

*TR*aining *E*ducators through *N*etworks and *D*istributed *S*ystems

## MODULE B

# ICT FOR TEACHING AND LEARNING

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## INTRODUCTION

This module aims at giving you information and hints to let you think about how the use of Information and Communication Technologies (ICT) or Information Technologies (IT) can:

- ◊ **improve** didactics and learning process;
- ◊ **enhance** exchange of information among teachers, solution of common problems and development of common projects;
- ◊ **act** as an innovation factor.

In order to make the module an easy and operational tool, it has been structured in units. Consistently with the aforesaid aims, three are the main units which is composed of:

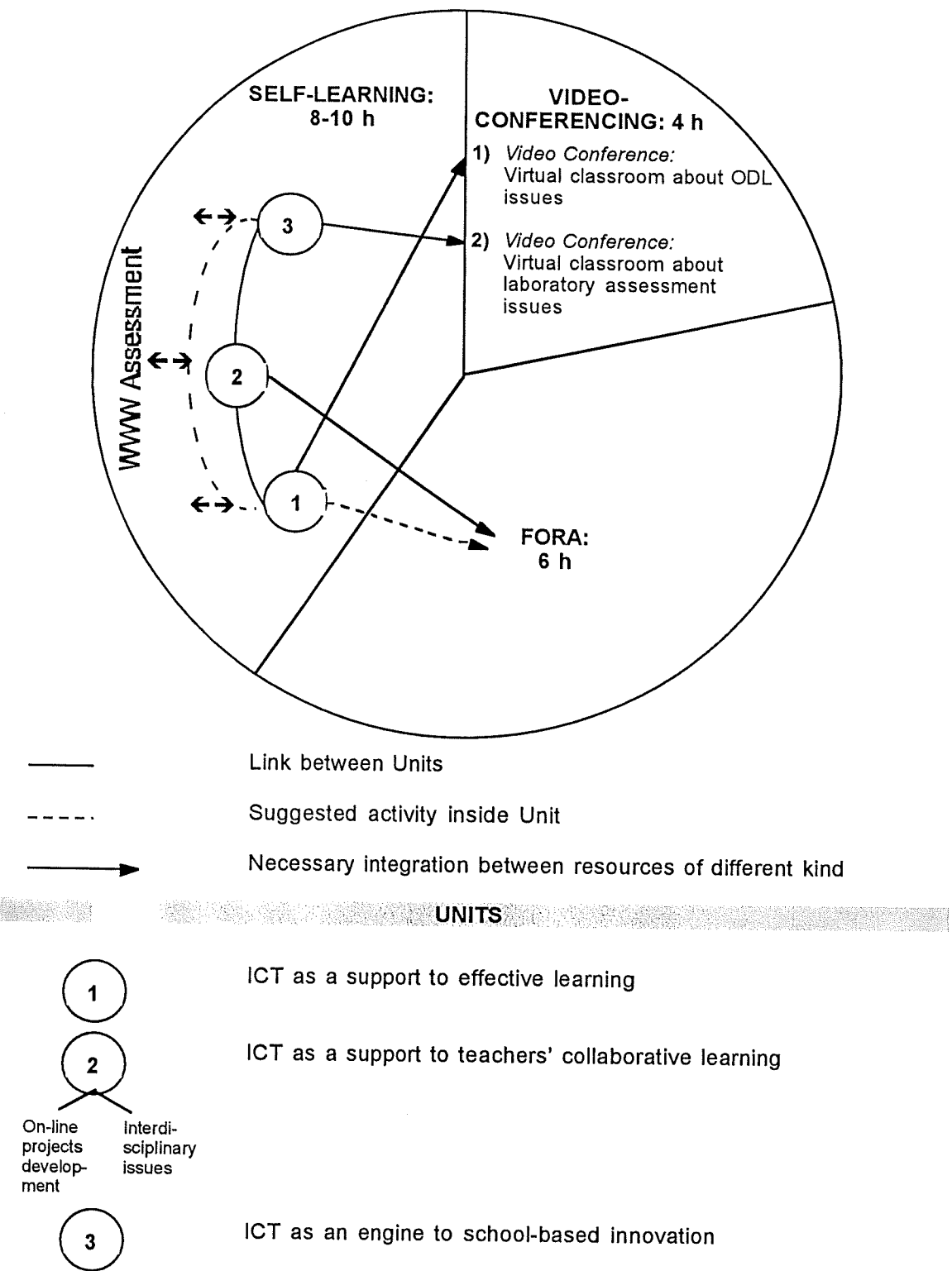
1. ICT as a support to effective learning;
2. ICT as a support to teachers' collaboration;
3. ICT as an engine to school-based innovation.

It is also characterised by the use and the integration of **resources of different kind**: the units provide you with sessions of **self-learning, collaborative learning** (through the discussion fora) **and participation in two video-conferences**. The duration of the whole module is of about 20 hours (see the graph illustrated below).

**It is clearly impossible for teachers to understand fully how IT can be integrated with the teaching of their subjects if they are not aware of what IT can do. Initially, this module will focus on awareness-raising, looking at what can be achieved with ICT. However, it is important that does not remain at this level: teachers need to progress to considering IT's connection with their subject, and the place of IT capability.**

In this respect, each unit is articulated in two main parts:

- ◊ the former, where examples and hints are given in order to facilitate reflection;
- ◊ the latter more operational, where you will be asked to contextualise in your class-room activities the use of ICT to encourage the learning process, to surf and assess relevant WEB sites, to take part in discussion fora and video-conferences.



## UNIT 1: ICT AS A SUPPORT TO EFFECTIVE LEARNING

The present unit will give you elements to let you think about advantages and potential of ICT in the teaching and learning process.

Particularly, it will explain to you how the introduction of flexibility dimensions into didactics can:

- ◇ **favour** individualised and flexible learning and learning by discovery;
- ◇ **promote** pupils' active and autonomous attitudes;
- ◇ **stimulate** group-working;
- ◇ **differentiate** activities to deal with special needs;
- ◇ **sustain** motivation;
- ◇ **respect** different learning styles;
- ◇ **respect** different learning paces.



*Time (study + activity) = 4 hours*

## INTRODUCTION

### BACKGROUND INFORMATION: BASIC CONCEPTS OF ODL AND ICT



**Foreword:**

Before going forward to parts one and two, you might need to know some basic concepts on Open and Distance Learning and its evolution, as well as on Computer Mediated Communication in ODL. This also with the aim of giving you some background information which might support you when participating in the video conference about ODL issues. In case you think you are already aware enough of these general issues, feel free to pass directly to Part 1.

The TRENDS project will make use ICT in order to create an environment for distance, school-based teachers training. In order to understand in depth the rationale and nature of this teacher training environment, it would be useful to focus on Open Distance Learning (ODL) as promoted by ICT in an attempt to clarify the basic concepts and issues arising from current developments in this area.

#### ODL Characteristics

Compared to a traditional training system, there are several advantages in the use of ODL systems. Among others, there are no limitations of the following kinds:

- ◊ **Geographical:** One of the problems that often have to be faced by teachers needing training, as part of their continuous professional development, is the fact that some of the courses that might be of interest are provided in distant places. Such a condition may discourage them from attending to or participating in training actions of their preference, or force them into situations of great professional, family and/or personal inconvenience.
- ◊ **Schedule of lectures:** Since ODL systems are based on autonomy and self-learning, the trainee is not limited by any schedule and, thus, the schedule used for learning purposes is aligned with his own pace. An exception for that appears in ODL systems where real-time technologies, such as audio or video-conference, are used.
- ◊ **Time and rhythm of learning:** Another feature of ODL systems is their flexibility as far as timing (the time spent in a learning task) and rhythm of learning are concerned.
- ◊ **Learning environment:** In a traditional education system the learning environment is pre-defined, usually by the institution that organises the training courses. In ODL systems the learning environment is selected by the trainee and it may be his/her house, his/her school, a training centre nearby his/her house, etc.
- ◊ **Trainees' learning needs:** Since in ODL systems the courses ordinarily take a modular form, with pre-defined objectives, the trainee can choose to take up the modules which correspond to his/her training needs. This clearly requires a high level of responsibility, discipline and self-control on part of the trainee, hence the fact that these courses are often considered more adequate to adult education, as is the case of the trainee-teachers in the current project.



- ◊ **Individualisation of the teaching/learning process:** In an ODL system, wherever s/he considers it necessary, the trainee may ask for help - using E-mail, for instance - from the trainer(s), his/her colleagues or an expert, in search of new sources of information or other means that may enable him/her to attain the objectives with various strategies.
- ◊ **Training costs:** Another advantage in the exploitation of ODL systems is the reduction of training costs, both for the trainee and the training institution. For the former, because s/he won't have to travel, and for the latter, because theoretically there is no limit in the number of trainees taking a course. Compared to traditional systems, which require the physical presence of trainees, the number of trainers tends to be much smaller in an ODL system.

## ODL Evolution

Distance education started with the classic courses by mail and continued with the use of similar media formats, such as television, radio and other more advanced. The interaction of the trainee with the trainer(s) was, and still is, in any case, rather limited. The previous experience related to ODL services for teachers' training has been normally provided by Open Universities. Among their statutory attributions, these universities develop university degrees and courses for populations that, given their geographical dispersion, justify the use of ODL courses.

Teachers also belong to this type of population. The learning scenario most frequently used by Open Universities is supported self-learning. The trainees receive the learning material, texts and formative evaluation after their registration in the courses they want to take. Radio and TV sometimes support delivery of the core content of the courses. In other cases, the core content is delivered by means of print material, audio or video cassettes or more recent technologies and resources, such as tutorial software, CD-ROM, etc.

Individual support is supplied by Post Office or regional offices (normally installed in regional teachers training institutions). Teachers' assessment may also be carried out with the support of regional institutions. The print learning material and the interaction between the training institution and trainees, before the widespread of ICT, were mainly provided by printed texts and the Post Office.

Due to its support technologies, especially the advanced telecommunication technologies, the third generation of ODL systems has potential to enable people to take any given course in a large list published wherever these technologies are available, tutored by experts of more or less distant places, home or abroad.

Advanced telecommunications have opened up opportunities of attending distance courses, better adapted to the trainee's needs, with greater interactivity, providing more possibilities of individualisation of the learning process, in which the trainer is not a mere transmitter of knowledge and the trainee is not just a passive receiver.

As they explore innovative technological structures, the latest ODL systems contribute to the creation of learning scenarios that have just recently started being studied and implemented. However, in dozens of Internet sites, there are already several open courses in various learning areas, features and methodologies, which allow the global net users to access courses of interest, this way meeting more easily **different training needs** and providing **diversified learning paths**. The diversity of learning paths and subsequent **individualisation** of the learning process are also related to the kind of **learning material** which is provided. This material, as opposed to written sequential ones, explore **hypertext** structures, making possible varied connections among the different parts of documents.

