Education

ICT is an essential component of our education systems. It is a medium for administration, learning and teaching.

ICT and Administration

Staff in schools and colleges have many administrative functions;
- Registration
- Reporting to parents and ROA's
- Monitoring and Recording pupil progress
- Examination entries
- Pupil records keeping
- Manage budgets
- Writing letters
- Email
- Using an intranet of internet to access and share information
- Careers advice e.g. online database of careers, UCAS
- Timetables
- School sports day records

Most of these functions can be done using general software such as DTP, spreadsheets, databases the Internet, Email and the schools own intranet.

Registration
Optical mark recognition (OMR)
The teacher makes a black mark on a form at a set place. The optical mark reader scans the forms and the data is converted into characters on a students file. They have a high rejection

rate if they are not filled in correctly or if they are creased or ripped. These then have to be entered manually.

The advantages of these types of forms are data does not have to be keyed in which takes time and can lead to errors.

Other means of electronic registration includes;

Wireless networking | Smart cards | Retina scans

Student records

When students join a school a parent fills in a form. **Data must then be coded, verified and validated**

Coded data

Advantages of coding data;

- it takes up less memory on disc
- it is faster to type in
- it is faster and less prone to errors to do searches on standardised data.

E.g.

Language codes	CY=Cymraeg first language	EN=English first language
Gender	M = Male	F = Female
House codes	TY =Tyglyn PO=Portland	TA=Tan y Fron

Types of Errors that can occur

- **Transcription / typing errors**
    Typing in the wrong character by accident e.g., 2 instead of a 7
- **Transposition Errors**
    i.e. keying in, in wrong order e.g. 56789 instead of 57689
- **Data entered in wrong format**
    e.g. date is 2002/ 09.11 instead of 11/09/02

The HCI, ' the onscreen form' *(forms dialogue)*, the secretary uses to enter the data into the student database is designed so it matches the printed form. This cuts down the risk of errors.

We also use verification and validation techniques to cut down errors.

- **Verification** is the process of checking that data has been correctly copied from one media to another.

In this case has the secretary copied the data from the form to the onscreen form correctly? The secretary would then perform the verification technique of **visual checking** for errors. Double entry keying or check bits are not appropriate in this application.

- **Validating data** .
    'Validation is the process of ensuring data is valid and legal'

When creating fields in a file the user often puts controls over the way in which data is entered. This ensures that;
    * data is entered into the correct format
    * data is sensible
- reduces the risk of mistakes on data entry

Validation type	Explanation	Example
Range checks	Data is between stated ranges	Admission No must be between 1 and 9999999999
Format checks	Dates	12/04/03
Presence checks	There must be a character present in a particular place e.g. the first 2 letters must be YR to represent year	YR7
Check digits	No added to a code	Bar codes on library tickets

Designing a student record form

Keyfield

Students are given an when they first join the school or college. This is the *unique identifying field* which uniquely identifies one student record from another e.g. there may be 3 David Evans in one year. Which is which ?

Complete the table below stating what other fields are included on the student record form and give an example showing what type of data each field is.At the end state a sutiable validation technique for the fields.

Fieldname	Integer	Real	String	Date	Boolean	Coded
Admission no	**10292097**					
Surname			Evans			
Firstname			David			
VALIDATION						

Changes in working practises

The introduction of computers has caused a change in the day to day working practises in an office.

Data Protection Act

Data held on computers in schools and colleges must be registered under Data Protection Act 1998

Employment issues

Jobs in the school or college office have changed.

Jobs lost	audio or copy typist
Jobs required retraining	secretaries use DTP and databases, bursar uses spreadsheets
New job	ICT technicians

Codes of Ethics
All staff must adopt a new code of ethics.

Ethics/Code of Conduct	= Do not bring in discs from outside
	= Do not misuse email
	= Do not visit pornographic sites on the Internet
	= Do not use the printer for personal work
	= Do not copy software for use at home

Health Hazards

Hazard	Prevention
RSI repetitive strain injury caused by prolonged working at computers or computer games	Ergonomic keyboards ; wrist and foot supports: correct chair positioning
Eye Strain and epileptic fits	Non flickering screens; Scree filters to remove glare; correct lighting in the room
Back problems	Adjustable chairs; foot supports:; tilting screens
Ozone irritation from laser printers	Locate personal laser printer 1 metre away from user
Radiation affects embryos leading to miscarriages	No real evidence for this

Physical protection of the data from accidental or deliberate destruction

- keep BACKUP copies in a safe place
- use an online tape or disc streamer which automatically backs up data on a network
- put the write protect notch on your disc
- make hard discs read only
- keep copies in fireproof boxes or computer discs in fireproof rooms.

