

# Learning and Teaching in Multigrade Settings (LATIMS)

## A final report to DFID

Angela W Little  
Pat Pridmore  
Hridaya Bajracharya  
Manjula Vithanapathirana

### 1.0 Introduction

#### 1.1 Background

The Learning and Teaching in Multigrade Settings (LATIMS) project is an extension to the Multigrade Teaching (MGT) research project. The project grew out of a number of studies of teachers and classrooms undertaken as part of the original project and published recently as the book *Education for All: challenges and opportunities* (ed. A W Little, 2006). Those studies had included a number of small scale exercises of curriculum adaptation with multigrade teachers (e.g. Vu Son and Pridmore 2006, Pridmore with Vu Son, 2006 and Vithanapathirana, 2006) and studies of teacher training and teacher needs (Suzuki, 2006, Croft, 2006, Berry, 2006, Berry and Little, 2006). Collectively they had led to the conclusion that national –level curriculum adaptation and teacher education were required if teachers in multigrade classes were to be empowered in their work in classrooms.

Previous analysis of teacher practices and reviews of research had led to a broad typology of approaches to curriculum in multigrade classes (Little, 2004).

- *Multi-year curriculum spans.* Units of curriculum content are spread across 2-3 grades rather than one. All learners work through common topics and activities
- *Differentiated curricula.* The same general topic/theme in the same subject is covered with all learners. Learners in each grade group engage in learning tasks appropriate to his/her level of learning
- *Quasi monograde.* The teacher teaches grade groups, in turn, as if they were monograded. Learners follow the same or a different subject at the same time. Teachers may divide their time equally between grade groups. Or they may deliberately divide their time unequally, choosing subjects or tasks within subjects that require different levels of teacher contact.
- *Learner and materials-centred.* This strategy depends more on the learner and learning materials than on teacher input. The curriculum is translated into self-study graded learning guides. Learners work through these at their own speed with support from the teacher and structured assessment tasks. Learning is constructed as involving a relationship between learner, learning materials and teacher.

As we shall see in subsequent sections the Nepal team would employ the differentiated curriculum approach while the Sri Lanka team chose to employ the learner and materials-centred approach, following recommendations made in the earlier study by Vithanapathirana (2005).

In most countries teacher education for multigrade teaching either does not exist at all or is offered as part of in-service training. Nepal is unusual in that all teacher education was, until recently, in-service. Pre-service teacher education package was developed only in 2003 its formal and regular implementation still remains to be undertaken. Pre-service training is still not a requirement for teacher recruitment. Currently the government provides two types of in-

service teacher training in Nepal - 10 months training divided into four packages of 2.5 months each and short term needs-based recurrent training packages of 10 days. Multigrade teaching is included as a part in the initial 2.5 month packages and one of the 10 days training package is about multigrade teaching. Government Teacher Training Centres (TTCs) provide the 2.5 months training packages. The short term need based package (10 days package) are run by Resource Centres (RCs). RCs provide professional support to the schools clustered around it including short term recurrent training on the basis of teacher demands. UNDP supported Community Organization of Participatory Education (COPE) schools also run short term multigrade teacher training specially focused to grade teaching in one room classes. For many years training programme for multigrade teachers has also been supported by UNICEF (e.g. see Suzuki, (2004, 2006) for an analysis of this programme).

In Sri Lanka there has been less of a tradition of generic training for teachers in multigrade teaching. Special projects have mounted in service training during the life of these projects and distance education programmes have included modules on multigrade teaching.

## **1.2 Objectives**

This project was designed with two specific practical objectives:

- to analyse National Curricula and their potential for adaptation to the needs of multi-grade teachers in two countries, Nepal and Sri Lanka
- to develop accredited Teacher Education courses to be validated by Universities that recognise the professional development needs of teachers in multigrade teaching settings, in two countries, Nepal and Sri Lanka

## **1.3 Project strategy**

The project was conceived as a collaborative exercise between researchers, teacher educators, curriculum developers and teachers. Institutionally the project was located in the Institute of Education (IOE), University of London, England, the Research Centre for Educational Innovation and Development (CERID), Kathmandu, Nepal and the Faculty of Education at the University of Colombo (UC), Sri Lanka. The project was designed to create new materials for use by teachers in multigrade classrooms and by teachers in their professional development. Teachers were involved in development of these materials.

The work of the CERID country team in Nepal was coordinated by Dr Hridaya Bajracharya and of the UC country team in Sri Lanka by Dr Manjula Vithanapathirana. Overall direction of the work was provided from IOE by Professor Angela Little and Dr Pat Pridmore who provided inputs to workshops and advice, managed progress reports and finance, edited materials and updated continuously the multigrade website [www.ioe.ac.uk/multigrade](http://www.ioe.ac.uk/multigrade) for shared use.

Members of the teams in each country were:

### **Nepal Core team**

Dr. Hridaya R. Bajracharya (Team leader)  
Dr. Ganesh Bahadur Mali  
Dr. Prem Narayan Aryal  
Ms. Neera Shakya  
Mr. Rom Prasad Bhattarai

### **Nepal Resource Persons**

Dr. Rukmini Bajracharya  
Dr. Dibyaman Karmacharya

Dr. Basudev Kafle  
Dr. Damodar Gyawali  
Dr. Chidanand Pandit  
Ms. Uttara Bajracharya

### **Sri Lanka: Core Team**

Dr Manjula Vithanapathirana (Team Coordinator)  
Prof Swarna Wijetunge  
Dr Senarath Nanayakkara  
Mr M. P. M. M. Sibli  
Mr. K.R. Pathmasiri

The work was stimulated and supported through joint team workshops involving staff from IOE, CERID and UC and held in Nepal and Sri Lanka, country workshops, small group and individual work. During each of the joint team workshops team review and planning discussions were combined with joint field visits to multigrade schools and a national seminar with policymakers and practitioners. Throughout the life of the project team members disseminated their work at conferences, workshops and seminars.