On the other hand, it can take the form of **multimedia** material (with the incorporation of sound, text, still image or video image) with the corresponding advantages.

As far as **interactivity** is concerned, these ODL systems allow interaction not only between trainer(s) and trainee(s) but also among the trainees themselves. This is possible because the created learning scenario can identify and accommodate the trainees' interests, which can be developed into collaborative tasks. The rapid information exchange enhances interactivity of these systems. For example, a trainee's question or preoccupation may now be answered in some hours.

From what has been mentioned above, one can conclude that recent ODL courses using advanced technologies offer great advantages that increase learners' motivation and facilitate the learning process itself.

### Computer Mediated Communication in ODL

Computer Mediated Communication (CMC) systems are the use of ICT to provide a computer mediated environment which allows one-to-one, or one-to-many communication. (CMC) is a generic term which includes the use of electronic mail (e-mail), computer conferencing (both text-based and video), and mailing lists. Benefits of CMC to individual learners include:

- ◊ peer group interaction;
- ◊ self-paced work;
- ◊ access to peer and tutor advice almost on demand.

There is increasing interest in the use of Computer Mediated Communications (CMC) to provide an Open Distance Learning (ODL) environment for teacher education, which is already impacting on teacher training, both pre-service and continuing professional development (CPD). Talk of 'virtual' classrooms and 'telepresence' may enthuse the technologically converted, but is unlikely to convince all potential participants that electronic communications has a place in teacher training. To help readers make up their own minds, this chapter covers some of the main benefits to be gained and looks at some aspects of CMC which might be of particular use in supporting CPD (Continuous Professional Development).

In education, the networking of distance learners for course delivery and mutual support can provide effective professional development. Training providers can deliver courses on-line and give students access to guest lectures over the network. CMC is keeping tutors, teachers, mentors and students in contact. Increasing use and familiarity with the technology reinforces teachers' confidence and competence in using IT.

Mason (1995) has identified a number of ways CMC can support professional development and training, for example:

- ◊ enhancing tutorial support;
- ◊ a forum for interaction between teachers and learners;
- ◊ a medium for mutual support;
- ◊ facilitating access to expert debate;
- ◊ as a teaching medium;
- ◊ for course delivery.

*Early evidence from a number of projects which have used CMC for teacher education, suggests that the benefits of CMC for staff development and training are considerable:*

- ◊ *participants can be involved in several discussions at once, something difficult to achieve in face-to-face discussions;*
- ◊ *discussions are recorded electronically and can be accessed at other times;*
- ◊ *as part of an institution-wide or faculty-wide programme, the electronic 'common room' has a democratising influence on decision-making;*
- ◊ *when we open our doors onto the Internet we can share research and ideas about teaching and learning with international communities;*
- ◊ *membership of an electronic community of teaching colleagues, people with common research themes and special interest groups decreases feelings of isolation for all participants;*
- ◊ *time and place become unimportant when we use asynchronous electronic communications;*
- ◊ *conferencing encourages sharing and dissemination of ideas;*
- ◊ *participation in the conferences can be active or passive, users may never post messages, but learn a great deal from reading the discussions.*

#### **CMC as a support mechanism**

*CMC adds a collaborative learning experience to ODL education programmes, diminishing the isolation frequently experienced by students and staff on these courses.*

*There are a number of advantages to using CMC as a support mechanism for ODL:*

- ◊ *access to tutor and peer support on demand, independent of time (asynchronous) - with portable computers access is also independent of location;*
- ◊ *access to national and international research, expertise and opinions;*
- ◊ *access to materials as required.*

*By using CMC, teachers, and tutors can maintain close contact irrespective of distance or preferred time of working. This can be achieved by using computer conferencing.*

*Computer conferencing is a broader term referring to systems that link people together in many-to-many communication. Computer conferencing may be an ideal starting point for teachers and student teachers to share practice and collaborate within the time constraints of their work and other studies.*

#### **Enhancing tutorial support**

*ODL systems are based on autonomy and self-learning. CMC can be particularly beneficial for teachers engaged in school-based projects where their efforts might be enhanced by ongoing tutorial support. For example, a school-based project might involve developing a task with pupils. Students may feel unsure about the activity in the light of classroom experience. They need to talk to someone and a video conference in real time (might be beneficial) or a text-based conference which can be asynchronous.*

### **A forum for interaction between teachers**

Classroom management, supporting children with reading difficulties, assessment and identifying suitable teaching resources, are some of the areas that have been discussed by students, teachers and tutors using CMC. Requests for advice or ideas may be initiated by anyone, and responses will come from a range of sources including other teachers who are undertaking the training, tutors and others who have been invited to join the discussion perhaps because of their particular expertise.

One-to-one interaction can be achieved by using electronic mail (e-mail). When using e-mail, individuals may send and receive personal e-mail messages to and from others for whom they have an electronic address. Messages are independent of time and distance (asynchronous) and can be read on screen, printed out or saved to disc. E-mail is usually restricted to text-based messages although inclusion of a graphic image is possible.

Another method of establishing, encouraging and supporting debate is via mailing list. A mail list is like a conferencing system, but uses electronic mail. Mail-lists are used to enable a group of people who all have e-mail to send and receive communal e-mail on a particular topic. It is a method of providing a similar environment to a conference system but using e-mail. There is no permanent message storage system. Instead, a message posted to the conference is sent to a mail-list server, which then copies the message to every subscriber on the mail-list. Each subscriber finds a copy of all new conference messages waiting in their mail.

### **A medium for mutual support**

Teachers working on ways of improving their practice believe that interest and support from colleagues is an important factor in professional development. Often there are not enough people with whom to discuss ideas. By inviting others who share similar interests to participate in on-line discussions teachers can be encouraged to continue working on their practice, sharing their success and frustration and seeking advice and solace from like-minded others.

### **Facilitating access to expert debate**

A group of 'experts' in an area can be invited to engage in a conference. This can be used to stimulate later discussions between participants which is either face-to-face, on-line or both. Experts may be drawn from the academic community, teaching colleagues or members of other professional groups with an interest in education, e.g. careers service.

### **Communications technology as a delivery mechanism**

One of the problems that often have to be faced by teachers needing training is the fact that some of the courses that might interest them may be held in distant places. The time taken to travel to course and the regularity and frequency of attendance, may result in a teacher being unable to attend all or part of the course. For these reasons, ODL systems are often seen as an alternative substitute. CMC brings a greater control and flexibility to the delivery mechanism of ODL.

Strengths of CMC as a delivery mechanism:

- ◇ training locations can be flexible and not necessarily local;
- ◇ learners can experience scenarios outside their experience;
- ◇ entry and exit points can be selected by the learner;
- ◇ immediacy of control means that the course is delivered at the pace of the user;

- ◊ learners can return to consolidate their learning;
- ◊ the increasing availability of portable computers means learners can;
- ◊ choose the most suitable time and place for study.
- ◊ A feature of ODL systems are their flexibility as far as the learning timing, i.e. the time spent in a learning task and the rhythm of learning. The asynchronous nature of CMC means that users can read and reflect on ideas presented in their own time. The text of a lecture can be sent to students who are enrolled on a course. Students can request further clarification or explanation. Using CMC learners can think about the issues and respond with questions to clarify a point or to refute a line of thinking. They can consider their reactions to the text, exploring what others have said about the subject, and make a considered response. The tutor can reply individually or to the whole group.

## PART ONE

### THE VALUE OF ICT IN THE CURRICULUM

Uses of ICT are found everywhere. Their importance in everyday life is taken for granted. It is vital, therefore, that students should learn about the role of ICT in the wider world and its implications for their future. It is equally important that students should learn to use the ICT tools that are available. They should become critical and autonomous users of ICT. Achievement in ICT capability will not happen by accident.

Students need to be taught new techniques and offered opportunities to try out them out and to compare the effectiveness of using IT with other methods of working. These opportunities need to be offered in a coherent manner. Students are unlikely to be given opportunities to use IT in all areas of the curriculum unless this is carefully planned and co-ordinated.

### THE VALUE OF ICT IN TEACHING AND LEARNING

ICT can have many positive effects on **teaching** and **learning**. For students there are frequently gains in:

- ◊ motivation;
- ◊ presentation;
- ◊ questioning skills;
- ◊ problem solving;
- ◊ information handling;
- ◊ techniques of modelling.

Teachers often find that (among many other gains) using ICT can lead to:

- ◊ rethinking teaching and learning strategies;
- ◊ more opportunities for differentiation;
- ◊ greater expectations of their students;
- ◊ more opportunities for individual teaching and group work;
- ◊ better understanding of their students' learning.

### THE VALUE OF ICT CAPABILITY

ICT is now a key skill within the curriculum. Without a grounding in ICT, students will be disadvantaged in their ability to take part fully in the rest of the school curriculum and the wider world of work.

It is clear that our society is rapidly transforming into one which is based on information, requiring its citizens to be familiar with and at ease with information-based resources and their manipulations.

To take full advantage of information-based resources all students will need opportunities to develop:

- ◊ a competency and confidence in the use of computers and their peripherals in a range of contexts;
- ◊ an awareness of the importance and limitations of computers and ICT tools in society;
- ◊ an appreciation of the range of applications of ICT, including using IT to communicate and handle information, measure;
- ◊ control and model;
- ◊ an understanding of the contribution that ICT can make to solving problems in a systematic and methodical manner.

## ICT CAN...

### ICT MEETS INDIVIDUAL NEEDS AND ABILITIES

Not everyone learns in the **same way** or at the **same pace**. Good teachers have always sought ways of presenting teaching material in **different ways** for **different students**, but this is not always easy to do. Information technology can help.  
A computer:

- ◊ can be used to **overcome** physical disabilities and to open up learning opportunities for students: even the student who is unable to attend classes can share in education using distance learning;
- ◊ can work at a speed **suited** to the student's needs, rather than at a common pace;
- ◊ **allows** a student to go back over work, ask for clarification and make mistakes without being shown up in front of others;
- ◊ **can provide** different entry and exit points, allowing the student to start and end work at different places;
- ◊ **can give** immediate positive feedback, so the student knows that he or she is on the right lines; there is no need to wait for the teacher to mark the work before turning to a new task;
- ◊ **can be** infinitely patient, is non-judgmental, informing the student of success or failure without saying that the student is good or bad;
- ◊ **can link** to other learning resources such as CD-ROM and interactive video, allowing the student to find out information from a variety of sources without having to consult the teacher.

### ICT AND LEARNING BY DISCOVERY

Multimedia software allow students to interact with original source materials in new ways which can lead to more reflective work and deeper understanding.

- ◊ Students are not limited to the resources within their physical reach;
- ◊ Newspapers, museums and art galleries are able to make their treasures available in every classroom;
- ◊ Ideas can be cross-referenced and presented in text, sound and images;
- ◊ Picture indexes and menu systems allow easy access to sophisticated materials;
- ◊ Vast quantities of information can be accessed very quickly;
- ◊ Electronic sources provide students with references that make the use of traditional resources more effective;
- ◊ Information skills like skimming and scanning and the use of key words develop naturally.



