



African Virtual University

Education: Education EDU23

ICT INTERGRATION IN PHYSICS

Salomon Ngamo



Foreword

The African Virtual University (AVU) is proud to participate in increasing access to education in African countries through the production of quality learning materials. We are also proud to contribute to global knowledge as our Open Educational Resources (OERs) are mostly accessed from outside the African continent. This module was prepared in collaboration with twenty one (21) African partner institutions which participated in the AVU Multinational Project I and II.

From 2005 to 2011, an ICT-integrated Teacher Education Program, funded by the African Development Bank, was developed and offered by 12 universities drawn from 10 countries which worked collaboratively to design, develop, and deliver their own Open Distance and e-Learning (ODeL) programs for teachers in Biology, Chemistry, Physics, Math, ICTs for teachers, and Teacher Education Professional Development. Four Bachelors of Education in mathematics and sciences were developed and peer-reviewed by African Subject Matter Experts (SMEs) from the participating institutions. A total of 73 modules were developed and translated to ensure availability in English, French and Portuguese making it a total of 219 modules. These modules have also been made available as Open Educational Resources (OER) on oer.avu.org, and have since then been accessed over 2 million times.

In 2012 a second phase of this project was launched to build on the existing teacher education modules, learning from the lessons of the existing teacher education program, reviewing the existing modules and creating new ones. This exercise was completed in 2017.

On behalf of the African Virtual University and our patron, our partner institutions, the African Development Bank, I invite you to use this module in your institution, for your own education, to share it as widely as possible, and to participate actively in the AVU communities of practice of your interest. We are committed to be on the frontline of developing and sharing open educational resources.

The African Virtual University (AVU) is a Pan African Intergovernmental Organization established by charter with the mandate of significantly increasing access to quality higher education and training through the innovative use of information communication technologies. A Charter, establishing the AVU as an Intergovernmental Organization, has been signed so far by nineteen (19) African Governments - Kenya, Senegal, Mauritania, Mali, Cote d'Ivoire, Tanzania, Mozambique, Democratic Republic of Congo, Benin, Ghana, Republic of Guinea, Burkina Faso, Niger, South Sudan, Sudan, The Gambia, Guinea-Bissau, Ethiopia and Cape Verde.

The following institutions participated in the teacher education program of the Multinational Project I: University of Nairobi – Kenya, Kyambogo University – Uganda, Open University of Tanzania, University of Zambia, University of Zimbabwe – Zimbabwe, Jimma University – Ethiopia, Amoud University - Somalia; Université Cheikh Anta Diop (UCAD)-Senegal, Université d' Antananarivo – Madagascar, Universidade Pedagogica – Mozambique, East African University - Somalia, and University of Hargeisa - Somalia

The following institutions participated in the teacher education program of the Multinational

Project II: University of Juba (UOJ) - South Sudan, University of The Gambia (UTG), University of Port Harcourt (UNIPORT) – Nigeria, Open University of Sudan (OUS) – Sudan, University of Education Winneba (UEW) – Ghana, University of Cape Verde (UniCV) – Cape Verde, Institut des Sciences (IDS) – Burkina Faso, Ecole Normale Supérieure (ENSUP) - Mali, Université Abdou Moumouni (UAM) - Niger, Institut Supérieur Pédagogique de la Gombe (ISPG) – Democratic Republic of Congo and Escola Normal Superior Tchicote – Guinea Bissau

Bakary Diallo

The Rector

African Virtual University

Production Credits

This second edition is the result of the revision of the first edition of this module. The informations provided below, at the exception of the name of the author of the first edition, refer to the second edition.

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Introduction

Prerequisite

1. ICT basic Skills
2. Access to a computer
3. Access to Internet* (highly recommended for many activities)

Time

1. 120 hrs (40hrs. focusing on general teaching skills in the use of ICTs in education;
2. 80 hrs specific to the use of ICT in biology)

Material

Computer with Internet access, videoconferencing equipment, CD-ROM, video projector, television.

Module rationale

Excellence in education calls for the integration of various media, technologies and techniques to teaching and learning environment. Access to a new generation of ICT has brought new opportunities to teachers and learners in the sciences. However the effective integration of such applications depends on educator's familiarity with and command of the new resources. A module on the integration of ICT in the science classroom is therefore a valuable addition to progressive science and mathematics educators' progressive development.

Content

The process of integrating ICT in education is rarely a simple and linear one - overlaps are often noted, with some elements operating in parallel, in partnership and cyclically. The sequence of steps varies from one activity or situation to the next and must take context into account in order to be effective. The process is thus necessarily incremental and relies on clearly defined objectives to succeed in improving the efficiency of ICT use in education. This document presents major themes to assist educators in better integrating ICT with their teaching, and particularly allowing them to offer higher quality distance education programs to Mathematics, Biology, Chemistry and Physics students. An introduction to the theories and principals of ICT integration is presented within six themes, and further developed into seven specific learning objectives, which can be adapted according to the specific subject of the program.