The project started in April 2003 and was planned to be completed by the end of March 2006. The political turbulence in Nepal throughout much of the project period delayed some of the work by preventing the project team travelling to the rural areas where the study schools were located and preventing teachers in these schools attending workshops in Kathmandu. The extended sick leave of one of the UK project directors led to some loss of momentum in the latter half of 2004. Despite these setbacks the project was completed with only a few months delay. The timetable of work was as follows:

### **1.3 Main Project Outputs**

This project has developed materials for teachers and students in multigrade settings. The main project outputs are.

#### **Nepal**

1. Curriculum Materials adapted for multigrade teaching. These are located in the teacher's guide in Annex 3, pages 79-183.
  - Environment, Health Sanitation and Social Studies (Grade 2 and 3 in Nepali language);
  - Social Studies Grade 4 and 5 in Nepali Language;
  - Science, Environment and Health Education (Grade 4 and 5 in Nepali Language)
2. Handbook for Teachers (Nepali) (Annex 3)
3. A short training DVD to accompany the teacher's manual for multigrade teaching. (Annex 4)

#### **Sri Lanka**

1. Curriculum Materials (Sinhala)
  - Mathematics Grades 3, 4 and 5. A set of 500 student learning 'cards' for 17 topics covered in the syllabus, Sinhala language (Annex 5)

- Translations of two of the topics, Multiplication and Subtraction, in English language (Annex 6)
2. Teacher-education modules designed for self-study and directed learning on multigrade teaching, with special reference to curriculum adaptation (Annex 7)
  3. A short training DVD to accompany the teacher education modules (Annex 8)

Background research reports were prepared in Nepal on a status review of multigrade teaching and case studies of multigrade schools; and in Sri Lanka on a survey of multigrade teachers' needs. Regular project progress reports were submitted to DFID between 2003 and 2006. Substantial reports based on meetings, field visits and conferences held in Kathmandu (May 2003), Colombo (April 2004) and Kathmandu (November 2005) have also been submitted to DFID previously.

## **1.4 Organisation of the report**

The rest of this report is organised as follows. Section 2 describes the background context and the curriculum and teacher education work of the Nepal team. Section 3 describes the background context and curriculum and teacher education work of the Sri Lanka team. Section 4 concludes the report. Attached to this report are eight annexes comprised of Primary education curriculum materials and teacher education materials (handbook, self learning modules, DVD and video).

## **2.0 Nepal**

### **2.1 Background context**

Nepal is a country with diverse topography and sparsely populated areas, especially in the remote and mountainous regions. The number of students in such areas is very low and therefore a teacher cannot be supplied for each grade level and schools need to be multigrade to ensure access to all primary school age children. Multigrade and multi-class teaching classes are also formed due to chronic shortage of teachers, inadequate number and size of classrooms and teachers' absenteeism. In multigrade classes student of more than one grade are taught together by a single teacher in the same classroom. A study by CERID (2003) in three districts showed that 73% of primary schools have less number of teachers than the classes. This issue is more prevalent in the mountain region (82%) than in the plains Terai (53.2%). Multiple class teaching is the same except that the students sit in their own grade classrooms and the teacher moves between the classrooms. Given the high prevalence of multigrade/multi-class teaching in Nepal, and the fact that it is here to stay for the foreseeable future, there is an urgent need for teachers to know how to plan multigrade lessons and organize instructional activities in the classroom.

Some support for multigrade primary teaching is already being provided through the ten-month government training (pre-service and in-service) for primary school teachers but minimum weight is given to the multigrade training packages. Multi-grade recurrent teacher training is also being conducted in 40 districts through resource centres. However, current curricular materials and multi-grade teacher training need to be more closely related to the real life situation in remote multi-grade classes. The purpose of the project in Nepal was therefore to analyse the primary curriculum and then develop teacher education materials that were closely contextualised to the skills of average teachers and to the condition found in remote rural schools.

At the outset of the project the CERID team started work with two rural primary schools in Dhading inviting their volunteer participation for the development and trialing of multigrade teaching materials. These two schools were Golmarani Primary School, Parewatar, Malekhu, and Jana Kalyan School, Primary School, Thakre, Ganise. The CERID team carried out formative research with the teachers in these schools to identify how best to intervene. At the same time they made a start on analysing and adapting the National Primary School Curriculum for use by multi-grade teachers and developing a guide for multigrade teachers. The new curriculum framework is still being developed and therefore the 1992 version of the curriculum was used for these adaptations, which it is still in use in primary schools. Copies of this curriculum in Nepali and English are given in Annex 1 and 2. The project then moved into an action research phase. School and local resource centre teachers developed, trialed and improved multi-grade lesson plans. The strength of this project is that it has been working within the government school system to try to improve the quality of multigrade teaching and learning. It has not set up an alternative model but tried to improve the existing model. The action research approach enabled the team to identify a number of small steps that can be taken to support average teachers in average schools to improve teaching and learning in the classes. CERID will continue to follow these schools to increase understanding of the barriers to teaching learning and how to overcome them.