As they work with these large collections of data, students become familiar with different ways of arranging information. Grouping, organising and classifying become second nature to them and they organise their own work more effectively.

In comparing different information sources, such as newspapers and encyclopaedias, students see the importance of careful evaluation of the resources they use. Questions are raised about who is doing the writing and whether it is based on fact or opinion.

## ICT CAN HELP STUDENTS TO UNDERSTAND AND ASSIMILATE INFORMATION MORE EASILY

ICT can display still or moving pictures, link at one point sounds and text, and enable information entered once to be used in many ways.

- ◊ **Information handling**  
Simple databases can show students that the information they have found can be stored and organised in many different ways. Deciding which is best for the task they have to do is an important information-handling skill.
- ◊ **Visual concepts**  
Visual concepts are important in many professions. Seeing what is abnormal is vital to doctors or engineers.  
Weather forecasters and sailors need to recognise changes in cloud formation and interpret their meaning.  
Computer-generated models and tutoring programs contribute interactive learning modules to many professional training programmes.
- ◊ **Creative writing**  
Students and teachers can share thoughts and ideas as they write a playscript together. They can use picture sequences with speech bubbles which can be filled in by the teacher, the student or together. This informal language can then be printed in playscript format leading the students easily into a more abstract and formal style of writing.

## ICT CAN REDUCE FAILURE AT SCHOOL

Many students, particularly adult learners and older students who feel they have been failed by the traditional educational system, will respond better to correction from the computer.

Students enjoy working with computers and will concentrate longer than they would with pen and paper. Motivation and concentration on learning are key factors in acquiring basic skills.

Once students appear to fail they are often made to work on low-level activities, giving and receiving the required information in order to get the right answers, until their basic skills improve. Computers can offer these students the chance to work on higher-level activities, seeking information and using it to solve problems. They learn to communicate their ideas, to ask questions and be critical, and are motivated to acquire the basic skills which will support this kind of activity.

Multimedia can present problems from real life which draw on the previous learning and experience of students and link it to their current learning. Seeing practical applications makes for a richer and more enjoyable experience and stimulates the student to go on learning.

## ICT CAN HELP TEACHERS TAKE A FRESH LOOK AT HOW THEY TEACH AND THE WAYS IN WHICH STUDENTS LEARN

Having a computer in their classroom forces many teachers to think imaginatively about its effective use.

Research identifies three approaches which teachers use:

1. using the computer as a kind of machine-tutor allowing students to use it alone, often as a reward for good behaviour;
2. using software tools, especially word processors, to support their existing style of learning;
3. devising new kinds of learning tasks which the computer makes possible or easier to do.

As many classrooms have only one computer teachers have to think about **how** it should be used. Sometimes they use it with the whole class, sometimes with small groups or individuals. They see that group work encourages discussion and teamwork but that group size is important if everyone is to participate. They have to think about how group work can be individually assessed.

Often students are more skilled than teachers in handling the technology. Teachers who accept this **change in relationship** can use it to gain more time to support the learning process. Students can control the pace at which they learn and choose to work in the ways in which they learn best.

Easy access to information sources means that the **teacher no longer controls** and constrains the amount of information the student works with and investigations may take off in new directions.

Students explore ideas alone with teachers ready to supply new information, to make links with prior learning or to re-direct thinking when learning is blocked. Teachers and students become partners in learning, using a computer to explore new areas together.

## ICT OFFERS POTENTIAL FOR EFFECTIVE GROUP WORKING

Because computers help teachers to provide structure for and direction and support to students the management of group work becomes easier. Students working in small groups at the computer work collaboratively for longer. With the computer as a focus they discuss ideas, listen to others and build on one another's experience and knowledge.

Often the process of explaining to others what they think helps individual students to understand and to learn more effectively.

When doing group work with computers, good classroom management is essential.

How the groups are chosen is important. Teachers need to look carefully at differences in ability, gender and cultural experience. Their own observations of what works in terms of grouping will be important. Research suggests that three is an optimum group size. Sometimes in pairs one partner can dominate while if the group is larger some students become passengers instead of participators.

Where students' ability and experience are carefully matched, working in pairs can result in greater achievement and less anxiety about learning. Sharing responsibility creates an

environment where getting the wrong answer is not a problem so long as students can analyse why and learn from their mistakes.

Teachers must be clear about the type of task they are setting and what they hope it will achieve. Sometimes students will be working in groups but will need to produce individual results. Students working on a co-operative task to produce a group result are more likely to work collaboratively.

## **ICT CAN HELP STUDENTS TO LEARN WHEN THEY ARE USED IN WELL-DESIGNED, MEANINGFUL TASKS AND ACTIVITIES**

All tools are useless unless someone shows you how to use them and what to use them for. Teachers need to **ensure** that computers are used in worthwhile activity. Too many students learn how to use computers but not **how to use them appropriately** with real tasks..

Teachers are the link between students and learning. Teachers should introduce new work in ways which their particular students will understand. This linking is especially important in computer work.

Teachers need to ensure that work with computers includes tasks which:

- ◊ have clear learning outcomes;
- ◊ are described simply and directly;
- ◊ offer opportunities for different styles of learning;
- ◊ relate to the cultural backgrounds of all students;
- ◊ are interesting to both boys and girls.

Students need to know how they are expected to work. They need to know:

- ◊ **what** they will learn
- ◊ **why** they need to learn it
- ◊ whether the **task** is for an individual or a group
- ◊ **when** they will have access to the computer
- ◊ **how** their work will be assessed

Challenging computer activities require students to think about and respond to results. Well-designed tasks can show students how their learning can be applied to real problems.

## ICT: STUDENTS MAKE MORE EFFECTIVE USE OF COMPUTERS IF TEACHERS KNOW HOW AND WHEN TO INTERVENE

Most teachers intervene effectively and easily in other curriculum areas but some find it difficult to help students learn with ICT. They are uncertain **when** and **how** to intervene. Early research findings indicate that this may be because the relationship between student and teachers changes when computers are introduced.

- ◊ When work begins with ICT, students often ask for help and the teacher's intervention is usually to encourage or reinforce learning. Control and management of the learning is with the teacher.
- ◊ As students become more experienced with ICT they need less encouragement to use the computer but effective intervention by the teacher will help them think about what they have done and predict what will happen next.
- ◊ The teacher becomes an adviser or counsellor to help students set their own tasks and goals.
- ◊ Sometimes the teacher's intervention is needed to redirect the student by suggesting strategies for problem solving, or by giving a new piece of information. The teacher becomes a resource to enrich the learning with IT.
- ◊ As students gain more control over their own learning the nature of the teacher's intervention changes again. The teacher moves to an enabling or facilitating role and students become more willing to work collaboratively with both the teacher and other students.

## SOME EXAMPLES



*Below, some examples concerning the use of ICT in some teaching subjects are given, in order to give you some cues to transfer/adapt them into your classroom.*

### HOW CAN IT HELP IN THE GEOGRAPHY CLASSROOM?

Students studying geography can use IT to:

- ◊ enhance their skills of geographical enquiry and investigation;
- ◊ gain access to a wide range of geographical knowledge and information sources;
- ◊ deepen their understanding of environmental and spatial relationships;
- ◊ experience alternative images of people, place and environment;
- ◊ consider the wider impact of IT on people, place and environment.

IT capability will be developed in geography by using IT for:

#### Communicating and handling information

The use of word processing, desktop publishing, presentation and graphics packages helps to enhance and refine the precision of students' work and encourage the development and articulation of students' own ideas. This will develop capability to communicate at a variety of levels.

The use of spreadsheets, databases, graphing and mapping packages helps students to manipulate, interpret and predict and display information, some collected through fieldwork. This will develop the capability to pose questions, test hypotheses, analyse and evaluate information and detect patterns and relationships.

#### Controlling, measuring and modelling

The use of data-logging equipment supports students as they measure, collect and display fieldwork, weather and satellite data. This will develop capability in planning, analysis and interpretation of data.

Students can use simulations, spreadsheets and modelling software to explore and investigate geographical relationships.

This will develop the capability to manipulate variables, make predictions and test hypotheses.

### HOW CAN IT HELP IN THE SCIENCE CLASSROOM?

Datalogging equipment and special sensors are commonly in use in the science classroom to measure physical quantities in investigations, monitor changes in a given environment, and manipulate variables to test hypotheses. Likewise, the use of modelling software and spreadsheets enables the testing of hypotheses and solving problems. Spreadsheets and databases enable analytical work to be carried out on data and encourage students to look for patterns and relationships. Calculators can enhance the study of science and along with dataloggers and laptop computers are versatile and portable, enabling students to work outside the classroom when needed. Both word processing and desktop publishing software can be used for individual projects or for displays and presentations but are not used very often.

How ICT might be used: As well as the many CD-ROM encyclopaedias and databases available for this topic, students could use the Internet. There are many pages on the Web that provide information on the planets and stars, - e.g., Nine Planets (<http://seds.lpl.arizona.edu/nineplanets/nineplanets/>). Students begin by using a search engine to find a selection of pages. They would find that their search strategies would bring wide and varied results. They would have to practice to refine their results.

They could then evaluate relevant sites and incorporate relevant data and information into a document created using either a word processor or a desktop publishing package.

## HOW CAN IT HELP IN THE HISTORY CLASSROOM?

Databases and spreadsheets are among the most commonly used forms of IT employed in a history classroom. Spreadsheets and databases enable analytical work to be carried out on data and encourage students to look for patterns and relationships as well as interpret and decipher historical evidence.

CD-ROMs are increasingly used in history, as more and more titles appear which provide appropriate sources, information and archives. Desktop publishing software is used occasionally for individual projects or for displays and presentations.

However, in many instances, desktop publishing has been used as a popular way of writing news articles about historical events from opposing standpoints.

## HOW CAN IT HELP IN THE MATHEMATICS CLASSROOM?

The use of dynamic geometry software, spreadsheets and calculators can enhance the study of mathematics. Dynamic geometry software can help students to develop their visualisation skills as well as understand the relationships between angles and shapes. Spreadsheets and databases enable students to look for patterns and relationships. They also allow analytical work to be carried out on data. Graphic calculators can be used to explore functions and use equations, create graphs and do much that any personal computer can and their advantage is their portability. Ordinary calculators and laptop computers are both versatile and portable.

It is important to remember that pencil and paper work usually needs to take place alongside computer work and activities involving other mathematical equipment.

## HOW CAN IT HELP IN THE ENGLISH AS AN ADDITIONAL LANGUAGE CLASSROOM?

With the development of language-teaching methods towards role-play in everyday situations, the communality is growing between English for speakers of other languages and English as a foreign language. Information technology (IT) can help in language teaching by creating increasingly realistic situations in which to communicate, such as shopping, paying bills, entertainment and health care.