Overview/Outline

The content of this module focuses on developing those teacher competencies and abilities common to all approaches to integrating ICT in learning, as teachers seek ways to improve their teaching. Examples of these general competencies include among others, ability to decide why, when, where, and how ICT tools will contribute to teaching objectives, how to choose from among a range of ICT tools those that are most appropriate to stimulate learning and improve the quality of education offered; ability to facilitate students' use and analysis of information from the Internet and ICT-based sources in relation to learning in specific subject areas. Thus, the process of integrating ICT in subject specific areas is of necessity incremental and relies on clearly defined objectives for its effectiveness in education. The integrated use of ICT in subject curricula and classroom teaching and management, is a complex process, which is usually achieved by following a set of guiding parameters. In this module, there are two complementary activities: the first focuses on the theories and principles that underpin ICT integration in education; and the second is teachers' computer-assisted practice in the use of ICT with support web-based portals. The module content provides a teacher training curriculum that incorporates the pedagogy, i.e. specific learning objectives and learning activities required to effectively integrate ICT into biology education. The principles are presented below, in the following form:

SECTION I: Conceptual framework

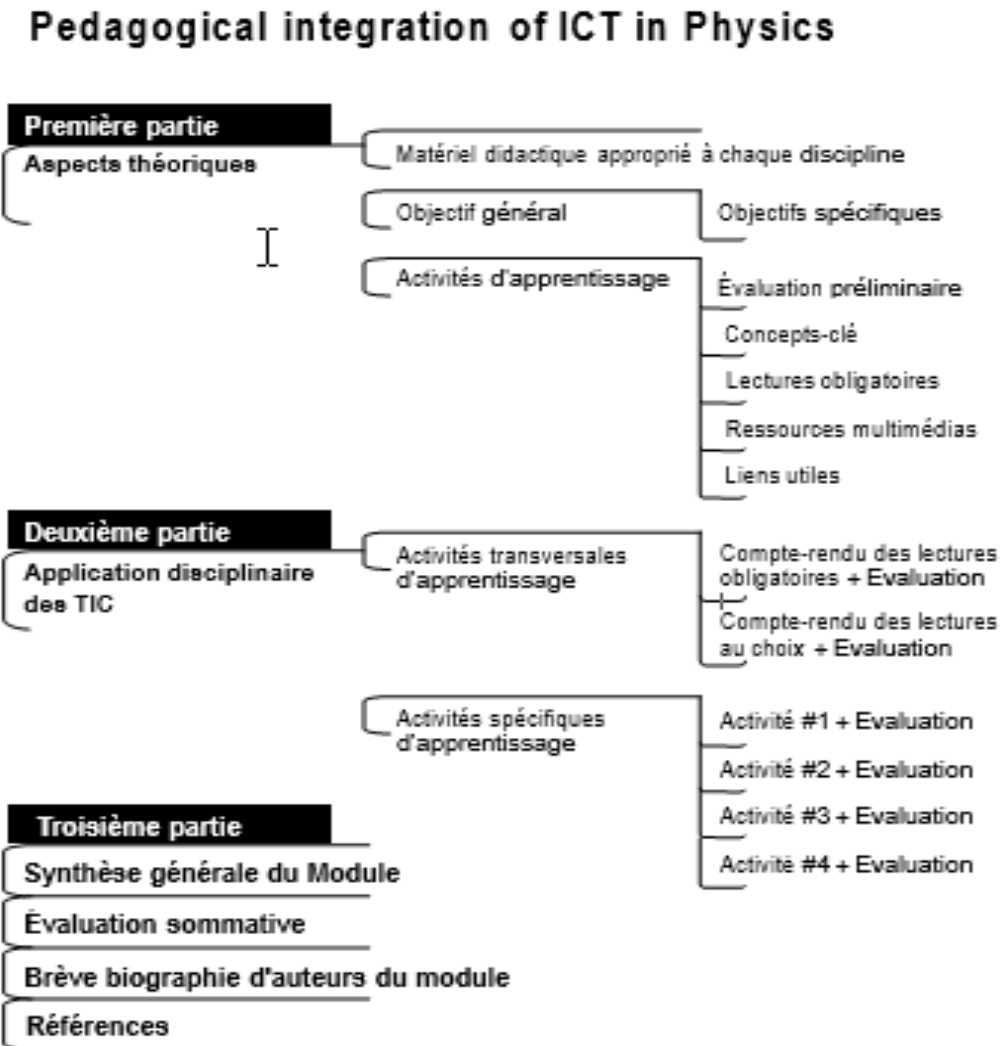
1. Required course materials
2. Module Rationale
3. General objectives, specific objectives
4. Learning activities
 1. Pre-assessment
 2. Key concepts
 3. Required readings: references, summary and description
4. Multimedia resources
5. Useful links: address, title, screenshots, summary and description

SECTION II: ICT integration in specific disciplines

1. Crosscutting learning activities
 1. Report on required readings
 2. Report on selected readings
2. Biology specific learning activities
 1. Activity one
 2. Activity two

- 3. Activity three
- 3. Module synthesis
- 4. Final evaluation
- 5. References

Graphic organizer



Objectives

General Objective(s)

The module's general objective is to help student-teachers of Physics, to know how to use ICT as a tool for designing new learning environments for their own subject-specific purposes and to help their future students to use ICT. Exposure to this module is expected to provide the student-teacher with the knowledge, skills and attitudes to better use technology in their lesson-planning and lessons, research, communication, problem-solving, and continuing professional development.

Specific Learning Objectives

(Instructional Objectives)

The principles of ICT integration in education are expressed here as seven specific learning objectives for Physics. Students should be able to:

1. Critically apply the pedagogical principles of ICT integration in education.
2. Develop and facilitate ICT-based learning activities in the context of teaching Physics.
3. Analyse and evaluate appropriate content and context for the use of ICT in Physics teaching.
4. Use appropriate and varied communication and multimedia tools (emails, Websites, etc) in teaching and learning Physics.
5. Use ICT efficiently in research, problem solving and project-based learning in Physics.
6. Use ICT efficiently for professional development in the context of teaching and learning Physics.
7. Integrate ICT appropriately into chemistry curriculum activities that will foster students ownership of their ICT-rich

Teaching and Learning Activities

Pre-assessment: are you ready for this module?