As mentioned above, security issues linked to the insurgency and political conflict have created barriers to working in the multigrade schools. There have been times when the insurrection has escalated and it has not been possible to visit the rural schools to trial the multigrade materials. To compensate for the project team not being able to visit the schools regularly, teachers were called to Kathmandu for feedback and inputs. On one occasion a seminar arranged in Kathmandu had to be called off at the last minute because road blocks prevented teachers from travelling to Kathmandu. Despite these setbacks, the team has persisted and during ceasefire periods this trialing has been carried out and the necessary workshops and meetings held. For example, the workshop and field visits in November 2005 were held during a short ceasefire and were attended by Pat Pridmore from London. These workshops and field visits served not only to trial materials but also to strengthen links between CERID, the Faculty of Education and the Department of Education, and to revitalise the team, and, even more importantly, to offer mutual support for professional development during a very challenging time professionally and personally.

## **2.2 Timetable of work**

The first joint team workshop was held in Nepal in May 20-24 2003 in Kathmandu. Work plans and time schedules for the year 2003-04 were prepared by CERID and Colombo University. The following is a brief account of the activities undertaken by the Nepal team.

Project Year 1: April 2003-March 2004

*Follow-up activities after joint team Workshop 1 held in Nepal in May 2003*

- Teachers' training needs analysis
- Existing training provision analysis
- Curriculum structure and content analysis of one subject

Workshop 2: National workshop on LATIMS in December 2003

*Purpose:* to report and review findings of the teacher needs analysis and curriculum analysis.

*Follow up activities:* Further work, analysis and reporting on:

- Teachers' training needs analysis
- Existing training provision analysis
- Curriculum structure and content analysis of 2 subjects – Environmental Studies and Social Studies

At the end of the year a joint team workshop was held in Sri Lanka in April 2004 to review the activities and to prepare work plan for the years 2004-05.

Project Year 2: April 2004-March 2005

*Follow-up activities from Joint Workshop 3 in Sri Lanka*

- Curriculum analysis continues for two further subjects
- Teacher education materials developed with teachers for trial in each country.

Project Year 3 April 2005-March 2006 (extended to September 2006)

Workshop 4 Country specific (Nov4-6, 2005) (With Co-Director from London)

*Purpose:* To finalise materials to be used for trial delivery of teacher training in each country.

*Follow-up Activities (Nov. 7-8 2005)* (With Co-Director from London)

- Trial course delivery, interim evaluation and report
- Continued curriculum reconstruction

Workshop 5: Country specific (November 9-12 Follow-up sessions)

*Purpose:* To review trial course delivery and curriculum re-construction and to revise course materials

*Follow up activities*

Country teams revise training and curriculum materials, translate, edit, produce prototypes.

In November 2005 a seminar was conducted at CERID for the main stakeholders including the government personnel, teachers, researchers and school supervisors. The purpose of the workshop was to revisit and critically analyse the MGT situation and to prepare an outline for school based actions. Workshops were subsequently conducted in the two field schools over two days to test the use of the lesson planning framework in the schools. These activities tested and improved the multigrade lesson plans and approach to teaching and learning. These lessons were subsequently translated into the development of the teaching materials, the teacher guide and the training for the teachers.

### **2.3 Analysis of Primary Curricula**

Work to adapt the National Primary Curriculum for multigrade teachers has been carried out for the subjects of Environmental Studies and Social Studies.

The curriculum material adapted for multigrade teaching includes the curriculum for classes 2 – 5 set out as a planning table. This table consists of the following six columns: (i) classes concerned (ii) topics and credit hours (iii) scope and sequence of activities (iv) learning outcomes (v) teaching learning activities, and (vi) multigrade strategies.

The team followed the following five steps in adapting the monograded curriculum:

1. Analysis of curriculum
2. Combining similar curriculum content across the classes 2 - 5.
3. Discussing the scope and limitations for different class combinations
4. Identification of suitable learning activities
5. Planning the approach to be used to deliver the activities in the class

Each multigrade lesson plan followed three steps explained below in the description of the training DVD. These are a joint/combined introduction followed by activities in single grade groups and then a final joint/combined session to review the activities, draw out the main conclusions from the lesson and give further instructions for the students to do homework before the next class.

The curriculum adaptation has been undertaken in the Nepali language.

## **2.4 Development of Teacher Education Materials**

LATIMS work on teacher education in Nepal complements the short term training modules currently in use. LATIMS analyses and adapts the National Primary Education Curricula in order to facilitate learning and teaching in multigrade settings and the development of a multigrade teacher manual developed through working with multigrade teachers and field tested in disadvantaged rural schools.

A Handbook for Teachers of Multi-grade Classes has been developed to fill a gap in existing provision. This guide has been written in simple, clear language so that teachers in remote primary schools will be able to learn from it and see it as a resource that can help them make their multi-grade teaching easier and more effective.

The development has been undertaken by a small but experienced working group. The group started by reviewing relevant materials available in Nepal and then reviewed a range of guides for multi-grade teachers from other countries including one developed during the first phase of the DFID-funded multigrade teaching project in Vietnam and one from the Commonwealth Secretariat based in London. They also reviewed a report on curriculum adaptation in Bhutan written by Dr. Pridmore for UNICEF that that included adapted curriculum for all subjects in the National Curriculum.