- Lock computers to desks

Software protection of data

A. Unauthorised Access/ hacking

- **Hierarchy of Passwords**
  - Identification   User Name
  - Authentification   Password
  - Authorisation   What files you can see and what your allowed to do

    Read only write only or read and write
- **Encryption**   Coding sensitive data at on end sending it and decoding it at

    other end. E.g. exam entries
- **Voice / hand prints**   To access rooms
- **Smart cards**   To access rooms and computers

B Spreading of viruses

- **Write protect** media so can't be written onto
- **Don't copy illegal software**
- Use a **virus scanning** software and **virus eradication** program. Make sure this is **kept up to date with the latest virus definitions** – available from the Internet.
- Don't download from the Internet straight onto hard disk
- **Control access to portable media** and do not let users use own disk etc on the organisations system.

ICT and Learning

A) Access to sources of information

(i) The Internet provides;

- **Access to online databases e.g. Encarta, worlbooks**
- **Libraries, newpapers and journals**
- **Specialist sites e.g. history sites such as Spartacus**
- **Specialist search tools e.g. 'Endnotes' used to locate every book or article published on a certain topic. Law sites which track details of all law cases.**

(ii) CDRoms such as encyclopedias Encarta and tutorials have a multimedia capacity and can give information in the form of text sound and video. .

B) Computer Assisted Learning (CAL) / Computer based Training (CBT)

This can range from learning to use a spreadsheet to flight simulator training
Computers, and particularly **multi-media** systems can be used for education and training.
There are several types
- Tutorials
- Drill and practice (Repeat over and over again).
- Simulations
- Games
- Tests

(i) Many software packages come with **'Tutorial'** sessions, which allow the user to learn by following simple instructions on the computer. They can be used for teaching Maths, ICT etc. Questions might be asked and the session continues only if the user enters the correct answer.

(ii) Spelling programs which have an interactive component testing student with **games, quizzes and tests.** A scoring system allows students to assess their progress. Often after 3 tries the answer or clues will be given to them. Picture and sound are used to enhance the experience.

(iii) Laserdisc technology is being used for **interactive video simulations**. eg highway code, driving lessons, fire officer training.

(iv) Virtual Reality systems are being developed where the user puts on a helmet which projects images into the eyes using small computer screens. Although great for computer games, there are serious uses as well. VR systems are being developed to help student surgeons; a CAT (Computer Aided Tomography) scan can create a 3-dimensional picture of the human body. A surgeon can put on a VR helmet and feel as if he is walking around inside the patient! He can view eg a tumour from different angles etc..

(v) **Revision programs** eg. GCSE byte size

C) Distance Learning

Students may not always be in the same place as the teacher.

(i) A level electronics as a **distance learning course** where the tutor is in North Wales. Students are provide with course booklets and practical work and **videoconferencing** is used to discuss problems that arise. The tutor may visit every 4 – 6 weeks for face to face consultations. Assignments are marked electronically.

(ii) **Online courses**
These can be intranet based in universities or Internet based. Some university modules are completely computer based with knowledge sections and task sections. The software records how much of the course you have covered and if you do not complete the full module you will fail the module. The classic distance learning is the Open University which now has greater online components to its courses.

(iii) **E – learning sites** are now available. Subscribers can even do A levels online approved by exam board such as OCR. Schools in England are given **E-learning credits** which they can use to purchase online courses.

(iv) **Chat rooms** to discuss courses and problems with tutors.

ICT and Teaching

a) Interactive whiteboards are now present in most schools. They can be used for large projection of CROMS or Powerpoint presentations but there is also an interactive set of activities and special effects to reinforce teaching notes.

b) **Authoring software** allows users to create multi-media presentations.(Powerpoint)

combining text, graphics, sound, video, slide layouts, animation, hyperlinks, 'hot spots'

c) Teachers and students can use packages such as DTP, spreadsheets, database software to produce teaching notes and to present quality course work respectively.