IT offers the benefits of:

- ◊ repetition;
- ◊ one-to-one tuition;
- ◊ manipulation of language;
- ◊ immediate feedback;
- ◊ equity;
- ◊ differentiation;
- ◊ access to a wider range of accents and cultures;
- ◊ wider communications and access to real people;
- ◊ dissolving boundaries.

Word processing is often employed in language learning because it allows students to structure and draft documents, combine graphics with text and edit their work. The use of overlay keyboards can be a useful tool in acquiring and understanding new vocabulary. Students see objects on the overlay in context through the use of pictures, symbols and images, understand what each is and hear or see the English word or phrase when each is pressed.

Databases, the Internet and CD-ROMs can be used to learn about foreign cultures and as consolidation/revision aids for language learning. Videoconferencing, electronic mail and faxes are used to communicate with people from other countries. Television and Teletext are easily accessible, and text is usually kept to a minimum. Multimedia packages and audio-visual aids reinforce a student's development of the English language by combining text and sound with visual images.

**To summarise:**

- ◊ *The computer can provide fast and reliable feedback which is non-judgmental and impartial; this can lead to an unthreatening environment in which students are encouraged to make their own conjectures*
- ◊ *The very power of the computer means that it is often easy to press another button to gain further information; however, sometimes it may be more appropriate for students to reflect or to ask 'What would happen if...?'*
- ◊ *The computer offers many powerful opportunities for generalisation based on experimental evidence but it is important that students are also encouraged to explain results and to analyse situations*
- ◊ *Dynamic images can support the development of visualisation skills and this may suggest new approaches*
- ◊ *Computers enable the use of real data in statistical work and so cross-curricular approaches may be more feasible*
- ◊ *Having machines available which can, for example, solve problems at the touch of a button has strong implications for the way particular topics are approached.*



## PLANNING ICT ACTIVITIES

At this stage, after showing you the range of possible ICT uses, we invite you to start thinking about possible ICT applications you can do in your classroom to solve real problems, by planning their introduction. Planning ICT activities is the same as planning for any other area of the curriculum.

Medium-term planning allows teachers to identify the activities that students will be involved in over a period of time, such as a month or half a term. Links can be made between ICT and other subjects. This will include identifying whether:

- ◊ subject and ICT development will take place
- ◊ subject development will take place and ICT capability will be consolidated
- ◊ ICT capability will be developed and the subject consolidated.

At this stage it is necessary to specify the purpose of the activity and where appropriate skills are to be developed.

Short-term planning will identify opportunities with different learning objectives for individuals and groups of differing abilities.

In some cases it may be possible for similar activities to challenge individual students. For example, while some students are redrafting work by moving sentences or blocks of text, others may be checking and correcting spelling or inserting and deleting individual words. It is important that teachers evaluate the effectiveness of what has been taught against criteria identified in planning, and set out what students are expected to achieve in order to make judgements about their readiness to move to the next stage.

## PROGRESSION

Progression in ICT capability should be seen as more than the development of ICT skills. The acquisition of IT skills, while important, is not sufficient on its own to develop capability. Students need time to consolidate their skills by applying them in a wide range of contexts. They need to be able to reflect upon their use of ICT in different situations before becoming fully capable of deciding when, and when not, to use ICT.

Progression in ICT capability can develop as students begin to choose the ICT tools they wish to use to meet the particular needs of an activity. Sometimes a familiar piece of software, or some of its facilities, will meet those needs. On other occasions, they may find that the ICT tools they used before are inadequate. The opportunity then arises for the introduction of new features within a familiar piece of software, or a more powerful program.

The software and the activity will determine the amount of teacher input required. The learning will, however, be focused and motivated towards developing the new skills necessary for the students' needs.

We cannot always assume that students will themselves identify the need for an alternative ICT tool. The introduction of new skills can often significantly improve students' use of ICT, and positive interventions by teachers can be invaluable. Opportunities to talk with students about their use of ICT can help teachers in making decisions about whether to provide consolidation activities or to develop IT capability

further. This should be seen apart from, rather than integral to, an ICT activity, once students have had an opportunity to reflect on their experiences.

Progression in ICT arises, therefore, where students acquire new skills as a response to the needs of an activity. The consolidation of these skills, in a range of contexts, together with discussion and reflection on their effectiveness, leads to ICT capability.

## ASSESSMENT

ICT capability is developed over a period of time. Since ICT capability involves far more than simply acquiring ICT skills, it is important that any assessment should take account of:

- ◊ the ICT skills developed;
- ◊ the contexts of the activity;
- ◊ the purpose of the activity.

As with any group activity, it is often difficult to assess the contributions of individuals. Discussion with the group can be valuable in ensuring that they reflect upon their experiences as well as providing an insight in to the role of each member.

The judgements teachers make will inform them in identifying and planning the next ICT learning opportunity that students require in order to:

- ◊ develop new skills;
- ◊ extend their appreciation of the potential and value of ICT.

It is no longer considered necessary to keep detailed records of assessments, although teachers may find it beneficial to record significant moves forward in learning. ICT co-ordinators have a vital role to play in helping colleagues to build a clear picture of what is significant through:

- ◊ informal discussion

Keeping some evidence will be useful to inform annual reporting to parents and end of key stage judgements of 'best fit'. It may be useful for students to evaluate their own work and where appropriate make decisions about the inclusion of work in records of achievement and portfolios.

## LEARNING APPLICATION

The learning application that you will now develop can refer to something as simple as a short activity in a classroom, but also to the adaptation of an exercise or a theme proposed in a text-book, or even to the implementation of a long project with your learners.

The value of this application consist in being able to check personally the usefulness of Internet as source of resources for your teaching job. With respect to the TRENDS course, every teacher will be able to decide, according to her/his personal interests and needs, the nature and the duration of this learning application.

Your first task will be to select some of the resources that your previously found on the Internet, considering their connection and relevance to the subject curricula of the group of learners that you are addressing.

The second step is to decide what kind of activity you want to design and implement. You should consider the equipment you can use and the knowledge about it already available to your learners. The nature of the activity can vary a lot depending on each subject, selected theme, available time, and your own imagination.

## HOW TO CONDUCT THE ACTIVITY

In an ideal situation our activity could take place in a multimedia classroom with an Internet - connected computer per each learner. In such a way, your learners could access themselves the resources of the net. Through the data collected, and with the help of other applications, they could deliver to you a work rich of images, tables and duly commented graphics.

The reality is that in the majority of schools this availability of equipment is not existing, nor learners are prepared to do such a work.

So, let us consider which alternatives are available:

- ◊ Many schools have a computer classroom, though without external connection. If the computers have sufficient memory, some navigators could be installed to access WWW pages previously copied into the hard disk through a floppy disk or into the server if the classroom computers are networked.
- ◊ If only one computer is connected to Internet and you have a special overhead projector for computers, you can project on a screen the learning materials that you have selected.
- ◊ Whenever it is allowed, you can also print the pages that you have found and photocopy them for your learners. In such a way you can design interesting activities based on those materials. For many learners knowing that they are working with recently found Internet materials may constitute an incentive.
- ◊ Even in the simplest of cases, you can utilise the information found on the net to enrich a learning unit or to design an activity of a different kind. In such a case the learners may not even know that part of the information they are working with comes from an Internet search done by their teacher.
- ◊ Though the pieces of equipment you can use in the school are not always those that you desire, it does not mean that no learner can navigate from home. We can

design particular activities for them, or suggest that in the next Geography homework they consult Internet as well as the classic Encyclopaedias in the library.

However short is the activity, it must be embedded in the context of your subject, with clearly defined objectives, with a clear specification of the work to be done by learners and of the evaluation criteria that will be used to assess the achievement of objectives.

You should not forget that the activities may involve very varied degrees of difficulty and interest to your learners, so in any case you should design activities while considering the differences among learners that exist in every group.

After the activities have been done, it is very important to conduct a reflection and an evaluation of the work done, in order to improve future activities. You should analyse the difficulties encountered and the degree of achievement of the fixed objectives.

Finally, you should consider and assess the contribution that technology can bring to the teaching/learning process. In view of helping you in this activity, here follows a "Guide to the implementation of the learning activity" and a "Guide to the evaluation of the activity conducted".

## GUIDE TO THE IMPLEMENTATION OF THE LEARNING ACTIVITY

**Group to which the activity is addressed:**

***Skills of the group:***

- ◊ related to the task;
- ◊ related to new technology;
- ◊ other competencies required.

**Participation of other teacher/learners:**

***Place where the activity will be done:***

- ◊ in the usual classroom;
- ◊ in the computer classroom;
- ◊ in another place.

### ANALYSIS OF ACTIVITY

**What is the context of the activity?** (place of the activity in the curriculum)

**What are the specific objectives of the activity/learning unit?**

**What will the learner have to do?**

**How will the activity fit to the different learners?**

- ◊ help for the most difficult tasks;
- ◊ complementary exercises for the most performing learners.

**Which learning strategies will be used?**

- ◊ large group;
- ◊ small groups;
- ◊ support of experienced learners to small groups;
- ◊ individual support;
- ◊ others.

**How will the achievement of objectives be assessed?**

**Which resources will be utilised?**

- ◊ related to the task/subject;
- ◊ related to technology.

**How will resources be accessed?**

- ◊ through Intranet;
- ◊ through direct access to Internet;
- ◊ through files or photocopies previously prepared.

**Which software will be utilised?**

**Which sites will be accessed?**

## GUIDE TO THE EVALUATION OF THE ACTIVITY CONDUCTED

What has the activity given to your learners (in positive and negative)?

- ◊ with regard to the specific task assigned?
- ◊ with regard to technology?

Have you achieved any other objective?

Which learning problems occurred? Why?

What would you change if you had to do it again?

What consequences will this experience have in the teaching/learning process that you organise with your learners?



## PART TWO



### ACTIVITIES

- 1) Starting from the examples and clues given in the Part One, think of your classroom activity and:

- a) describe synthetically, using the table below, how you are used to facing the following didactic aspects:

Favour individualised and flexible learning and learning by discovery

---

---

Promote pupils' active and autonomous attitudes

---

---

Stimulate group-working

---

---

Differentiate activities to deal with special needs

---

---

Sustain motivation

---

---

Respect different learning styles

---

---

Respect different learning paces

---

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- b) Show, the table below, where ICT could help you to improve the strategies used by you up to now:

Favour individualised and flexible learning and learning by discovery

---

---

Promote pupils' active and autonomous attitudes

---

---

Stimulate group-working

---

---

Differentiate activities to deal with special needs

---

---

Sustain motivation

---

---

Respect different learning styles

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Respect different learning paces

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- 2) Which possible uses of ICT you could do in the short term, on the basis of the competencies and means which are available to you?