The teacher hand book targets teachers engaged in learning and teaching in the multigrade situation. It provides a short overview of the multigrade situation in Nepal, the principles and practical guidelines for planning in MGT situation, brief descriptions of basic techniques for MGT classes, and guidelines regarding teacher mobilization for generating resources and support for MGT school improvements.

The draft handbook was presented for peer review and subsequently revised before being finalised. The final handbook has been produced in Nepalese and is included with this report. The outline of the handbook is presented in Figure 1 below.

## **2.5 The DVD for training teachers in the three-step approach to lesson planning**

The project team developed a short training DVD to accompany the teacher's manual for multigrade teaching. The video was filmed in Jana Kalyan Primary School, Thakre, Ganise, Dhading by Dr. Pat Pridmore and edited with support from the media services at the Institute of Education. The teacher is shown teaching an Environmental Science lesson on the 'five senses' to a multigrade class of grade 2 and 3 students. He demonstrates how to deliver a lesson following the differentiated curriculum model of organization and using a three step-approach (i) whole class introduction (ii) grade differentiated group work (iii) whole class feedback, review and homework.

The whole class introduction is carried out in the classroom. The teacher asks questions to stimulate discussion and elicit what children already know about the five senses. He uses a variety of real objects to consolidate this knowledge. He then takes the students to the grassy area outside the classroom where they have more space to carry out the differentiated group work tasks. Students sit in circles of 5 or six with students from the same grade group. Each grade group has a different activity to complete and whilst they are doing this the teacher moves from group to group stimulating and stretching the understanding of individual students or providing additional support as needed. When the group work is completed the teacher takes the students back into the classroom and facilitates the sharing of feedback from the

group work activities. He then leads a question and answer session to review what has been learned in the lesson before setting homework and closing the lesson.

## **Figure 1 Teaching in the Multi-grade Situation – An outline of the handbook for teachers, Nepal**

**Introduction:** What is this handbook about? Why do we need this handbook? Objectives. How should this handbook be used? Contents. How do we assess students' performance?

### **Contents**

#### **1. What is Multi-grade Teaching?**

- Concept of Small Schools
  - Location
  - Population
  - Student enrolment
  - Physical facilities
  - Student teacher ratio
- Introduction to MGT
- Conceptual Clarity of MGT/MCT

#### **2. How should MGT be conducted?**

- Process of Curriculum Adaptation
  - Identification of related subjects
  - Identification of similar contents of subjects
  - Linkage of contents across the grades
  - Linkage of curricular contents with textbooks
- Planning for the Delivery Instruction
  - Daily/weekly activity plan
  - Classroom management techniques
  - Instructional materials -identification, collection, preparation, production and utilization
  - Techniques of classroom delivery
  - How to manage learning to learn
  - Assessing student performance

#### **3. What Support does a Teacher Need?**

- School based support -- PTA
- Community Based Support -- Parents
- RC Based Support
- Local Government Support
- Support from local organization
- Monitoring, Supervision and Feedback procedures (including benefit)

#### **4. What Roles a Teacher should Play?**

- Characteristics of a good teacher
  - Personal
  - Professional
- Expected roles of a teacher as:
  - Facilitator
  - Action Researcher
  - Promoter/ Implementation of activity based learning
  - Professional support provider
- Managerial roles of a teacher
  - Coordination between school and community
  - Relation with PTA
  - Relation between HT and Teachers
  - Relation between school and RC



## **3.0 Sri Lanka**

### **3.1 Background context**

In 2003 18% of all government schools in Sri Lanka had four or fewer teachers (School Census, 2003). This figure coincides with the percentage in 1998 (Vithanapathirana, 2006). Government statistics do not provide figures for the number of teachers in primary schools separately. Only 32% of all schools are classified as primary or Type 3. Most of the others (Type 2, 1C and 1AB) offer all- through education from Grades 1-8, or 1-11 or 1-13. Only 3.5% offer education from Grade 6 – 11 or 6-13. The primary stage comprises 5 grades. Since 18% of all these schools with multiple grade ranges have four or fewer teachers it is likely that the overall need for multigrade teaching across all grades is very high indeed.

Curriculum development for primary education is based on the assumption that one teacher teaches all subjects to one grade. No special guidance is provided to teachers and principals in schools with multigrade classes. Teachers are trained through pre-service and continuing teacher education. Training in multigrade teaching is sometimes made available to teachers through special development projects (e.g. the DFID-funded programme for primary Mathematics) but it is not offered routinely and is not integrated into the regular system of teacher education.

### **3.2 Timetable of work**

The development of curriculum and teacher education materials was undertaken through a variety of strategies.

- Identifying the team
- Preparing the three year plan at the joint team Workshop in Nepal in May 2003
- Planning team workshops and future joint team conferences
- Trying out different approaches to reorganise the curriculum
- Design and conduct of teacher needs survey, 2004-5
- Review of work at Joint team workshop held in Colombo in April 2004
- Final choice of approach to development of student learning materials Sept. 2005
- Initiating the preparation of learning materials based on the 30-workcard-per topic approach with 45 teachers and curriculum developers at several workshops conducted at NIE
- Further preparation of learning materials (workcards) in collaboration in multigrade teachers through a two-day workshop with team members and 11 multigrade teachers. A majority of these eleven were selected from among a group who had participated in Manjula Vithanapathirana's earlier study (Vithanapathirana, 2005) in Dehiowita, Sabaragamuwa Province.