Learners

In this section, you will find self-evaluation questions that will help you test your preparedness and readiness to complete this module. You should assess your performance objectively after completion of the self-test, and carry out the recommended action based on your score. We encourage you to take your time in answering the questions.

Instructors

The Pre-assessment questions below are meant to guide the students to help them decide whether they have sufficient background knowledge and skills required for the completion of the content presented in this module. As the instructor you should encourage your learners to evaluate themselves by attempting all the questions provided below. It is strongly suggested that the individual student abides by the recommendations made on the basis of the mark obtained. Education research consistently shows that compliance with the recommendation will ultimately help learners to be better prepared for linking the new with their existing knowledge.

Self-evaluation of ICT competencies

Evaluate your ICT competencies for this subject specific ICT integration exercise. If your score is equal to or greater than 60 out of 75, you are ready to use this module. If your score is between 40 and 60 you may need to revise your previous ICT basic skills course. A score less than 40 out of 75 indicates you need to do a basic ICT skills course. Try the following questions and evaluate where you are in the ICT user spectrum.

ICT Integration in Physics

Areas of Competence	Level of confidence				
	Low help	Need	Good	High	Very high
	1	2	3	4	5
A) General					
1. Familiar with the AVU Basic ICT Skills (using word processors, spreadsheet software, web navigator, etc. See list of pre-requisites).					

2. Content in guiding AVU's ODeL trainee (lesson Planning, reference links, etc.)
3. Using a software (interactive whiteboard software to create and save "ip charts). (Annotation desktop mode, "ip chart, paste in objects, load images.)
B) Using ICT in Numeracy
4. Whole class teaching & group work Software e.g. Geogebra, Graph, ActivPrimary, Easiteach Maths, RM Maths, ICT in Maths, websites. Using RM Maths Using ICT in Literacy (Whole class teaching & group work)
5. Software e.g. ActivPrimary Creating resource in generic software (e.g. TWAW, Talking First Word, My World3), websites.
C) Using ICT in Physics
6. Using virtual labs and simulations (e.g. Optics Bench Applet http://www.hazelwood.k12.mo.us/~grichert/optics/intro.html , Physics 2000),
7. Using physics modelling software (e.g. Crocodile clips). See http://www.crocodile-clips.com/science/
8. Use of other ICT resources (e.g. Junior Insight & Sensing/sensor equipment, digital camera, E-microscopes). Active Primary for whole class teaching
D) Using ICT in Science
9. Using generic software to present information and for creating pupil resources in (e.g. TWAW, Talking First Word, My World, data handling programs), Datalogging Research using websites & CD ROMS, African Virtual University 10
E) Using ICT in other curriculum areas
10. Active Primary, creating resources in generic software (e.g. TWAW, Talking First Word, My World), websites, Micropedia CD ROM, other specific CD ROMs, digital camera, digital video camera..
11. Using the shared areas on the AVU and/or PI site (Read, Write & Homework) to put templates and files for the pupils, to share work.
12. Using Office software (Word, Excel, PowerPoint) for professional use e.g. to create and adapt teaching resources, write reports, plan out timetables, record pupil data.
13. Use the Internet for professional development (teaching resources, teaching information, copying images)
14. Use software to record pupil's progress.
15. Use of other ICT resources (e.g. scanner, digital camera)

Precautions about misconceptions in teaching and learning

Learners

This section offers support to students who are apprehensive about working with computers or using the Internet. You will also find in the section a number of useful tips that would help you to avoid some of the more common pitfalls, misconceptions and prejudices. For you to appreciate the relevance and appropriate application of ICT, you need to take a critical look at the perceived and real risks if any, of teaching with ICT.

Misconceptions about ICT sometimes arise as a result of misunderstandings or insufficient knowledge one has about how things work. The preconceptions held might be close to the correct view but are essentially incorrect. For example, children may have a naïve view of how the computer works, crediting it with super intelligence beyond the capabilities of any existing machine. Such views may have been developed as a result of some of the more mind boggling things information technology has been able to achieve in modern times. Hence, young people's alternative frameworks often involve perceptions and/or limited understanding of the nature of technology. But there is no doubt that access to ICT provides one of the best educational facilities necessary to prepare young people to play full roles in contemporary society and to contribute to a knowledge economy.

However, not all teachers are convinced that ICT should be an integral part of their teaching strategies (Galanouli, Murphy, & Gardner, 2004). Resisting change is a state of mind for many teachers, and it is one of the most difficult barriers to effective ICT integration. To address some of the misgivings people may have, be prepared to discuss some of the concerns raised, if necessary engage in constructive debates that are meant to clarify issues and acknowledge limitations where they exist. Issues such as the role of ICT in a changing society could be framed for discussion in a way that provides for informed opinion. The assertion for example that: "The Internet is potentially dangerous and people just want to sell you anything imaginable without any moral compunction"; "Computers are 'boys' toys' and not interesting or useful to girls" are certainly interesting statements that need to be justified or debunked. Similar topics can be proposed for elucidation, even your own perceptions and attitude towards the use of ICT in schools.