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- 3) At national level a FORUM about "learning styles..."has been set up. If you think to be able to give some contributions or to find there some solutions to problems you may consider common, we invite you to visit it.



## UNIT 2: ICT AS A SUPPORT TO TEACHERS' COLLABORATION

The present unit will give you elements to let you think about how ICT can encourage on-line collaboration among teachers.

Particularly, it will explain you how collaboration may help you to:

- ◇ **favour** information exchange;
- ◇ **allow** sharing and development of knowledge among teachers and **solve** daily teaching problems;
- ◇ **develop** inter-disciplinary problem-solving and project-based activities for pupils (e.g. materials and test on a given subject);
- ◇ **analyse** different ways of introducing a new content into previous curricula.

In the part one of this unit, the different aspects will be analysed by providing readers with many examples.



*Time (study + activity) = 3 hours*



*Read through the first paragraph for some basic concepts on collaborative/co-operative learning.*



## INTRODUCTION

### CO-OPERATION IN SOCIAL SCIENCE AND WHY IS IT INTERESTING FOR LEARNING PURPOSES?<sup>1</sup>

“Co-operative learning” is a fairly new concept, certainly as a way of thinking and conducting the educational process. Co-operation in learning is not in itself new, but the idea of “co-operative learning” as a particular system of learning is. But what do people mean when they talk of co-operative learning? And what are the outcomes and benefits to the learner of co-operating with other learners?

The act of co-operation is something which is deeply embedded in western societies. It seems to be a fundamental aspect of our every-day lives that people co-operate, although we do make choices about when to co-operate and with whom.

The nature of co-operation is something which social scientists are interested in analysing and researching. Argyle (1991, p.15) defines it as, “acting together, in a co-ordinated way at work, or in social relationships, in the pursuit of shared goals, the enjoyment of joint activity, or simply furthering the relationship.” This is a fairly wide ranging definition that can be useful in thinking about the nature of co-operation in learning situations. It emphasises the role of groups of people in co-operative acts and points to the wider social dimension of co-operation (...).

Co-operation is usually analysed in game theory by means of a non-zero-sum game called the “Prisoner's Dilemma” (Axelrod, 1984). The two players in the game can choose between two moves, either “co-operate” or “defect”. The idea is that each player gains when both co-operate, but if only one of them co-operates, the other, who defects, will gain more. If both defect, both lose (or gain very little) but not as much as the “cheated” co-operator whose co-operation is not returned. The whole game situation and its different outcomes can be summarised by table 1, where hypothetical “points” are given as an example of how the differences in result might be quantified.

**Table 1:** outcomes for actor A (in words, and in hypothetical “points”) depending on the combination of A's action and B's action, in the situation of “prisoner's dilemma” game. A similar scheme applies to the outcomes for B.

Action of A/Action of B	Co-operate	Defect
Co-operate	Fairly good [+ 5]	Bad [ - 10]
Defect	Good [+ 10]	Mediocre [0]

The game got its name from the following hypothetical situation: imagine two criminals arrested under the suspicion of having committed a crime together. However, the police does not have sufficient evidence in order to have them convicted. The two prisoners are isolated one from the other, and the police visits each of them and offer a deal: the one who offers evidence against the other one will be released. If none of them accepts the offer, they will be in fact co-operating against the police, and both of them will get only a small punishment because of the lack of proof.

<sup>1</sup> This part is drawn from D. McConnell “Implementing computer supported co-operative learning ” Kogan Page Limited, 1994, pp.12-15





They both gain. However, if one of them betrays the other one, by confessing to the police, the defector will gain more, since he is released; the one who remained silent, on the other hand, will receive the full punishment, since he did not help the police, and there is sufficient proof. If both betray, both will be punished, but less severely than if they had refused to talk. The dilemma resides in the fact that each prisoner has a choice between only two options, but cannot make a good decision without knowing what the other one will do.

Such a distribution of losses and gains seems natural for many situations, since the co-operator whose action is not returned will lose resources to the defector, without either of them being able to collect the additional gain coming from the "synergy" of their co-operation. For simplicity we might consider the Prisoner's dilemma as zero-sum insofar as there is no mutual co-operation: each gets 0 when both defect, or when one of them co-operates, the defector gets + 10, and the co-operator - 10, in total 0. On the other hand, if both co-operate the resulting synergy creates an additional gain that makes the sum positive: each of them gets 5, in total 10.

The gain for mutual co-operation (5) in the prisoner's dilemma is kept smaller than the gain for one-sided defection (10), so that there would always be a "temptation" to defect. This assumption is not generally valid. For example, it is easy to imagine that two wolves together would be able to kill an animal that is more than twice as large as the largest one each of them might have killed on his own. Even if an altruistic wolf would kill a rabbit and give it to another wolf, and the other wolf would do nothing in return, the selfish wolf would still have less to eat than if he had helped his companion to kill a deer. Yet we will assume that the synergistic effect is smaller than the gains made by defection (i.e. letting someone help you without doing anything in return).

The problem with the prisoner's dilemma is that if both decision-makers were purely rational, they would never co-operate. Indeed, rational decision-making means that you make the decision which is best for you whatever the other actor chooses. Suppose the other one would defect, then it is rational to defect yourself: you won't gain anything, but if you do not defect you will be stuck with a -10 loss. Suppose the other one would co-operate, then you will gain anyway, but you will gain more if you do not co-operate, so here too the rational choice is to defect.

The problem is that if both actors are rational, both will decide to defect, and none of them will gain anything.

"The main results of Co-operation Theory are encouraging. They show that co-operation can get started by even a small cluster of individuals who are prepared to reciprocate co-operation even in a world where no one else will co-operate. The analysis also shows that the two key requisites for co-operation to thrive are that the co-operation be based on reciprocity, and that the shadow of the future is important enough to make the reciprocity stable. But once co-operation based on reciprocity is established in a population, it can protect itself from invasion by uncooperative strategies" (Axelrod, 1990, p173) (...).

In the very broadest sense, co-operative learning involves working together on some task or issue in a way that promotes individual learning through processes of collaboration in groups. It is, "the opportunity to learn through the expression and exploration of diverse ideas and experiences in co-operative company. It is not about competing with fellow members of the group and winning, but about using the diverse resources available in the group to deepen understanding, sharpen judgement and extend knowledge (Cow and Redue, 1988, p.13).

(...) Co-operative learning is process-driven, i.e. those involved engage in a social process and have to pay attention to that process in order for them to achieve their desired end point. It usually involves people working in groups. They may be group "products" towards which the learners are working; co-operative learning can give rise to "products" which are not achievable by people learning on their own. And they may be in the group helping each other deal with their own individual learning concerns."



Within the context of ODL forms made available through the use of ICT, in the **Collaborative Learning** scenario, the activities arise when a group of people share the same goals, interest, needs, etc., and decide to work on these together. The trainees can also work together on a subject proposed by their trainer(s). In a first virtual meeting (using e-mail, a created news group, a discussion forum or a audio/video-conference) the group settle down their ideas, the scope of their work and the activities to be carried out to achieve their initial goals. From there on all the participants will contribute to the final product, which can be, for instance, a multimedia tool, to deliver in the Web or not, or a forum with the results of the discussion.

This dynamic communication flow will take place one-to-one, one-to-many and/or many-to-many. Each participant will be able to send his/her own messages and read or answer other participants' messages. From this point, dialogues or discussion fora will arise, using the technologies mentioned above.

Although all the persons enrolled in the project can and must be agents and end-users in their own and the others learning process, sometimes there should be an anchor person, often the trainer him/herself or an expert, whose main task will be to play the role of a moderator maintaining the discussion, suggesting new subject matters, new directions for information search or new questions related to the work that is being done, selecting the messages or the joining of new participants. Theoretically, there are no clearly pre-defined objectives and, thus, core content or they are determined in a very global way; however, the existence and the role played by an anchor person gives the trainer(s) the opportunity to guide the follow-up of the work to his(their) pre-defined but yet not clearly stated directions/objectives.

A typical way of giving focus in collaborative learning is to refer to the representation of existing competencies among the collaborating learners and of new competencies developed through the exchange of experience related to different contexts. This method would normally work at best among a relatively homogeneous professional group: school teachers of the same discipline are one of the most frequently mentioned cases to suggest collaborative learning, but also teachers of different disciplines facing a common problem may contribute a good group.

Collaborative distance work gives trainees/teachers the opportunity to leave behind the traditional stand-alone position without having to find a common space and time at the expense of professional and family duties. This scenario can make things much easier for teachers, either if they are working in big schools of busy cities or small schools in distant isolated places. It brings together, in a virtual environment, persons who do not have to travel to that effect and who can meet at their own convenience whenever they have time and feel like doing it. It means that the work is normally group-centred without any constraints concerning time, space and schedules, except for the cases in which real-time technologies are exploited. In this scenario the trainees support each other, but always having the opportunity to turn to the trainer(s) for special help. For instance, if someone gets lost or joins the group at a latter time, he/she can at any time rely on the trainer(s) who will set him/her in the right direction.

In conjunction with the self-evaluation and the hetero-evaluation elements, there is - in the collaborative scenario - a third evaluation instrument, based on collaborative work, that is the so called co-evaluation. The exchange and improvement of the work done collaboratively and its results can be a co-evaluation element very useful for everybody. This means that at various stages during the learning process as well as at the end of it all the participants critically analyse not only what they have achieved but also how they have achieved it. The co-evaluation of the processes in this scenario proves to be the most important evaluation component. Consequently, there are several evaluating agents, tutors, colleagues and trainees who interact in this function through the learning material as their connecting point.



## PART ONE

### COLLABORATIVE LEARNING FROM THE ICT PERSPECTIVE

Though new learning approaches and problematics make teachers aware of the need to work together, to share ideas, knowledge and learning strategies, the technology available in the TRENDS pilot project will make interaction a real need.

As Kellogg and Viehland (1995) suggest "Internet develops according to personalised interaction in such a way that previous technologies and isolated applications would have never been able to conceive and anticipate".

The scenario of collaborative learning allows teachers to meet new colleagues who can share the same interests and goals, and develop common projects beyond the constraints of place and time. This scenario gets people of different cultures and languages nearer, it enhances dialogue and helps overcoming cultural barriers.

In a collaborative learning scenario teachers may take part in different activities, among which:

- ◊ to search and share updated information from libraries, research centres, magazines, journals, etc.;
- ◊ to develop on-line projects;
- ◊ to create subject-related groups and develop new information and knowledge through the exchange of experience.



## ICT AS A WAY TO FAVOUR INFORMATION EXCHANGE

The collaboration among teachers will provide the group with an easy access to different information, experiences and materials.