- Further preparation of the work on learning materials at NIE with two teachers from the group
- Editing and typesetting the work cards. (2006)
- Studying the nature of existing teacher training materials (2004)
- Preparation of drafts of teacher education material (with special reference to the curriculum adaptation exercise and Vithanapathirana (2005) 2004-5
- Revision of teacher education materials, 2006

More detailed descriptions of how the key steps were undertaken are provided in 3.3-3.5 below.

### 3.3 Survey of teacher needs

A survey of teacher needs in rural areas was conducted by Mr. Dimuthu, an MPhil student of Prof. Swarna Wijetunge. The survey was carried out under the direction of Professor Swarna Wijetunge and Dr Manjula Vithanapathirana.

A sample survey of teachers was carried out in 2005. The sample area was limited to one of the education zones in Ratnapura district in Sabaragamuwa Province where multigrade teaching is common (Jayawardena, 1995; Vithanapathirana, 2005). The sample consisted of 72 multigrade teachers (49 males and 23 females) and Principals of 24 schools having multigrade classes (19 males and 4 females). Teachers and Principals were asked through open-ended questions (in Sinhala) in a questionnaire about their needs for training in multigrade settings.

Table 1 describes the Principals' and teachers' expressions of training needs in relation to multigrade classes.

**Table 1 Multigrade training needs stated by teachers and principals, Sri Lanka**

Expressed training needs	No. of Principals	No. of Teachers
Time management in multigrade classes	7 (29%)	30 (42%)
Using the syllabus as a guide for teaching in multigrade classes	13 (54%)	55 (76%)
Controlling the Multigrade class	4 (16%)	7 (9.7%)
How to address the different ability levels of children in multigrade classes	7 (29%)	11 (15%)
How to provide special attention to slow learners	3 (12%)	2 (3%)
work load in handling multigrade classes is very heavy		
Planning lessons for multigrade classes	5 (21%)	11 (15%)
Timetabling when multigrade teaching needs to be followed (preparing and adhering)	4 (16%)	2 (3%)
Teaching different grades simultaneously when use different text books		20 (28%)
Preparing assignment cards for multigrade lessons		4 (5.5%)

The main conclusions of the survey were:

1. All teachers and principals identified training needs for teaching in multigrade settings

2. Principals and teachers indicated the need for training in

- using the syllabus as a basis for systematic teaching
- teacher and student time management
- lesson planning
- addressing different ability levels
- supporting slow learners

3. Teachers expressed the need to have training in the use appropriate textbooks specified for different grades in addressing multigrade classes.

In addition to the training needs specified above multigrade teachers identified the following as challenges in multigrade schools.

1. High rates of student absenteeism.
2. Frequent changes in grade combinations.
3. Lack of textbooks.

In view of the teachers' concerns with the use of the syllabus in guiding their teaching activities and with managing their and their student's learning time it was concluded that the adaptation of curriculum materials oriented to student engagement and learning was a priority

### **3.4 Analysis of Primary Mathematics Curriculum**

At the outset of the project the Sri Lankan team decided to focus on the re-organisation of the mathematics and language curriculum. The university team planned to involve the National Institute of Education (NIE) institutionally. However personnel changes at the top of the NIE delayed this arrangement and the work. Eventually a current member of the NIE and two former members formed a team working under the general direction of the UC. Mathematics became the single subject focus. The chosen approach was the development of graded learner materials.

The first step was the examination of the existing mathematics curriculum blueprint. This comprises 7 mathematical themes and 24 topics arranged across three key stages and five grades. Figure 2 presents this blueprint.

As will be seen the 7 broad themes are subdivided into 24 'topics'. Of these 24 topics, eight (number concepts, number patterns, addition, length and distance, weight, volume and capacity, solids and plane figures, spatial concepts) are common to Grades 1 to 5 and three key stages while 16 are common to Grades 3, 4 and 5 and key stages 2 and 3.

The general idea is the identification of common topics, the examination of how each topic is handled in current curriculum materials, the creation of a continuum of learning objectives for the same topic across the grades, and the re-sequencing across the school year so that students in different grades are following the same topic at the same time. Since each topic will usually be revisited more than once during the school year at successive levels of difficulty the idea is to subdivide the learning objectives for each grade level into hierarchically linked sub-objectives. It will be noted from Figure 2 that eight topics are common across Grades 1-5. Since the focus of this research is Grades 3-5, the lowest level of Grade 3 achievement is assumed to be equivalent to the highest levels of Grade 2 achievement where these topics are common

**Figure 2 Curriculum Blueprint for Mathematics Grade 1 to 5, 1999, Sri Lanka**

Themes	Topic	Key Stage		Key Stage		Key Stage 3
		Gr1	Gr2	Gr3	Gr4	Gr5
<b>Pre-number Concepts</b>	Sorting	X	X	-	-	-
	One-to-one correspondence	X	-	-	-	-
	Ordering	X	X			
<b>Number</b>	Counting	X	X		-	-
	Number Concept	X	X	X	X	X
	Number Patterns	X	X	X	X	X
	Fraction	-	-	X	X	X
	Decimals	-	-		X	X
	Roman numerals	-	-	-	X	X
<b>Mathematical operations</b>	Addition	X	X	X	X	X
	Subtraction	-	X	X	X	X
	Multiplication	-	-	X	X	X
	Division	-	-	X	X	X
<b>Measurement</b>	Length and distance	X	X	X	X	X
	Weight	X	X	X	X	X
	Volume and Capacity	X	X	X	X	X
	Time	-	X	X	X	X
	Area	-	-	-	X	X
<b>Money</b>	Identification and transaction	-	X	X	X	X
<b>Shapes and space</b>	Solids and plane figures	X	X	X	X	X
	Right angle	-	-	-	X	X
	Directions	-	-	X	X	X
	Spatial concepts	X	X	X	X	X
<b>Data handling</b>	Tables and Graphs	-	-	X	X	X
		12	14	16	20	20

Source: Primary Mathematics Project, Sri Lanka (1999)

The following themes and topics are covered in the work cards.

