world, where the majority of MS operate. Of course these ideas should be dynamically enriched with new ones that follow rapid ICT development. For example, the new 100$ PC developed in

MIT, expected to be deployed in schools of the developing world, promises to be a boost to the idea of applying ICT in education

New ways of teaching: ICT and multigrade teaching

As discussed above, ICT is an essential tool for education in a broader sense. In the case of multigrade school it can be the absolutely irreplaceable solution, with multiple roles in multigrade schooling, providing solutions in: a) teaching, b) teacher's training, and c) administration. Successful and effective ICT application requires infrastructure and equipment but also legislation, knowledge, methodology and culture.

Concerning dispersion of ICT uses, the EE ICT target ratio for 2006 is one PC in every 20 students. This can cause problems in the logistics for multigrade schools, since many of them function with less than 20 students. It would be a safer measurement to create a second alternative ratio of PC per teachers or better of PCs per students. ICT enrolment requires a range of necessary factors. In this point, it is worth to mention the Greek project "Information Society" which aims to train all Greek teachers of primary and secondary education in the educational use of ICT. Factors that obstruct ICT enrolment could be summoned up to the following points: a) Cost aspect, i.e. cost of equipment, cost of equipment's maintenance, cost of software, cost of software upgrading cost of teacher's training, cost of helpdesk to solve technical difficulties. b) Pedagogical aspects i.e. strategy on ICT in education, methodologies of ICT in education, best practices of ICT in education, and c) Culture of society and specifically the teachers facing ICT practices.

One of the major problems that hinders ICT enrolment maybe is retrogressive mentality according to which technology impedes teacher's work adding difficulties to an already demanding task. So, one of the essential things to be done for ICT best possible educational implementations is to try and persuade this portion of reluctant teachers that ICT can be there best ally.

Policies regarding multigrade schools

Educational policy regarding MS throughout Europe in general is directed towards closing down these schools, where possible. Teachers' syndicates are opposing them. Ministries of Education in many cases ignore them. University departments of Primary Education rarely prepare future students for multigrade teaching. On the contrary, it is really important to mention that there is a substantial number of academic researchers that are in favour of multigrade schools, stressing that their operation has certain advantages that make them superior to "normal" schools. Reality is that MS will not be eliminated, since they satisfy a number of social and pedagogical needs, mentioned already in this document. It is anticipated that MS will remain on the educational map, ignoring all these voices opposing the institution of multigrade schooling.
The author believes that there is an immense need to:

- Study the statistics and the functioning of multigrade schools in Europe there, where they exist
- Identify common and different characteristics in the reasoning of how educational authorities control multigrade schools and how they try to deal with the problem. Legislations, tendencies, policies, practices should all be the object of analysis and comparison
- Identify common characteristic and diverse tendencies and practices and to suggest policies and practices for the individual teacher and for administrators and policy makers
- ICT indicators involved in multigrade schooling can detect and define on a more precise way the different levels of multigrade teaching efficiency and the different level of competitiveness towards conventional teaching

National ministries of Education, University departments of education, teachers unions, teachers themselves as individuals and the inhabitants of the areas where multigrade schools operate, are all engaged in a political, educational, pedagogical and social strife that ensures a very intense dialogue in the function on multigrade schools that still operate in spite of the odds and the old tendencies.

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