"The construction and management of what we term a "common information space" has, in our view, been somewhat neglected, despite its critical importance for the accomplishment of many distributed work activities. Here the focus is on how people in a distributed setting can work co-operatively in a common information space - i.e. by maintaining a central archive of organisational information with some level of "shared" agreement as to the meaning of this information (locally constructed), despite the market differences concerning the origins and context of these information items. The space is constituted and maintained by different actors employing different conceptualisations and multiple decision making strategies, supported by technology." Schmidt & Bannon (1992)<sup>2</sup>

ICT (in particular technologies for Computer Mediated Communication, the World Wide Web and Desktop Multimedia Conferencing Systems) enhance teachers and students communication and exchange of information.

As a communication/collaboration channel, the ITC prove to be a powerful learning tools through which teachers and learners can work collaboratively on the creation of a shared product in the same physical location or at a distance.

For example teachers may find useful to:

- ◊ develop a database on a specific topic, which represents a shared information tools within the participants;
- ◊ create a "forum" on a subject matter in which colleagues coming from different countries and contexts and having different backgrounds are requested to presents their experiences;
- ◊ create a "common virtual space" where information on materials, news, interesting events, conference papers are located and accessible to all.

The exchange of information thanks to ICT is possible one to one, one to many or many to many and both in real-time interaction as well as in asynchronous interaction. The meaning of "real-time interaction" is to make people share the "same situation/event" by giving them the possibility to express themselves directly.

"Asynchronous interaction" is more a tool for a collaborative learning at distance and has the following advantages:

- ◊ participant can choose the best moment to access the net;
- ◊ participant can analyse the documents and materials developed by the others and to draw own materials when he/she feel ready to do it;
- ◊ it will be possible thank to some specific software tools to structure and organise the communication flow and diminishing the complexity.

It goes without saying that the exchange of information is the first requisite for any activities through the net.

## ICT AS A WAY TO ALLOW SHARING AND DEVELOPMENT OF KNOWLEDGE

<sup>2</sup> L. Bannon, S. Bødker "Constructing Common Information Spaces" Papers reports.





AMONG TEACHERS AND SOLVE DAILY TEACHING PROBLEMS

The bottom line which need to be emphasised is that, on the one hand the increased number of teachers' training experiences using ICT and ODL methodology and on the other hand, the achieved results have shown the efficacy and the appropriateness of these media and of the methodology applied for in-service training actions.

As far as the "teachers community" is concerned, two are the main factors which have to be underlined: on the one hand, participation in collaborative environment provides the teacher with access to a "community of learners" made up of colleagues with different background, knowledge, experiences, beliefs, approaches. It also provides teacher with a structured body of knowledge relating to a particular and developing subject area in an organisational context. It is through the interaction with these various components and, in this case, reflection on own experience, that teacher develops and expands his/her own awareness and understanding of this subject area ... (and) moves towards a greater understanding of the assumptions on which the beliefs about training and development are based.

On the other hand, the possibility of remaining in work-place gives the possibility to experiment actively the implications of concepts in new situations and this leads back into the concrete experience which again generates further observations, reflections and generalisations, so the process continues in a spiral fashion.

In a project based activity is necessary to adopt team-teaching approaches, where there is broad agreement over roles and all members of the team have a clear idea of what is expected from them.

Some experiences in using ICT for training teachers and trainers are presented within this section. It goes without saying that these experiences have been chosen as examples of learning through the net.

In particular:

Example	why has been chosen
Polaris	is a training course for teachers delivered at distance based on collaborative learning
Differentiated teaching	is a training course for teachers in which the topics are suggested by the teachers according to the real problems they are facing in daily classroom-activities
Disruptive students: answers to the problem	It is a possible path/project to carry out for solving a specific teaching problem (as disruptive students) based on the collaboration among teachers



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### Example 1: case study - project POLARIS -telematics for in-service training: “tutor in rete” and “telematica e didattica”

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#### **Provider**

CNR - Istituto di tecnologie Didattiche - via De Marini 6, Torre di Francia - Genova

#### **Context of reference**

Project Polaris is born out of the co-operation between “la Direzione Generale dell'Istruzione Tecnica (Div. II)” (DGIT) of the “Ministero Pubblica Istruzione” (MPI) and the “Istituto Tecnologie Didattiche” (ITD) of the CNR from Genova for the experimentation of a particular method of in-service training of trainers based on an intensive use of telematics resources according to the approach to the so-called on-line education or ODL of third generation..

It is a process in which the telematics connection among all the actors (teachers and pupils) allows to build a proper and real learning community to cancel the isolation of a single student and value his/her relations inside the group.

The project Tutor in rete (Tutor on-line) has been the first project developed in the framework of the initiative POLARIS, followed by Telematica e Didattica (Telematics and Didactics) and “Fiori Blu” (Blue Flowers).

#### **Objectives of the co-operation**

Trough a succession of experimental activities, the co-operation aims to:

- ◊ define methodologically the proposed model of training and on-line assistance of teachers and validate its effectiveness through the supply of a succession of on-line courses based on this specific approach;
- ◊ define a training package for the so called “tutor on-line” (strategic figure of the on-line education), that is also based on the on-line training techniques and validate its effectiveness through the supply of a pilot course;
- ◊ define criteria to design the model which enables the MPI to manage both tutor training and to design and conduct further on-line initiatives.

Regarding the figure of the tutor, it is worth noting that Polaris does not foresee a cascade training mechanism (training of a first group of tutors that will afterwards train others on the same methodological/training context and so on). In Polaris, in fact, the tutors will be introduced in a specific method of design and management of ODL. These methods could easily have different natures that should not be necessarily linked to the specific training competencies of these tutors.



## Pedagogic Dimension

### ◊ **Structure and organisation**

In POLARIS, ODL can be considered both a learning object and a training support instrument. The projects which have been surveyed adopted a methodology based on collaborative learning.

All the courses lasted about 5 months. The duration is, however, indicative as it includes trainers' holidays.

The commitment the trainers were asked for is of about one hour every day, mainly on-line, in order to work with others and to make exchanges.

However, if we also consider the time dedicated to e-mail and exchanges, this time might have been longer.

Both projects "*Fiori Blu*" and *Telematica e Didattica* had 45% of the time dedicated to virtual classrooms and 40% of the time to group work sessions, while only 10% of the time was dedicated to self-learning from didactic materials. A final 5% was used for face-to-face lessons (a 2 day meeting is organised to introduce the trainers into context, communication setting and use of computer conferencing) and for self-learning from on-line resources.

The whole courses were at distance. It is worth underlining that most teachers were connected from their own homes: teachers have, in fact, the habit of working and developing a part of their own activities at home.

The didactic strategy adopted aimed at familiarising the teachers with the available tools: it was a training strategy that cannot be separated from the function of tutor support, use of communication instruments and animation of debates.

The debate was shaped as a sort of brain storming or collaborative learning starting from a common theme: the problems connected with the adoption of the approach in professional activity (integration of the course in professional activity).

The projects were not only based on *collaborative learning* but also on *project learning, solving problems and constructivism*.

After one third of the learning path, in fact, there was a phase of brainstorming about the problems connected with the contextualisation. This was the first stage of the project work. At the end of the path, the projects had to be completely implemented in the classroom. The work of the group was developed at two different levels, local and on-line.

Schools' and teachers' selection was different in these two projects.

In the project *Tutor in rete*, there was a selective choice of tutors that had already worked with these themes and who were familiar with it.

In the project *Telematica e Didattica*, there was a sort of on-line "call for participation": it has been a more democratic procedure based on criteria like: being part of Technical Education, being part of the same Class Council, and finally, presence in the group of at least one person able to operate on-line (no previous training was initially foreseen for the use of on-line techniques and instruments: the tutor had to take care of computer literacy of other members of the group).

70% of the participants did not have previous on-line experience.

The course foresaw the development of competencies that have more to do with methodology than with use.

The course was articulated in stages (centred on a "cluster" of main subject areas having a consistent duration) and in modules, centred on a single subject and to be used in a flexible way. Inside these forms there was a discrete flexibility for the trainers.

### ◊ **Ways of accessing resources and using technologies**



Technology has performed different functions:

- ◊ the mode of communication between tutor and pupils and pupils among each other;
- ◊ the distribution channel of information and materials.

In a system based on computer conferencing as a mode of access to resources, the main difficulties were centred in the difficulty of the trainer to interact always at a distance. The support system could be mended by introducing periodical meetings and audio and video conferences.

## Example 2: Case study - Differentiated Teaching

### Provider

TESS NETWORK - Svienget 2, Denmark

### Context of reference

The course, developed for the first time in 1994 and re-proposed in the consequent years, is addressed to teachers of primary and secondary school. This experience represents a reply to changes occurred in Danish school because of the massive introduction of handicapped pupils and the innovation of the teachers' national curriculum, which foresee the use of new technologies in classroom activities. The course organised by TESS involves teachers of 5 European countries: Norway, Sweden, Iceland, Ireland and Denmark.

### Pedagogical Dimension

#### ◊ Objectives

The course is addressed to teachers and aims at developing competencies on new learning technologies and differentiated learning methodologies.

### Structure and organisation

The course is structured in :

- ◊ six video-recorded lectures, working group
- ◊ tele-conferences
- ◊ classroom-based activities

The recorded lectures are watched by teachers and commented.  
The tele-conferences deal with teachers' concrete topics and issues, while telematics experts are called to give support and consultancy.

*The topics of video-conferences are suggested by the teachers according to the real problems they are facing in daily classroom-based activities. Moreover, the teachers have also to work on a personal specific project agreed with their tutor.*

Peculiarity of this experience is that each group of teachers from one school takes part in the course collaborating with at least two schools from two different countries . The





methodology adopted makes collaborative learning, problem-solving, collective development of competencies and contextualised learning easier.

The option was for Open and Distance Learning, since it allows dialogue and continuing exchange of experiences, while teachers from different countries can work and collaborate together.

◊ **Degree of flexibility**

With regard to the training path the degree of flexibility is medium, since the teachers attend the whole course. On the contrary, with regard to study time, place and equipment the flexibility is high. The participants are teachers from primary and secondary schools belonging to the above mentioned countries.

◊ **Way of accessing resources and using technologies**

The course delivery is extensively based on the use of new technologies. This, since it involves participants from five different countries and lies on dialogue and a continuing collaboration among participants. Technologies represent also a part of contents which are delivered, while their use within the course makes it possible for them to get IT confident.

### **Example 3: possible project on Disruptive students: answers to the problem**

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*Project's objective:* To find answers to the question of how to deal with disruptive students in a school context and to promote the implementation of school experiences based on the found answers.

*Target:* Educators located in different places working together.

*Project's description:*

- ◊ A teacher, X, searches for Internet pages on the subject in order to find the E-mail addresses of those who share his worries and establish contact with them. A group of people sharing the same interests is thus created.
- ◊ The group can now try to stimulate a first meeting by means of audio or videoconference in order to distribute tasks and assign roles. The group decide to ask for the intervention of one or more experts to help them to clarify the concepts related with the subject.
- ◊ In a second audio or videoconference an exposition about the subject is made and a first discussion is carried.
- ◊ The group entails a search for information both using on-line and off-line technologies.
- ◊ A group of teachers creates a newsgroup or discussion fora to share and discuss the retrieved information. At this stage teachers engage themselves in a discussion covering the subject, and have the opportunity to share knowledge, experience and expertise.