Theme: Number

1. Number Concept
2. Number pattern
3. Fraction
4. Decimals

Theme: Mathematical Operations

5. Addition
6. Subtraction
7. Multiplication
8. Division

Theme: Measurement

- 9. Length and distance
- 10. Weight
- 11. Volume and Capacity
- 12. Time
- 13. Area (Grades 4 and 5)

Theme: Money

- 14. Identification and transaction

Theme: Shapes and Space

- 15. 2D and 3D shapes
- 16. Direction

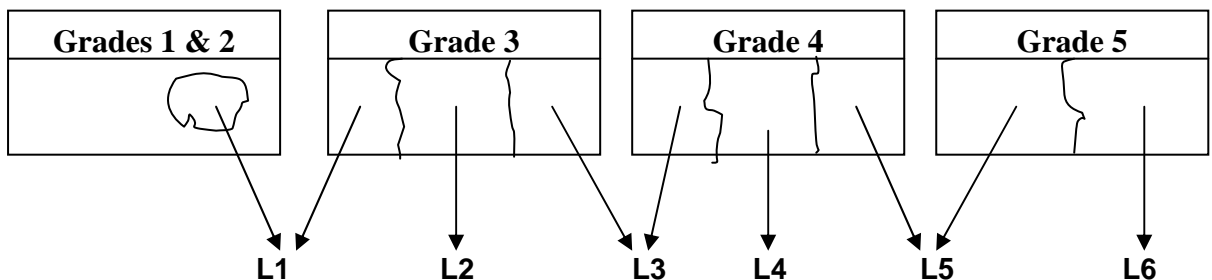
Theme: Data Handling

- 17. Tables and Graphs

Each topic was divided into six main levels of learning objective and each of the six was further sub-divided into five hierarchically-ordered activities. This yielded a total of 30 activities per topic. With 16 topics common across Grades 3-5 and 1 across Grades 4-5 this has generated a total of 500 graded activities (presented as work cards).

Figure 3 illustrates how conventional grade divisions have been translated to the six learning levels. Level 1 draws from mastery expected at the end of Key Stage 1 i.e. Grades 1 and 2 and the lower end of Grade 3. Level 3 draws from the top end of achievement of Grade 3 and lower end of Grade 4.

**Figure 3 Criteria for division of content into 6 levels across grades, Sri Lanka**



Current text books and other material were examined in order to identify the learning content/activities for Grades 3, 4 and 5. The curriculum exercise builds from and reinforces the mainstream materials developed for the mainstream monograded classroom. It does not start with a blank sheet. Where materials consistent with a graded learning approach appear not to have been developed they have been created afresh. The main challenge has been to work out levels and sublevels for each topic systematically and to resequence the order in which they appear in the timetable for each grade. This enables students, and more importantly, the teacher to work on the same topic at the same time with the students, albeit at different levels of achievement. Significantly these levels and sublevels have been systematised by curriculum developers and practicing teachers *working together*.

Figure 4 provides an illustrative example of the 6 levels and the 5 activities (cards) for each created for the topic of 'subtraction'.

#### *Order of topics and activities during the school year*

The order of topics has been re-sequenced so that students are following the same topics (albeit at different levels of learning) in the same week of the school year. Figure 5 illustrates how the re-sequencing has been done for Grades 3 and 4. Column 1 shows the week of the school year in which the various topics will be addressed by Grades 3 and 4 together. Columns 2 and 3 show the order in which the same topics appear for Grades 3 and 4 separately in the current teachers' guides. It would appear that the sequencing for Grades 3 and 4 in the guides for monograded classes have been developed independently of each. In their analysis of existing materials the researchers could identify no particular reason why, for example, number patterns appear in Week 6 for Grade 3 and Week 4 for Grade 4; or why money transactions for Grade 4 appear in Week 20 and for Grade 3 in Week 7.

The full set of cards for Grades 3-5, organised by level and activity/exercise is presented in Sinhala as Annex 5. A translation of two topics – multiplication and subtraction - is presented in English as Annex 6.

**Figure 4 Six levels of learning (L) about subtraction across 3 grades and five types of activity card (C) per level, Sri Lanka**

- L1** - Subtracting a number from a number less than 9
- L2** - Subtracting a number from a number not greater than 99, without bringing forward
- L3** - Subtracting a number from a number not greater than 99
- L4** - Subtracting a number from a three-digit number. Bringing forward from one place only.
- L5** - Subtracting a number from a three-digit number. Bringing forward in two occasions
- L6** - Problem solving involving subtracting a number from a number not greater than four-digits.