Some Misconceptions in ICT use

Here are some of the more common misconceptions:

- That a graphics file is different from a text file, or a word processor file.
- That a file currently being edited is merely a copy of the file in hard storage (and important too to note the exception for database files).
- That a data file for a picture is as different from a data file for text as a photograph is from a printed page. This is of course not true.
- That as one edits a document in a word processor the data file is automatically changed. But this is not true (until it is re-saved). The exception is a database in which any editing immediately changes the data file.
- That all web-pages are available indefinitely, without any time limit. This is not always the case. One needs to check the web site addresses before hand, to see whether they have limited life and when they are about to change.

Precautions

Students need guidance on the fine details of searching information from the Internet

As the instructor/teacher:

- Avoid vague statements such as "search the Internet for....." particular types of activities. Most pupils need more direction than that. If you want pupils to do an Internet search, give them a preparatory activity where they consider appropriate key words to enter into a chosen search engine. It helps for the teacher to do a pre-lesson check to ensure that the selected key words produce the desired results.
- Check the time it takes for the learning materials to be downloaded from your chosen sites before your lesson. If it takes an unusually long time then you have to plan your lesson accordingly.
- Check the language used in your chosen web sites, to see if it is in accord with the language of instruction.
- You may need to identify a short list of key words and concepts to be explained to pupils before they attempt any web site activities.

Your first choice may not be available:

- List some alternative web site addresses in case your first choices are unavailable.

Undesirable links and updates:

- Search your selected web sites for links to undesirable web sites and advertising material. New links appear all the time. Check these just before the lesson.
- Search your selected web sites for features, which invite responses by email.

See if a school email address can be submitted or if the option can be disabled. Avoid using web sites, which invite personal response by e-mail.

Key words: Their usefulness and limitations:

- Check for American spellings especially of key scientific words, e.g. Sulfur, instead of sulphur.

Access to/from the school computer may be restricted:

- Some school computers are programmed to block the saving and downloading of files, so the saving of files is limited.
- Some school computers block certain web sites, denying access.
- Check the computers, which you will use, for any special features before the lesson.

Backup an important aspect of ICT:

- Try to give out web site addresses in an electronic format, either saved to favourites, as an e-mail, on a floppy disk or on a CD ROM. Avoid writing long addresses on a board for typing into computers by hand. Typing wrong web site addresses can be very demoralizing to pupils.
- Keep a spare copy of your list of web site addresses on your own personal flash disc, floppy disk or CD ROM and keep this with you during the lesson.
- Once you have made your list of safe web sites, make it available to the pupils electronically, through a departmental web site, an electronic conference like First Class, or e-mail.
- Try to save your chosen sites to "Favourites" on the computers, which you will use. After you click the "Add Favourite" button, click to tick the box "Make available offline". Not all sites can be saved in this way. Those that can will be saved onto the machines, which you are using. This gives you the option to use the web site during the lesson without an active Internet link. Alternatively, you could burn CD ROM copies of the web sites, which you wish to use during the lesson, using a CD rewriter, and load the web sites before the lesson starts. The only disadvantage is that the CD ROM copies of the web site are not updated when the web site is updated.

Not all students have internet access at home:

- You can tell pupils to use the Internet to support homework. However, you should provide computer access at school before the homework deadline for those who do not have access to a computer at home.
- If you present your small selection of web sites to the pupils as a CD ROM they do not have to go on-line and they can have a virtual Internet experience

Current and likely future developments in ICT.

Predictions about future development trends for ICT generally involve adjectives such as 'smaller, faster, and cheaper'. Increasing miniaturisation, portability and capacity of systems mean that the range of uses for ICT is increasing exponentially. The next major developments are likely to be:

- Wider adoption of technology such as USB, which will cut down the number of leads trailing from the back of computers as more devices will be 'piggy-backed' on to a single connection;
- 'Bluetooth' technologies, which make use of radio linking and will cut out the cables altogether. Faster access to the Internet with 'broadband' connections becoming widespread, which will lead to increased use of online multimedia resources such as audio and video. The implication for schools is that they must continue to play 'catch up', devoting significant resources to investment in technology and training.

Appendices

Key Concepts (Glossary)

Learners

In this section, you will find key concepts useful in order to complete this module. You shouldn't consult them right away. Instead, we encourage you to briefly read over their descriptions and move on to the next section.

Instructors

The key concepts placed here introduce learners to the resources available to them in order to complete this module. As their instructor you should encourage learners to read the descriptions provided before moving on to the learning activities. Education research shows that this instructional and learning sequence helps learners to be better prepared to link previous knowledge to the new one.

Key Concepts

ICT: Information (I) and Communication (C) Technologies (T) - the term ICT encompasses innovative audiovisual, computing and telecommunications techniques which allow the acquisition, processing and storage of information. Many of these techniques come directly from computing and communications. A number of acronyms are used, including IT, NT and IS. The term ICT is becoming more and more common in science, in Open and Distance Learning, and in Pedagogical Integration of ICT.

Pedagogical Integration of ICT: This concept is not limited to the establishment of networks and/or the installation of equipment. It includes the use of technology in schools to improve learning and to facilitate educational development. Among other definitions, this concept implies a process of appropriate, regular, and regulated use of interactive technology with incurred beneficial changes in school practices and student learning.

Software: These are programs initially conceived to facilitate consumer use of ICT. There are various types of programs used in the Pedagogical Integration of ICT including learning, open source and “free” software. A number of support mechanisms exist to assist teachers and students in becoming comfortable and efficient with ICT. This support is often presented in the form of CD-ROMs, tutorials, exercises or other didactic material.