- ◊ A second group designs and develops an Internet page with the results of the discussion and the answers to the group's questions. The same work can be developed in absolute and real time collaboration with two or more teachers sharing the same tool and writing the same document.
- ◊ The solutions to the initial question of how to deal with disruptive students in a school context may now be discussed in different schools with other teachers and disruptive students. Experiences may be implemented and evaluated by the teachers of the initial group.
- ◊ A third audio or videoconference takes place with invited experts to share the experiences made in the teachers' schools and to evaluate the project and its results.
- ◊ The Internet page is improved with the description and results of the experiences led by the teachers.

### ICT AS A WAY TO DEVELOP INTER-DISCIPLINARY PROBLEM-SOLVING AND PROJECT-BASED ACTIVITIES FOR PUPILS (E.G. MATERIALS AND TEST ON A GIVEN SUBJECT);

Since it is not possible to present thoroughly all benefits and possible activities which can be carried out through on-line projects, this part aims at providing you with some examples. This, with the view to give you useful lines to work. It goes without saying that interest, motivation, real needs are the main drives to start up successful projects.

"This means project-based learning represents a very different approach from traditional schooling; instead of the teacher deciding what topics are relevant for student and pre-digesting pertinent materials for the students, projects give the students control of the topics they study and ask them to locate and make sense of material pertinent to the topic (...). A variety of terms are used to refer to different types of project-based learning. Examples include the *project exercise* which generally refers to a mini-project; *project component(s)* which covers one or more projects forming parts of a larger course; *project courses* which are courses including a substantial project elements; *project-based courses* which have all their assessment based upon a series of mini-projects; and *project credits* which are courses consisting entirely of one big project, similar to an undergraduate thesis or dissertation.

Two other terms are worth mentioning: *project approach* generally describes a situation where project work is used as one approach among many; whereas project methods (or orientation) refers to situations where institutions teach entirely or very largely through projects, offering students a discovery or problem-based approach to learning."<sup>3</sup>

"The term "project" is used to cover a variety of activities, which can be broken down into four fundamentally different types of inquiry: the literature review which normally entails research in a library; an information search which uses primary and secondary data; empirical research which might involve a survey or case study or an experiment; and design projects that involve specification and/or construction. It will come as no surprise that certain varieties of project work are more common in some disciplines than others, namely:

- ◊ literature review - humanities
- ◊ Information search - all

<sup>3</sup>J. Henry "Teaching through projects", Open and Distance learning series, Kogan Page, 1994, pp. 11, 13



- ◊ Empirical research -
  - survey - social sciences
  - case study - education, management, systems
  - experiments - science
- ◊ Design projects - technology, art and design.<sup>4</sup>

The **collaborative projects** could focus on:

- ◊ a problem to be solved
- ◊ a question to be answered
- ◊ an hypothesis to be tested
- ◊ an innovative activity to be carried out

all related to the use of ICT in the teaching/learning process.

The following examples present some suggestions/ideas on collaborative projects to be carried out by teachers and students.

### Example 1: Building a multimedia application about «Water pollution in Europe»

*Project's objective:* To collect information about water pollution in Europe and discuss its consequences. To build a multimedia tool to be delivered via Web or an Internet page about the subject to increase the awareness to the problem.

*Target:* Teachers and students.

*Project's description:*

- ◊ Via E-mail, identification of the possible partners interested in the subject of the project.
- ◊ A group of teachers or students, the project's leaders, create a newsgroup, or a discussion fora, or organise an audio or videoconference, to promote the discussion about the subject and the project's plan. Concerning the development of the multimedia tool, the following aspects can be discussed (all the people involved can make suggestions and give ideas for each item):
  1. Multimedia interface.
  2. Sounds - yes or no?
  3. Text - which language?
  4. Contents: which level?
  5. Real experiences in each country.
  6. Links to or references to the Web sites about this theme.
  7. Chemistry issues.
  8. Biological and environment issues. Etc.
- ◊ After the first discussions the leaders will organise all the information. The work to be carried out is distributed and a first beta version of the multimedia application is developed and distributed to every participant.

<sup>4</sup> This section is drawn from J. Henry "Teaching through projects", Open and Distance learning series, Kogan Page, 1994, pp.22



- ◊ In light of the beta version, the collaborative work starts again, for instance, via E-mail or an audio or video-conference, centred in issues like:
  1. General feedback about the beta version.
  2. Experiences with students of different levels.
  3. Impact in common persons.
  4. Experts feedback.
  5. Suggestions. Etc.
- ◊ Another «circles» of collaborative work can be done in order to improve the multimedia tool production and distribution, centred on:
  1. Money - Sponsors.
  2. Future new versions.
  3. General evaluation. Etc.

## Example 2 : Writing is a pleasure

*Project's objective:* To observe and reflect upon the writing process of students working collaboratively in peers, to improve their writing skills.

*Target:* Languages teachers and students.

Project's description:

*Note:* Since the writing process is a recursive process with frequent reorganisation of the text, the teachers group working in the project must analyse the students work during its development. This requires the use of on-line technologies that gives the teachers the opportunity to follow up the students writing process or the registration in a video cassette of the students' activities. The students working collaboratively may be physically in the same school and working in the same equipment or in different places sharing the same writing tool.

- ◊ One or two teachers suggest to the students the elaboration of a text of more or less five lines about their city. The teachers in different places observe the students doing the task (or the video cassette). The time spent on the task indicates if the students took time to prepare the task. The teachers may also observe the modifications done by the students. Another important issue to observe is what are the differences between the students' strategies working collaboratively compared to individual strategies.
- ◊ Using, for instance, E-mail, the teachers decide about the feedback to give to the students about their text. If in the introduction the city is geographically situated, if one of the phrases can be improved in what concerns the morpho-syntactic aspect, if the phrases are clear, etc.
- ◊ The students are asked to change the text taking into account the provided feedback. The teachers observe and analyse the rewriting process.
- ◊ The teachers ask to other peers of students to do the same or a similar task.

With the results of their observations and conclusions the teachers, in a fora or in an Internet page, organise a set of different instructions and comments to give to students engaged in a writing task. The instructions and comments aim to help students to improve their writing skills. Some examples are: In the phrase x, the verb and the subject are in agreement? In the phrase W did I really say what I wanted or did I confuse the meaning of the word p?

In an argumentative text: Am I being clear and convincing? Did I clearly state my point of view? Is there a logic sequence in the argumentation? In a narrative text: Are the persons or the places clearly characterised? Is there a logic sequence in the description? etc.









## HOW DO COLLABORATIVE ACTIVITIES DEVELOP ?

As it was mentioned in the introduction of this unit, in a collaborative learning scenario activities develop when a group of people share the same goals, interests, needs and decide to work together. In a first "virtual meeting" (by using e-mail, a newsgroup, a discussion forum, an audio or videoconference) the group discusses ideas, the objective of the work and the activities to be conducted. Starting from there, all participants should contribute to the development of a common output that could be, for example, a multimedia product or a new forum with the results of the discussion.

### THE CO-ORDINATOR

Though all people involved could and should be actors and users of their own and each other's learning process, sometimes a co-ordinator is required; he/she may be a member of the group itself or someone else. His/her main task will be to moderate and keep alive the debate, by suggesting new themes, new directions for the search of information, new questions related to the work undertaken, to select the messages or the inclusion of new participants. In this scenario teachers support each other, but they always have the opportunity to address the co-ordinator to ask for support. For example, if anyone gets lost or join the group late, he/she may always receive some summary discussion or guidelines from the co-ordinator.

### CO-EVALUATION

Co-evaluation is an important device to guarantee good results of collaborative learning. In various phases of the agreed workplan participants critically analyse not only what they achieved, but also how they achieved it. Co-evaluation of processes (rather than outputs) represents the most important evaluation component.

## PRACTICAL SUGGESTIONS TO IMPLEMENT COLLABORATIVE WORK AMONG TEACHERS

### Possible steps of a collaborative work

When a teacher wishes to propose a collaborative work, he/she may opt for one of the following possibilities:

- ◊ to announce her/his proposal in the newsgroup and wait for other teachers to contact her/him;
- ◊ to address a limited number of colleagues already belonging to a mailing list already active in the TRENDS project, that can share some interest with the proponent;
- ◊ to address individually by e-mail those colleagues that he/she may suppose to be interested.

Once a core of interested persons has been formed, they should agree on a few basic points:



- ◊ title of the work;
- ◊ working and communication language(s);
- ◊ number of participants (if too many people are interested, some independent sub-groups can be formed, with an agreement to keep communication flows);
- ◊ open or closed character of the group (are new members allowed to join once the work has started?);
- ◊ group co-ordinator (if any): in principle, the proponent can be the co-ordinator;
- ◊ how the group will communicate. You can create specific mailing lists for each group in the TRENDS Training Centre. An even simpler alternative is that each teacher of the group creates a special list in her/his e-mail programme. Discussions can take place in a newsgroup or through the chat server;
- ◊ description of the work to be done. It must be clear and concise to avoid confusion in subsequent steps;
- ◊ objectives of the work. In your first collaborative work experience it is advisable to be modest in objectives setting;
- ◊ milestones: it is important to set intermediate objective to be able to check if progress is made;
- ◊ ways and times for co-evaluation of work done;
- ◊ specifications of the final output of the work to be done;
- ◊ deadline to have the work finished.

## CONCLUSION

This unit focused on describing how ITC can support the collaboration among teachers and help them to create a “common information and learning environment”, where different experiences, contexts, background and knowledge are shared and become common patrimony for all the group.



PART TWO



ACTIVITIES

Think of your personal experience of teacher and point out:

- ◊ which topics, relevant to you, ICT should help you to exchange information with other teachers
- ◊ which topics you would to debate with other teachers to increase your knowledge about it
- ◊ which daily teaching problems you might solve by using collaborative learning
- ◊ think about a possible project proposal you might develop with other colleagues, dealing with one or more of the above items and possibly adopting an interdisciplinary approach (e.g. subject related data bases, multimedia presentations). Launch your proposal over the network and start working. In so doing take as a term of reference the examples given in Part One, when planning activities with your colleagues.





## UNIT 3: ICT AS AN ENGINE FOR SCHOOL INNOVATION

The present unit will give you elements to let you think about how ICT can be a key element for the innovation within the school.