***L1 - Subtracting a number from a number less than 9***

- L1C1** - Subtracting numbers less than 9 using material and reporting
- L1C2** - Subtracting numbers less than 9 using figures and reporting
- L1C3** - Subtracting numbers less than 9 by writing (in rows)
- L1C4** - Subtracting numbers less than 9 (across)
- L1C5** - Problem solving involving subtraction of numbers less than 9

***L2 - Subtracting a number from a number not greater than 99, without bringing forward***

- L2C1** - Subtracting a number less than 20 from a number using material
- L2C2** - Subtracting a number from a number less than 20 (without bringing forward)
- L2C3** - Subtracting a number from a number less than 99 (with bringing forward without zero)
- L2C4** - Subtracting a number from a number less than 99 (without bringing forward with zero)
- L2C5** - Problem solving involving numbers not greater than 99, without bringing forward

***L3 - Subtracting a number from a number not greater than 99***

- L3C1** - Subtracting a number from a number less than 20, without bringing forward (using material)
- L3C2** - Subtracting a number from a number less than 50 (with bringing forward without zero)
- L3C3** - Subtracting a number from a number less than 99 (with bringing forward without zero)
- L3C4** - Same as above (with zero)
- L3C5** - Problem solving related to subtraction less than 99 (with bringing forward and zero)

***L4 - Subtracting a number from a three-digit number. Bringing forward in one place only***

- L4C1** - Subtracting a number from a three-digit number (without bringing forward)
- L4C2** - Subtracting a three-digit number from a three-digit number (bringing forward to unit's place only)
- L4C3** - Subtracting a three-digit number from a three-digit number (bringing forward to ten's place only)
- L4C4** - Subtracting from a three-digit number with bringing forward from one place only with zero.
- L4C5** - Subtracting a three-digit number from a three-digit number with bringing forward from any one place.

***L5 - Subtracting a number from a three-digit number. Bringing forward in two occasions***

- L5C1** - Subtracting a number from a three-digit number (without bringing forward)
- L5C2** - Subtracting a three-digit number from a three digit number. (bringing forward from one place only)
- L5C3** - Subtracting a three-digit number from a three digit number. (bringing forward from ten's place only)
- L5C4** - Subtracting a three-digit number from a three digit number.
- L5C5** - Problem solving involving subtracting a three-digit number from a three digit number.(bringing forward from place)

***L6 - Problem solving involving subtracting a number from a number not greater than four digits.***

- L6C1** - Problem solving involving subtracting a number from a number not exceeding four digits
- L6C2** - Subtract a four-digit number from a four-digit number (bringing forward from only place only)
- L6C3** - Subtracting a number from a four-digit number
- L6C4** - Problem solving involving subtracting a four-digit number from a four-digit number
- L6C5** - Problems solving involving subtracting a number from a number not exceeding four digits

**Figure 5 Combined teaching sequence for Grades 3 and 4 Mathematics**

Grade 3 & 4	Grade 3	Grade 4	Topic
Week 1	Week 1	Week 1	Number understanding up to 9 999
2	2	2	Adding two three-digit numbers
3	3	3	Subtracting a number from a number less than 999
4	6	4	Number Patterns
5	11	8	Solids and Plane figures
6	8	5	Multiplication
7	9	11	Division
8	10	7	Fractions
9	5	6	Measuring lengths
10	4	19 - Lesson 1 28 - Roman Numerals	Time Roman Numerals
11	7	20	Money transaction
12			Revision
13	15	16	Number understanding up to 10 000
14	17	21	Addition
15	18	22	Subtraction
16	19	9	Handling Data
17	13	18	Angles and Directions
18	21	17	Multiplication
19	22	24	Division
20	23	23	Area
21	30	10	Weight: Kilogram and gram
22	16	14	Fractions
23	14	13	Volume and Capacity: litre and millilitre
24	20	19 Lesson 2	Time
25			Revision
26	28	29	Measuring length
27	27	27	Money transaction
28	31	26	Tables and Graphs
29	26	33	Skills related to Symmetry and Space
30	32	28 & 15	Decimals: Addition and Subtraction
31	33	31	Volume and Capacity
32	34	32	Multiplication and Division
33	29	30	Weight: Addition and Subtraction ( <i>kg</i> and <i>g</i> )
34	25	19 Lessons 3 & 4	Time
35	35	34	Revision: Time
36	36	35	Revision



### 3.5 Development of Teacher Education modules

LATIMS aims to facilitate learning and teaching in multi-grade schools by adapting National Primary Education Curricula and developing teacher education materials that meet the learning and teaching needs in these schools. The LATIMS approach has been to

- identify teachers' expressed needs in multigrade teaching
- identify the mathematics curriculum objectives by theme, by grade and by learning level within grade
- prepare learning materials related to these themes and grade subdivisions
- prepare learning materials for teachers in relation to the general needs of the multigraded class and the specific curriculum needs.

The modules prepared for teacher training are learner-centred handbooks and have drawn from research findings, in particular from the LATIMS survey of teacher needs, of the research undertaken by Vithanapathirana (2005, 2006) during the first phase of the DFID project on multigrade teaching, other relevant research (e.g. Jayawardena, 1995) and others handbooks for teachers developed during the DFID Primary Maths project, especially those prepared by Terry Cash and M. Sibli.

The modules have been developed mainly for multigrade teachers in Sri Lanka. A learning materials approach to learning and teaching in multigraded settings has been advocated. In the module this approach is illustrated through the subject of mathematics and is the approach adopted in 3.4 above. The teacher education modules are presented as Annex 7. A video film made in the course of trying out differentiated learning activities is presented as Annex 8.

### 4.0 Conclusion

The LATIMS project has succeeded in developing curriculum materials and teacher education materials relevant to the multigraded setting. Hitherto most curriculum support for the multigrade teacher has been piecemeal and illustrative. Teachers are presented with exemplars and then expected, *working in isolation*, to apply the general principle across the entire curriculum. By contrast, the LATIMS project has succeeded in undertaking an adaptation of the complete curriculum in two subject areas for Grades 2-5 in Nepal and for one for Grades 3-5 in Sri Lanka. Significantly both exercises have been conducted as collaborations between curriculum development experts and teachers working together over a period of time.