Web Sites: These are a collection of files (HTML pages, images, PDF, audio, video, Flash-animations) and folders forming the structure of a site, placed together in computer memory (on a work station during the development phase and a server when published), and linked together using hypertext. Access to a website can be global, using the World Wide Web, or limited to a local network. For any site to be accessible externally, web-server software must be operating on the server where the site is stored.

E-Learning: is a term used to refer to learning which takes place online. Self-directed learning plays an important role in this type of education, demanding an increased level of learner autonomy. E-learning programs can be completed remotely using the Internet, or can include short sessions of face-to-face teaching.

Synchronised communication: Refers to a mode of real-time communication, using tools such as Instant Messaging, chat rooms, discussion forums, conferencing systems and bulletin boards.

Non-synchronised communication: E-learning offers the option to de-synchronise educator and learner time, allowing them to communicate based on their own schedules, in a non-synchronised manner, through multimedia information exchange networks – for example using email or e-platforms to submit work.

E-portfolio: Also called a digital portfolio, this tool is unique in that it can manage about a dozen file types (text, images, audio, video, presentations, and hyperlinks). This new technology allows learners to subscribe to a portfolio, to organise their work, to be advised of updates, and to take tests and quizzes, in real-time. It is possible to communicate with the owner of a portfolio on edu-portfolio.org, either by email, or via the "comments" function. Overall this tool is flexible, simple and easy to use, allowing information and evaluations to be organised and exchanged. Its potential applications offer very attractive prospects to E-learning programs.

Internet: Connection to a very large number of computers using communication networks, such as telephone lines, to exchange information worldwide. The Internet is, however, distinct from the World Wide Web (www), which, like email, is only one of the principle services available through the Internet.

Intranet: This concept generally designates regulated connection between a group of authorised users. A password can be required for members to access and exchange information on these smaller networks (which use similar technology to the internet). Web sites, or web pages, are examples of networks that use Intranet. In E-learning Intranet networks are an efficient way of exchanging information between learners, educators, and peers.

Simulation : The animated simulation of a natural phenomenon is a reproductive strategy of a complex phenomenon for scientific, recreational or training purposes.

Computer Assisted Simulation (CAS) : uses the computation and display capabilities of the computer to simulate an experience or phenomenon and represent it on the screen with different levels of complexity, interactivity and realism.

Animation : Set into motion by a method of assembling still film images constituting the course of action.

Animation of a physical phenomenon : any creation of moving images by using many different techniques. The movement is decomposed into a sequence of images whose vision at a given frequency gives the illusion of continuous motion.

Chat : form of synchronous communication in writing using the resources of the computer, allowing participants to discuss a given topic.

Forum : form of asynchronous communication in writing using the resources of the computer where each participant makes a contribution that will be read later by other members.

Chart Wizard : Icon having the appearance of histograms in the icon bar of Excel

Curve : A set of graphical representations of the Chart Wizard, used if you want to know the evolution of a variable.

Scatter plot : all graphical representations of the Chart Wizard used to determine the variation of a variable y as a function of another variable x eg: $y = f(x)$

Compulsory Readings

Learners

In this section, you will find compulsory readings useful in order to complete this module. You shouldn't consult them right away. Instead, we encourage you to briefly read over their descriptions and move on to the next section.

Instructors

The compulsory readings placed here introduce learners to the resources available to them in order to complete this module. As their instructor you should encourage learners to read the descriptions provided before moving on to the learning activities. Education research shows that this will help learners be more prepared and help them articulate previous knowledge.

Compulsory reading 1

Complete reference

UNESCO (2004). Technologies de l'information et de la communication en Education : Un programme d'enseignement et un cadre pour la formation continue des enseignants. Division de l'enseignement supérieur. ED/HED/TED/1.

Abstract: This book has two objectives: the first to delineate an ICT educational program for secondary school teaching that responds to current international trends. The second objective is to outline a professional development program and to support teachers in its implementation. In addition, it lends a practical and realistic approach to educational programs and teacher training, which allows efficient implementation with a given set of resources.

Rationale : This book is a UNESCO offering which aims to support educators and students in better integrating ICT, including multimedia, e learning and distance education, in the processes of training and knowledge sharing in the field of education. A particularly well-organized document, it offers examples of ICT applications in Mathematics, Biology, Physics and Chemistry teaching.

Compulsory Reading 2

Complete reference

Becta (2005). The Becta Review 2005: Evidence on the progress of ICT in Education. Becta ICT Research.

Abstract: This document is a scientific journal that surveys the impact of ICT in education. In particular, it notes the recent progress in classroom instruction. This journal also explores the inherent and current challenges of fully integrating ICT in education in a dynamic policy environment. In short, while demonstrating an increase in comfort with ICT amongst users, and that their use has increased significantly in the last two years, this document reveals that there is also real evidence of the positive impacts of ICT use in education.

Rationale: This document is a valuable resource which allows a better comprehension of the importance of ICT as a set of educational support tools, especially in Open and distance learning. The evidence clearly presented in this text suggests directions for the development of new content for e-learning programs.

Compulsory Reading 3

Complete reference

UNESCO (2004). Schoolnetworkings: Lessons learned. Bangkok: UNESCO Bangkok (ICT lessonslearned series, Volume II).

Abstract: This document is a collection of references for teaching with ICT. It presents a variety of methods to integrate ICT in teaching. The document, compiled by specialists, synthesizes a number of examples, and presents lessons learned on ICT use in schools in a variety of countries. These lessons could help improve the planning and integration of ICT in education. The text suggests tools to guide both policymakers and users in their advocacy, as well as to support ICT initiatives in education.