Advantages of using ICT FOR TEACHING AND LEARNING

- Greater interactivity holds a pupils attention.
- Quicker feedback in online tests
- Offers a variety of different ways to learn and a variety of information sources.
- Allows user to learn at own pace and can learn at times suitable for themselves.
- Allows user to 'go over' earlier work again in case they did not understand i.e repeat sections they found difficult earlier.
- Computer based training significantly reduces costs for the employers and can be safer if it is a danger

Advantages of using ICT FOR ADMINISTRATION

- Improved speed of access to data - faster searches/ e.g looking for all the pupils in a particular form and faster sorts e.g. listing pupils by alphabetical order of Surname.
- A variety of output formats available e.g. printed reports, mailmerged documents. Etc.
- Faster and simpler to transfer data e.g. exam entries

- Saves time when reproducing standard letters e.g. lettes to parents informing them about parents evenings, school sports day programs. Such documents will only have minor changes each year.
- Increased security
- Saves on storage/office space

Problems with using ICT in Education
Apart from general problems associated with using computers there are a few specific ones.

- ICT is expensive and requires a great deal of capital investment, which is constantly updated and has to be maintained. Maintenance contracts can run into thousands of pounds which takes money away from traditional teaching materials such as books.
- Richer schools will have greater resources so there is an unfair distribution of ICT resources and hence learning opportunities.
- Some educationalists argue that younger pupils do not have as great an opportunity for group learning and this cuts down on social interaction skills.
- Some educationalists say the change in patterns of learning cuts down concentration spans.
- Text messaging has been blamed for a reduction in spelling skills because of the use of abbreviations.
- Distance learning does not provide the personal support needed by most students as and when they need it. The availability of support, advice and guidance is particularly crucial when a student lacks confidence or cannot interpret the written instruct
- Over reliance e.g. if there is a power cut you cannot use it.

HCI's Human Computer Interfaces

These are very important in education.

On one hand we need simple user interfaces which are suitable for adult tasks in school and o the other hand we need interfaces which are easy for pupils to follow.

Human must communicate with the computer via a user interface. There are several type s of interfaces and choice of a suitable interface depends upon the activity and the degree of technical ability of the user.

The desktop environment has arisen because smaller microcomputers have become more powerful and cheaper and small enough to fit on a desk. the development of laptops and digital mobile phones has meant that the electronic office can now be a mobile office. The widespread use of such computers means that they have to become more user friendly so the desktop/WIMP/GUI environments have developed.

G.U.I.'s – Graphical User Interfaces

The pupils and teachers would use this

Most modern microcomputers operate through a GUI (graphical user interface)

Terms such as WIMP [windows, icons, menus, pointer] or 'desktop environment' are commonly used to describe these interfaces. The user interface is the part of the system that communicates with the user usually via a screen e.g., WINDOWS 98 / XP.

The main features of such interfaces are that all of these use GUI' s ie Graphical User Interfaces and use a **WIMP** environment

W **indows** to allow multitasking and display file structure
I **cons** are symbolic representations of files
M **enus** to list appropriate facilities
P **ointer** to select and choose the command or facility you want.

Windows display the file structure and enable all file within a folder to be displayed on screen other windows can also be displayed on screen at the same rime. windows can be easily opened or closed using pointers.

Modern computers also have;
- **On screen help**
- **Customised user environments-favourites**
- **On screen assistants**
- **Tutorials**

Advantages
- User friendly because you don't have to remember all commands.

- Easy to use with minimum training. Intuitive and 'user-friendly' method.
- Suitable for users with lower IT skills. A number of different applications will use the same icons and methods - so each one 'feels' the same.
- Can run more than one piece of software so easy to transfer data between them eg **importing clipart pictures.**

Disadvantages
- Such environments do take up more RAM and storage space on the disc but this has not proved to be much of a problem - the cost of memory and disc storage has become cheaper and machines contain bigger hard drives.
- Can make the machine run slower.

Command driven interfaces

The ICT technician would use this

These are systems like MSDOS which require a degree of technical ability and are not user friendly. Commands are typed in response to a prompt.

This is not very user friendly and you need to know the commands of the operating system in order to perform jobs.

TYPE letter.doc
MKDIR new
TREE DEL *.*

The user needs to have some technical understanding of such systems to progress and use the system.