In both countries there was a degree of initial resistance to the idea of curriculum adaptation from curriculum developers for whom a curriculum process oriented towards the monograde class had been the norm. 'Thinking outside of the box' and reconceptualising a new approach to suit the reality of the multigraded class and the needs of the multigrade teacher required creative thought and courage. This was achieved in both countries.

The development of teacher education materials alongside the curriculum development exercise has had the advantage of bringing the most recent and innovative curriculum developments to the attention of all teachers and not only those whom participated directly in the curriculum adaptation workshops, trials and follow-up exercises.

Both countries have been beset by political difficulties and turmoil throughout the period of the project. The following account by the Nepal project director underlines the types of difficulties faced by multigrade (and other) teachers during this time

Undertaking school-based activities and bringing teachers to Kathmandu for workshops was very challenging at various times during the project because of the conflict situation in Nepal. In Thakre school there are five classes and three teachers, only one of whom was appointed by the government and received regular salary. The other two teachers depended on Village Development Committee (VDC) support for their improvised remunerations. They were working on a contract basis with a very low payment (much lower than the government primary school teacher salary) arranged by the VDC. The VDC Chair was killed in an insurgency encounter in the year of 2003. Consequently the two teachers did not receive salaries for several months. Subsequently the VDC system was suspended and remains so. The school was in a rather difficult situation for the lack of development activities. The doors and the windows were bare and open. The only room that could be closed is the office room which is also being used as the combined teachers' room and store. It is also used as a classroom when there is rain or when the children from multigrade classes needed to be separated for individual class work. The teachers worked under very stressful conditions until an emergency improvised system was implemented by the government.

Despite the constraints imposed by the political conflict and insurgency situation, it was possible to fulfil most of the objectives of the project in Nepal. Curricula have been analysed, adapted for multigrade teaching and field tested. A handbook for teachers in multigrade situation developed. During breaks in the insurgency activities it was possible to bring together the range of expertise needed to develop and field test the adapted curricula. The working group established included experts in curriculum development, teacher education and action research and practising multigrade primary teachers and resource centre staff. The work was supported by an informal forum and was linked to other research and development activities of CERID in the area.

CERID continues the work through dissemination of the research outcomes including the handbook. CERID is also taking initiatives to link the work with the programs of the Ministry of Education. It hopes to ensure that the new handbook for Multigrade teachers is disseminated to every multigrade school.

Despite a formal ceasefire in Sri Lanka in 2002 the general situation in the country has not been stable, deteriorating in the South and West particularly during 2006. Nonetheless a considerable amount of work has been achieved. The Faculty of Education in Colombo is taking active steps to integrate this developmental research into its teaching activities both within the University's teacher education courses and beyond. One of the LATIMS core team responsible for developing the curriculum materials also heads up the primary education group in the National Institute of Education and is therefore in a position to influence the content and structure of the primary mathematics curriculum as it is transacted in multigraded classes across the island. Future development work could usefully be undertaken to translate the material into Tamil with Tamil teachers and to extend the curriculum adaptation process to all other curriculum subjects. The Sri Lankan team members view this work as pioneering. The systematic development of learning activity (work) cards across a wide range of difficulty levels is of enormous value not only for the multigraded class but also for monograded classes in which students perform at diverse levels, a diversity that has been underlined recently by several recent pieces of research conducted by the National Education Research and Evaluation Centre (NEREC).

This research also demonstrates how curriculum development and teacher development can be school-based. Both are current requirements of the Sri Lankan education system.

A next step in Sri Lanka that could fruitfully be taken by primary curriculum experts, especially those based in the National Institute of Education, would be the adaptation of the teacher's guides to suit the needs of the multigrade teacher. Based on the curriculum adaptation already achieved by the LATIMS the work could have several dimensions: (i) curriculum experts work with teachers to align teacher inputs with the graded learning activities (ii) the creation of a new teacher's guide for the multigrade teacher responsible for Grades 3 , 4 and 5 mathematics (iii) the creation of learner guides that would incorporate the learning activities/workcards designed above but with the addition of simple guidance that would stimulate and lead the learner to the learning activities with minimal input from the teacher (iv) the creation of graded learning materials for Grades 1 and 2, mathematics, using the current workbooks but re-organised in such a way that the teacher can be supporting and guiding the same topic at the same time (v) the creation of a teacher guide for the multigrade teacher of Grades 1 and 2 (vi) the extension of the curriculum re-organisation principles developed above to all subjects in the primary curriculum. Each of these developmental tasks would constitute a worthwhile programme of work by the University's Faculty of Education and the NIE in partnership with practising teachers.

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## **Annexes**

Annex 1 Nepal: Current Primary school curriculum in Nepali

Annex 2 Nepal: Current Primary school curriculum in English

Annex 3 Nepal: Hand Book for Teachers in LATIMS

Annex 4 Nepal: DVD to train teachers in the 3-step approach to multi-grade lesson planning and delivery

Annex 5 Sri Lanka 500 learning activity cards for mathematics (in Sinhala)

Annex 6 Sri Lanka Illustrative learning activity cards for Multiplication and Subtraction (in English)

Annex 7 Sri Lanka Teacher education modules

Annex 8 Sri Lanka Video of multigrade class