Rationale: This document is a reference for ICT use in teaching and learning in specific discipline such as Biology, Chemistry and Physics. Like other texts in the series it helps to better understand the process of integrating ICT in teaching the disciplines and in the use of technology to enhance learning.

Compulsory Reading 4

Complete reference

Becta (2002). ImpactCT2: The Impact of Information and Communication Technologies. ICT in Schools Research and Evaluation Series, No. 7, Department for education and skills.

Abstract: This text is the next in a series of research reports produced by the UK organisation BECTA, on the educational impact of ICT. It addresses issues related to the use of ICT in disciplines such as math and science. It presents, in four stages, the relative gains of regular and occasional users of ICT in each discipline.

Rationale: It is important to read this document to better appreciate the benchmarks, and the real and potential impacts, for and of ICT use on learning in scientific disciplines. African teachers and learners faced with substantial challenges in their education systems can benefit from the experiences presented in this study to integrate ICT in their training practices.

Compulsory Reading 5

Complete reference

UNESCO (2002). Teacher Education Guidelines: Using open and distance learning. Education sector, Higher Education Division, Teacher Education Section in cooperation with E-9 Initiative.

Abstract: This document addresses decision-makers, teachers and students who are faced with the daily challenge of broadening educational programs through Open and Distance learning. Among other objectives, this document attempts to bring to light responses to fundamental questions in open and distance learning for teachers – What does this training consist of, what is the curriculum and who are the educators, is this training appropriate, who are the users, how should it be planned and organised, what technologies can be applied, how can it be financed, how can teachers develop competencies, how can they access these? These are the major questions broached in this important reference document for open and distance learning.

Rationale: This document addresses the inherent challenges of teaching in Open and distance learning. As a resource the text provides suggestions for financing, planning organising and activities, educational practices and evaluation. The document therefore presents useful information for collaborative work and further success in the field of Open and distance learning.

Compulsory Reading 6

Complete reference

Tchameni Ngamo, S. (2006). Principes pédagogiques et Théories de l'intégration dans l'Education. AVU. Atelier de développement de Contenu pour formation d'enseignant. Nairobi -Kenya, 21st Août au 2 Septembre.

Abstract: This text presents the fundamental ideas, which mark the way for ICT integration in education. The theories herein centre around six poles, which together provide the elements essential for consideration in the process of bringing ICT to learning the sciences.

Rationale: A clear objective is only as useful as a clear path towards it - this principal certainly finds application in education – for, while targets may be well defined, the path towards them must also be marked. It thus seems appropriate to gain familiarity with the issues facilitating the integration and application ICT, so as to prepare and pilot learning activities and to manage teaching.

List of relevant readings related to teaching/learning of physics

Compulsory Reading 7

Title : Initiation à Excel

Complete reference

DIOUF S. (2006). Initiation à Excel. Université Cheikh Anta DIOP de Dakar. Faculté des Sciences et Technologies de l'Éducation et de la Formation (FASTEF ex ENS). Sénégal, Cours inédit.

Abstract

This reading contains some basic skills of Excel that the students must eventually come to master: the meaning of certain forms of the mouse cursor on a spreadsheet, how to insert a formula to calculate a physical quantity, copy a formula, formatting a cell, and drawing a curve.

Rationale

This reading is essential because it enables students to prepare for solving exercises in learning activities of the module. It gives students some answers to the tasks that they have to run in this module and in other situations.

Compulsory Reading 8

Title : Microsoft Excel – Notions de bases, fichier pdf Complete reference http://www.lino.com/~vmartino/Excel/Excel_ba.htm

Abstract : This reading deals with various basic functions encountered in Excel. It explains how to insert a formula, how to make calculations in Excel and how to manage workbooks.

Rationale : This reading allows the learner to understand the functions of Excel to be able to solve some exercises for certain learning activities.

Compulsory Reading 9

Title : Image vectorielle Complete reference http://fr.wikipedia.org/wiki/Image_vectorielle

Abstract : This reading shows the vector drawing and bitmap drawing with emphasis on their differences. It also presents some drawing software.

Rationale : This reading informs the learner of the two types of design that exist in computers and various formats that exist. It allows the learner to tell the difference between the vector image and bitmap image.

Compulsory Reading 10

Title : les NITC dans l'enseignement des sciences

Complete reference

DIOUF, S. (2006). Les NITC dans l'enseignement des sciences. Université Cheikh Anta DIOP de Dakar. Faculté des Sciences et Technologies de l'Education et de la Formation (FASTEF ex ENS). Sénégal. Cours inédit.

Abstract :

This reading contains information on integrating ICT into the teaching and learning of science. It has two types of simulation emphasizing their advantages, disadvantages and contributions in learning science.

Rationale :

This reading is essential because it helps students learn about the possibilities of integrating ICT in teaching and learning of physics, in particular, and science in general. It allows students to anticipate the need of a computer simulation and the elements of an observation grid of an ODS.

List of suggested readings

Suggested reading 1

Title : Utiliser les TIC, une occasion de changer sa pratique ? Complete reference

CHARLIER, B. (1999). Utiliser les TIC, une occasion de changer sa pratique ? SYNITC, CTA-HORNU.

Abstract : In this reading, the author first presents the types of educational ICT and clarifies what it means to change their teaching or training. He then discusses the issues facing teachers and trainers and the representations that they will make in the face of these changes. The author describes some changes possible by analyzing the new practices experienced by remote tutors and suggests ways to manage change and try to control them.