Advantages

- faster and more versatile as a number of different 'switches' can be used to moderate the command. Better for the technical user as they can work faster.
- Takes up less memory

**Disadvantage** is that commands need to be known, typed and spelled correctly – need technical experience.

Forms Dialogue
The school administrators/secretaries would use this.

This is where the user communicates with the system by filling in a form eg database and output report forms have also been designed previously. The design of the form must be clearly worded and presented and colour and highlights can be used. Form filling enables experienced users to enter data quickly and is user friendly to the less experienced user.

An on-screen form is displayed and the user has to enter data and select options using text boxes, radio buttons, drop-down boxes etc.. The user does not have to learn commands. Easy-to-use method which avoids ambiguous or invalid data being entered - most drop-down boxes only allow the options listed to be selected.
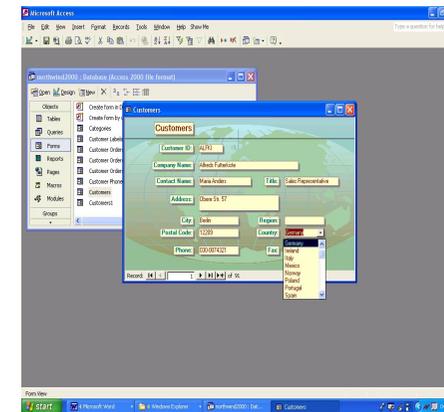
Online and Offline Help

Help and error messages
Different users require different amounts of help.

Many systems can restrict the level of help screen available. A good help system is important for the new user and may provide a complete online tutorial or online manual or menus activated by help keys.

Error messages or diagnostics are useful to all users. They must give some indication of the type of error that has occurred not simply say 'error'

Other HCI's to be found in a school or college.

Speech recognition
Microphone used to receive speech input. Speakers used for speech output.
This is a VOICE driven system which are still at the experimental stage but are under development and can help disabled people.
Systems for recognising users of cash or smart cards are also being developed.
The human factor is very important in the design of these systems and recent interest in expert systems and artificial intelligence has made such features as
Natural language interfaces more common place making machine human interfaces more user friendly.

Problems:
- users may speak different languages;
- local accents may not be recognised;
- some words sound the same - two, to, too

Dedicated keys Some keys or combinations of keys may perform pre-defined tasks.

Eg <CTRL> and <S> may save a piece of work. <CTRL> <ALT> and <DEL> may re-boot a computer.

Soft keys It may be possible to program keys to perform tasks when pressed.

Some keyboards may have programmable 'function' keys.

Pointing devices Manipulating a device, which moves a pointer on the screen. Mouse, Tracker ball,

OCR Handwriting Some hand-held computers allow users to 'write' on the screen. **OCR**

Disadvantages: Complex software needed to recognise different people's handwriting.

Exercise

A computer assist learning package is needed to help Year 7 pupils to improve their spelling.

a) Suggest a suitable way of going about designing such a package.
(Include text, pictures sound and feedback)

b) What form of user interface would be suitable and why?

c) How could the data be organised / accessed ?

d) What advantages would such a system bring
for teachers?

for pupils?

A history department has collected a great. deal of local historical
information about the area. It includes photographs, descriptions,
videos, sound clips, eye witness accounts and newspaper articles.

a) What hardware and software would be required to assemble and
display this material.   (4 Marks)

b) Describe a suitable method of presenting this data (4 Marks)

c) Describe how the data could be stored and indexed. (3 Marks)

d) What are the advantages of storing and presenting this data
electronically rather than in non electronic methods. (4 Marks)

General Packages used in Education

Presentation packages combine text graphics and sound to complete a document eg
Powerpoint
-slides/ templates / transition effects /graphs / video and sound clips/ hotwords/ auto
scrolling eg a salesman presenting sales reports or a new product.

Authoring packages similar to above but perhaps more widely used in teaching materials eg CD Roms or a lecturer presenting research findings Now have WEB authoring packages web pages can be uploaded onto the web and uses hyperlinks to link to other web sites.