Particularly, it will explain to you how ICT may give you effective media to:

- ◇ **enlarge** schools' capacity to respond faster and effectively to different needs coming from different target groups;
- ◇ **allow** people to develop skills which will be useful in all their life and help people to enter and remain in the labour market;
- ◇ **help** schools to provide students with updated and relevant contents;
- ◇ **favour** the shift from a oriented-teacher paradigm to a learner-centred paradigm.;
- ◇
- ◇



*Time (study + activity) = 2 hours*



*Read through the first paragraph for some reflections on the ICT in the European society*



## INTRODUCTION

"We are in the midst of a new industrial revolution: that of information technology. We are entering into what has been called Information Society and we can fairly confidently predict that the content and organisation of work - and our very way of life- are set to undergo profound changes. Through education we must equip Europe to adapt to these changes. There are two extremist view of technology to be avoided: it is neither an ogre nor a god. Multimedia, for instance, is not a magic wand. It can help to revitalise education or act as a teaching aid but, however useful, it is only an instrument.

Like any new means of expression it provokes debates, but these should not be turned into technological quarrels. We must make use of new technologies, not idealise them; nor should we underestimate them. We should use them, first because of the very real educational opportunities they offer. Second, because we need to prepare young people for a world in which technology will become increasingly important. Finally, we should recognise that these new technological tools are particularly suited to certain sectors of the population, especially young people from the most disadvantaged backgrounds. These young people often have no interest in books and literature but they revel in the world of images. This is a key issue of equal opportunities."<sup>5</sup>

With the mass of information instantly available in today's "Information Society" and the increasingly greater role played by the media in every facet of our daily lives, *education can no longer confine itself to the microcosm of the school*. It must train our future citizens for their lifelong road of learning by enabling them to develop the strategy necessary to sift through this mass of information for appropriateness, coherence, relevance, and even verity. In short, if we are to neutralise any demons that might escape from the Pandora's box that technological progress has opened, our *educational systems need to become a reflection of the society they serve and teach children to use judiciously society's methods and tools*.

The educational system of the future must become more open, offer more alternatives and fewer hierarchical restraints. Knowledge itself is becoming less hierarchical and today's data support systems provide an ideal opportunity to move the emphasis from "learning by heart" to association-connection network-type strategies. The teacher is no longer "the custodian of the knowledge", his/her ability depends not on knowledge but on the professional skills brought to bear on the learning needs of pupils and his/her capacity to motivate them in their lifelong journey of exploration and enquiry.

ITC can help in the response to meet the challenge of the Information Society by facilitating the individualisation and flexibility of learning. A wealth of past experience has shown this, in primary and secondary education, at university or in vocational training. From now on, it is a question of encouraging and developing products and services which are easier to use and meet the needs of users.

<sup>5</sup> Mrs Edith Cresson "*Information technology: devil or saviour*" Le Magazine for Education, training and Youth in Europe, published by the European Commission 1996, Issue 5



## PART ONE

### AREAS OF CHANGE

The school is in the centre of the innovation process especially coming from the rapid evolution of the external environment. Many are the elements which show the undergoing changes:

- ◊ **increase of the culture/education demand by different target groups.**  
This element has to be considered in the broader framework of the life long learning. In such a world the old linear concept of education-profession has disappeared. The citizen must become an independent lifelong learner if he/she is to succeed in adapting to his/her new living and working conditions. More and more adults are returning to educational paths during their life. Education and training can neither produce a "finished product" nor supply an adequate "stock of knowledge" that he can use throughout his entire working life. Education should therefore no longer consist of the accumulation of knowledge in a teacher-directed environment, but should rather aim at encouraging the learner to develop the skills and strategies which will enable him/her to cope with the complex situations he/she will incessantly encounter. Learning in school must be promoted from level 1 - transfer of knowledge - to level 2 - "learning to learn" in a meaningful environment that the students can carry with him throughout their life.
- ◊ In the above picture another elements has to be underlined: **the labour market requires skilled people.**  
In fact, the last decades are characterised by fundamental and structural changes in industry and economics. These changes lead new management strategies and specific requirements in terms of competencies. The so called "core competencies" (in terms of social, communication and organisational skills) are more and more recognised as key skills. They are the base on which to build and develop other competencies on specific sectors. They are considered "core skills" to enter into the market and maintain the role achieved.  
"The challenge facing education today is to implement methods that will succeed in transforming school knowledge into practical competence. It is now generally accepted that the most efficient and pertinent teaching is that which leads learners to solve the problems that they encounter in life and that are immediately attached to life, rather than learning by rote or repetitive exercises. There is a fundamental need to incorporate "doing" in learning, otherwise this learning cannot have its natural outcome in action<sup>6</sup>.
- ◊ **the quality and the ways of learning outside the school are increased.**  
The spread of information and communication technologies in our everyday life has broadened the traditional gap between the school and the outside world and undermined the role of our educational institutions as repository of the social and cultural values of society. In addition to formal education, children now have access to a whole range of information sources and channels.. Furthermore the means of transmission of information and knowledge is dramatically transformed. It has led to an extension of space and anonymity and an overwhelming complexity of the basic rules of life. The individual is finding increasingly difficult to navigate in the labyrinth of knowledge<sup>7</sup>. If he/she is to succeed in his/her lifelong path of learning he/she needs to master the strategies necessary to sift through this mass of information for appropriateness, coherence, relevance, and even verity.

<sup>6</sup> Haggis S., L'Education pour tous: les objectifs et le contexte, Monographie 1, Paris, UNESCO, 1993, p. 42 - 43

<sup>7</sup> Deberghes D., De la vie à l'école à l'école de la vie, in Annales des Mines, Paris, 1993, La Formation en Europe, p.59



This can only be achieved if, from an early age, students are encouraged to develop a "network-structured" logic through the mastery of enquiry-based reasoning strategies in a Socratic-type approach whereby they constantly acquire their own knowledge through the skills of deduction, prediction, formulation and verification of hypotheses and the seeking of relationships

Today, in the 1990's, computer has become the machine for all the family, used as much for professional and school work as for cultural enrichment and gaming. The interest shown by families in educational and cultural multimedia reflects the new concerns of parents. On the one hand, parents are conscious that these products offer an alternative to the passive consumption of television programmes. On the other hand, many of them are anxious about their children's futures, and invest in educational products and services in the hope of providing their children with optimum opportunities for professional and social integration. In the same way, that generations of working people are motivated to broaden their horizons and improve their job opportunities by going to night school, an effective application of new technology offers the prospect of work-based training coupled with teaching packages which can be used at home. There is no doubt that educational channels on television and educational software for home computers are going to expand massively in the next few years.

◇ **scientific and technical contents are changing rapidly.**

The basic function of education has always been the transmission of knowledge. However, change is currently taking place at such a rate that an estimated 15 - 20% of the existing knowledge base in many sectors becomes obsolete every year; some estimates claim that two thirds of the technology needed by the year 2000 has yet to be invented<sup>8</sup>.

◇ **shift of the attention from the teaching to the learning process.**

Student must be encouraged to discover and perfect their own knowledge-seeking skills that they will use for the rest of their lives. In this context, problem-solving strategies, exploration of resources and autonomy in learning take on far greater importance. They must also be capable of formulating hypotheses on possible solutions to the task in hand, and proficient in the art of collecting, sorting, organising and applying knowledge. In this way, not only do they learn to navigate in a mass of information to extract the knowledge needed, they also develop a greater facility for finding the most appropriate source of information (books, newspapers, etc. remain a major reference resource, even in IT-equipped classrooms) and learn to use their sense of judgement in assessing the value of information obtained. By giving children a greater degree of autonomy in applying basic skills and strategies in their learning, knowledge becomes far more than what teacher says or what they read in a book; the ready-made formulae learnt at school become part of a dynamic process that links school to the outside world, allowing the learner to understand the underlying concepts and know how and when to apply them.

<sup>8</sup> European Commission, Lifelong Learning, in issue 4 of *Le Magazine for Education, Training and Youth in Europe*, Brussels, European Commission, 1995, p. 4





## THE ROLE OF ICT IN SUPPORTING AND ENHANCING INNOVATION

If we consider the above mentioned list of changes affecting schools, we can identify a possible role for ICT in accompanying or constituting a central element of the school reactions/innovation strategies. The use of ICT:

- ◊ can promote the development of a permanent aptitude to training and education. Schools, supported by ITC, can design different training and educational paths in order to reach a wider target group (adults, workers, unemployed people, et) and provide them with innovative and motivating materials. ICT can be used to increase access to education by adults who could not (for economic, geographic, physical or organisational reasons) attend full-time course;
- ◊ can develop the ability to apply an active research reasoning method, "learning by doing", to find the right tools and adapt the teaching style to suit the needs of their pupils. Furthermore ICT can enhance skills of deduction, prediction, seeking of relationships, independent formulation and verification of hypotheses, problem-solving strategy, develop creativity, interdisciplinary approaches and communication skills;
- ◊ in schools is the national component to the broad access to media that young people have outside school: it is a way to develop learning methods and learning-oriented keys to access information;
- ◊ can help (in particular, CD-roms, hypertexts, animation, graphics, ..) teachers to set priorities within courses and give them more power to develop an individual curriculum for students. Furthermore teachers can design relevant and updated materials for students;
- ◊ in school by definition encourage autonomy of learner and provides a broad range of opportunity to practice exploration learning.

## NECESSITY TO DESIGN A STRATEGY FOR INTRODUCING AND USING ICT IN SCHOOLS

The previous section focused on demonstrating how ICT supports and may strengthen/accelerate all the major processes of change affecting schools. It is probably possible to demonstrate that implementation strategy of ODL, which is unaware of its possible implications can well be neutral or even delay the above mentioned changes.

That means that the implementation of ICT in school has to be carefully planned and organised:

not only from a technological point of view (e.g. buying the equipment or organise the access to laboratory) but especially from human resources' point of view. That is why the introduction of ICT should be integrated or embedded into a strategic direction of evolution/innovation already existing in each school environment.

The effort to provide training and information to teachers is a pre-condition for the development of pedagogic uses for ICT. It would allow them to be involved in the evolution of products and services and it would contribute towards the creation of a core group of teachers and trainers ready to advise and support colleagues, on the ground, in the use of new technologies. Teachers must be given the opportunity to develop new learning experiences and new valid models, from which they may build the "new" role of



teachers. They also need to be given the time necessary to learn to use new technologies, sufficient access to resources and the possibility to communicate easily with colleagues who are working on similar projects.



PART TWO



ACTIVITIES

Analyse the innovation within your school:

- ◊ debate with your TRENDS colleagues in your school about the lines/actions through which some innovation perspective is being carried out in your school and how ICT can foster the process. Please, write down the main issues.
- ◊ Exchange the information collected in your school with the other schools participating in TRENDS. What is common and what is different in the other schools?
- ◊ Identify, through the comparison with what is happening in other schools, some elements of “best practice” to introduce and use ICT to support innovation within the school context.
- ◊ Think about a possible project proposal - related to development and diffusion of innovation -, that you might develop with other colleagues within your school and/or in other schools



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