Rationale : This reading allows learners to learn more about the possible uses of ICT in teaching and the educational contributions that they can generate.

Suggested reading 2

Title : Rôle et impact des TIC sur l'enseignement et l'apprentissage au collège I

Complete reference

PERREAULT, N. (2003). Rôle et impact des TIC sur l'enseignement et l'apprentissage au collège I. Collège Edouard-Montpetit.

Abstract: This reading describes the benefits of using ICT in teaching and learning. It focuses not only on the impact of ICT on the teacher, but also on the student. It describes three types of ICT activities: production and management activities, streaming media activities, and interactive learning activities.

Rationale : This reading equips learners with computer literacy. The related information allows students to keep pace with information and different intervention possibilities of ICT.

Multimedia Resources

Learners

In this section, you will find multimedia resources useful in order to complete this module. You shouldn't consult them right away. Instead, we encourage you to briefly read over their descriptions and move on to the next section.

Instructors

The multimedia resources placed here introduce learners to the resources available to them in order to complete this module. As their instructor you should encourage learners to read the descriptions provided before moving on to the learning activities. Education research shows that this will help learners be more prepared and help them articulate previous knowledge.

Aide-mémoire Excel de base, document pdf

This resource explains some features of Excel: Using a spreadsheet, and how to insert formulas.

Useful Links

Learners

In this section, you will find links you will find useful in order to complete this module. You shouldn't consult them right away. Instead, we encourage you to briefly read over their descriptions and move on to the next section.

Instructors

The links placed here introduce learners to the resources available to them in order to complete this module. As their instructor you should encourage learners to read the descriptions provided before moving on to the learning activities. Education research shows that this will help learners be more prepared and help them articulate previous knowledge.

Useful links 1

Big Brown Envelope Educational ICT Resources

<http://www.bigbrownenvelope.co.uk/>



Description

This site Web provides access to the very educational resources for teachers to aid use of ICT in their lessons.

Rationale

The success of the pedagogical integration of ICT in teaching and learning largely depends on the availability of resources to bring to life important aspects of the training content. This site hosts a number of resources, which could help educators fill-out, enrich their lessons, and make them more exciting.

Useful links 2

Educ - Portfolio

www.eduportfolio.org



Description

Edu-portfolio is a website which presents, in a clear and straightforward manner, a virtual portfolio – a very important training tool in distance learning.

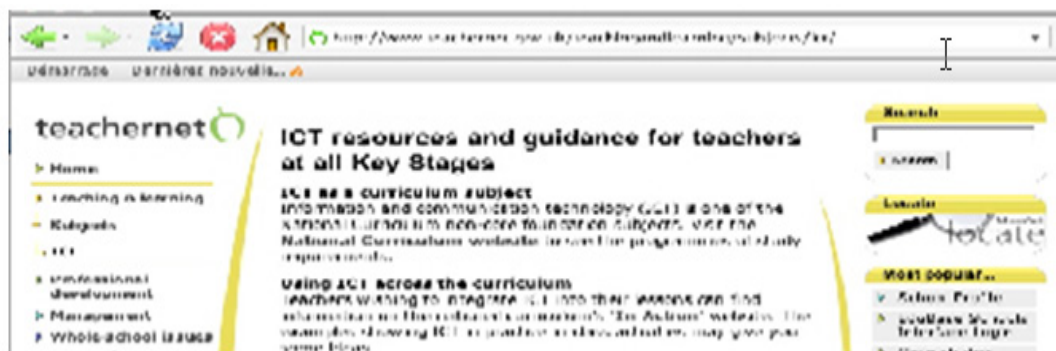
Rationale

A secure method for organising work is primary to success in an open and distance learning program. A portal through which to archive content, in addition to a discussion platform, makes for a dynamic educational environment.

Useful links 3

ICT resources and guidance for teachers at all Key Stages

<http://www.teachernet.gov.uk/teachingandlearning/subjects/ict/>



Description

Practical help on using ICT in teaching is provided by TeacherNet.

Rationale

The application of technology in distance learning presupposes the availability of well-developed and reviewed content. Teachernet, to this end, assists educators in the complex and fascinating challenges of integrating technology with their teaching methods, by providing tools and pedagogical content.

Useful Links 4

Unesco Bangkok: ICT Resources for Teachers CD-ROM

<http://www.unescobkk.org/index.php?id=3871>



Description

ICT Resources For Teachers CD-ROM contains a set of ICT-based resources for teaching and learning of science, mathematics, etc. for secondary-level students, including simulations, video clips, interactive learning objects for quizzes, animation, and other kinds of multimedia learning activities. The materials and lesson plans provided here are organized and relevant to subjects. A separate directory is provided to give an overall view of the types of resources available.

Rationale

In pedagogy the use of a variety of available resources stimulates learning. Appropriate audio-video support for learning activities which include diverse, information-rich, content, seems to hold learner's attention throughout the training process. Additionally, learning activities appear less monotone. This UNESCO website is worth a visit because it provides a collection of these resources for learning math and the sciences.

Useful links 5

4Teachers: Home Page

<http://www.4teachers.org/>



Description

4Teachers.org works to help you integrate technology into your classroom by offering FREE online tools and resources. This site helps teachers locate and create ready-to-use Web lessons, quizzes, rubrics and classroom calendars. There are also tools for student use. Discover valuable professional development resources addressing issues such as equity, technology planning and at-risk or special- needs students. Here you will find some of our resources to help you integrate technology into your curriculum, along with links to stories written by teachers who personally conquered integration challenges.