Wordprocessors
5 reasons why W.P. have become popular;
- Output better quality documents - fonts and graphics than typewriters
- text can be edited and manipulated
- spelling and grammar checks
- save and reuse text
- **used** with email and file transfer facilities

Criticisms
They are wasteful of paper because minor editing a reprinting takes place.
Affects on jobs
- Needs less staff as many managers and teachers do own typing.
- Secretaries have fewer repetitive jobs to do e.g. writing out school parent evening letters

Differences between DTP and W.P.
WP limited to font styles font sizes bold italic underline tabs indents
spellcheckers etc **DTP** better graphics handling import
and export capabilities better frame **handling rotate** text
wordart
text flow **or** "wrapping **around**
objects text and graphics sizing
and distort

Word Processing features

- Most word processors are **WYSIWYG**.
- Editing facilities - Search and Replace, Move, Copy, Cut, Paste
- Layout facilities - Page size, margins, Tabs, Indents, Linespacing, Justification, Headers and Footers, automatic page numbering.
- Style - Font, size, bold, underline, italic, subscripts and superscript
- Preview facilities - Print preview.
- Spelling checkers and Thesaurus.
- Grammar checkers.
- Mail merge - Using a database to create a **form letter**.
- Communications - Email and fax facilities.
- Statistics - Word count, page count etc

Desk Top Publishing.

- Facilities to place and manipulate **text** and **graphics** on a page.
eg in columns

- **Leading** - alter the spaces between lines
- **Kerning** - alter the spaces between letters
- **Master page** - anything on master page appears on all pages.
- **Graphics** may be imported

Spellchecker	-compares word with online dictionary -suggests alternative words -does word counts -add to users own dictionary -grammar checks
Mailmerge	-Inserts fields from a separate database -into predefined positions -in a prepared WP document
Online thesaurus	displays alternative words of similar meaning eg good, better, great
Online dictionary	-look up meaning of words
Headers and footers	-enables same text at top or bottom of every page automatically

Pagination	-automatic no of pages by computer
Document Index	-automatic production of a sorted index -needs auto paging to be turned on -entries and sub entries can be created
Table of contents	-automatic production of contents pages -needs key word handling and auto paging to be turned on -entries and sub entries can be created
Macros	-stored set of commonly used instructions -can be re used "e.g. tab settings/ auto columns - speeds up repetitive operations
Export of data	-copies graphics or text to a separate file in a format

	suitable for a different package
Import of data	-inserts graphics or text from another package as long as the format is readable

Spreadsheets used for handling number applications do not confuse with databases!

Spreadsheets.

- Numerical or alphanumerical data entered in rows and columns of **cells**.
- Data formatting facilities.
- Cell sizing.
- Facilities for entering **formulae**.
- Financial and statistical **functions**.
- **Macros** - frequently used lists of commands
- Graph and chart drawing facilities.

Definitions

Macro	
	- stored set of commonly used instructions - can be re used - speeds up repetitive operation

Sorting	- sorting a column into order - alphanumeric or numeric desc or asc
Multi level sorting	- Sorting on several columns - sorting is logical using pointers to where the data is stored not duplicating data - index of pointers maintained
Functions	library of subroutines e.g. average / sum
Absolute addressing	address a particular value in a particular cell
Relative addressing	address cell location and when replicate down you replicated the relative address not the actual original data

Databases
Allow you **to** access data in a variety of ways e.g.

queries searches
save queries and recall as macro command - logical use pointers
uses *Structured query language* to allow search on one or multiple criteria using **AND, OR and NOT**
validation of data

sorts - logical using pointers
access through **menu searches**
key words searches
variety of output report formats
export data for mailmerging

view
data via a form so user friendly HCI
access online databases

What features do all applications packages have?

> **Load**
> **Save**
> **Print**
> **Edit**

General features of a 'good' package...

If you were to buy a software package, what would be the qualities you would look for? The following list suggests some qualities of 'good' software packages...

- Data from other packages should be **importable**.
- **Upgrades** - new versions should be able to load work done on older versions.
- **Speed** - slow-running software can be very frustrating! Some software packages come with their own **programming** capabilities. For example Microsoft Access - the advantages of this include
- the ability to tailor your software more to your own needs.
- easier to maintain if changes need to be made.

Exercise

Complete the table below stating which would be the most suitable type of software or facility for the activity given.

Writing letters to parents	
Poster for school play	
Departmental record of student marks	
School student records	
Producing a school menu for the Intranet	
Stock records	
Sending a message across the Internet	
Discussing a problem with a distance learning tutor	
Managing the school budget	
Presenting a talk on a school trip	