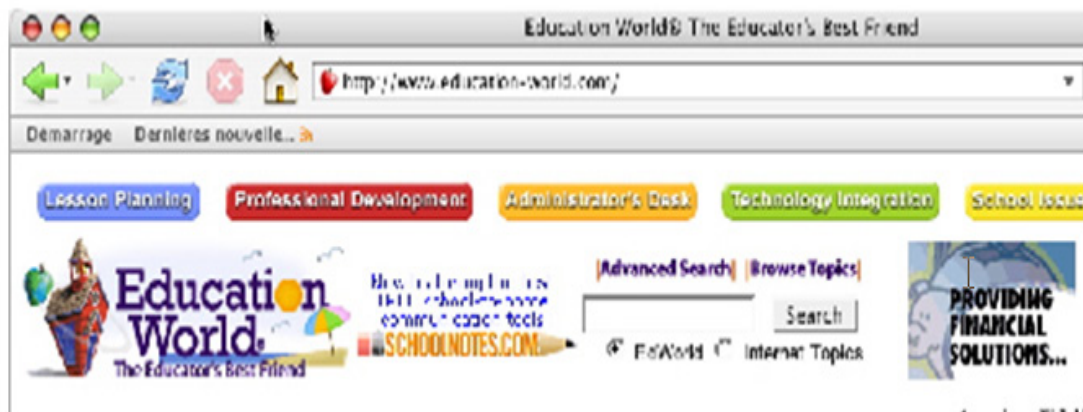
Rationale

Online learning is facilitated when available resources include a variety of multimedia resources and examples. As well, when these resources reflect real experiences of technology integration, they allow educators to discover new ideas and enhance their professional development.

Useful link 6

Education World: The Educators Best Friend

<http://www.education-world.com/>



Description

The Website provides free featuring collaborative projects, virtual field trips, educational games, and other interactive activities.

Rationale

Problem-based and collaborative learning are standard pedagogical approaches in Open and distance learning. It is thus appropriate that learners and educators in the field visit this site, where projects and interesting interactive activities are available.

Useful links 7

Resources to help students practice skills needed on state assessments

<http://www.internet4classrooms.com/>



Description

This Website provides resources to help students practice skills required on various assessments. Online Modules are available for elementary, Middle and high school students' assistance.

Rationale

The Internet holds an increasingly important place in schools. Because they are considered role models teachers must not fall behind their student's ability to use email and navigators. ICT use generally, and the Internet in particular, requires at least basic competencies. Internet4Classrooms provides a portal that reviews material to assist educators in effectively using the Internet.

Useful links 8

<http://www.unescobkk.org/index.php?id=1366>



Description

This website includes a number of free, downloadable resources and provides substantial support for childhood education. Also available is free software for educators.

Rationale

Games play an important role in children's lives. They contribute, in large part, to motor and cognitive functions as well as accelerating the process of gaining social skills and knowledge. This UNESCO website is an easy-access source for a variety of interactive learning activities which supports different aspects of childhood development.

Useful links 9

Unesco-Bangkok: ICT in Education

<http://www.unescobkk.org/index.php?id=1366>



Description

Five principal themes related to ICT integration policy are available on this UNESCO website. Teacher training, teaching, learning and monitoring are explored.

Rationale

Teacher training is only one, but perhaps the foremost, among the multiple preconditions necessary for the successful integration of ICT in education. In addition to reviewing information related to learning and teaching, this website also provides useful information on ICT integration policy.

Learning Activities: Written Report on Compulsory Reading

To note: Reading is an especially important activity in Open and distance learning. To best grasp the concepts of the pedagogical integration of ICT, the readings for each activity are compulsory. Two texts accompany activities 1.1 and 1.4, and a single text for 1.2 and 1.3

Learning activity 1: Reading critique

Summary of learning activity

Read thoroughly the UNESCO (2004) text on continuing education for teachers, and the integration of ICT in scientific disciplines (lessons-learned and best practices for ICT in Mathematics, Biology, Physics and Chemistry teaching programs).

Reference for the compulsory reading:

- UNESCO (2004). Technologies de l'information et de la communication en Éducation : Un programme d'enseignement et un cadre pour la formation continue des enseignants. Division de l'enseignement supérieur. ED/HED/ TED/1
- UNESCO (2004). Schoolnetworkings: Lessons learned. Bangkok: UNESCO Bangkok (ICT lessonslearned series, Volume II).

Detailed description of the activity: suggestions for completing the assignment

Read the UNESCO (2004) text and produce:

- A 3-page (maximum 1300 words, 1.5 line spacing) summary report. The report should clearly bring out the major points of a professional development plan that would allow teachers to succeed in integrating ICT in their discipline.
- A synthesis table presenting the basic skills necessary to apply ICT in pedagogical practices.
- An analysis of the important themes developed in the two texts, noting opportunities to integrate them in your discipline or teaching practices.

Formative evaluation

The evaluation of the learning activities is based on the quality of the learner's analyses, arguments, and examples, and the depth, richness and variety of their ideas. As well, the structure of the submitted work, how well it is organised, its style and language and presentation, are important. In line with these expectations, the evaluation of this activity will be weighted as following:

- Summary report (40%)
- Synthesis table of basic ICT skills (30%)
- Analysis and opportunities for integration (30%)

Learning activity 2: Creation of a trainer profile in distance learning.

UNESCO (2002). Teacher Education Guidelines: Using open and distance learning. Education sector, Higher Education Division, Teacher Education Section in cooperation with E-9 Initiative.

Summary of the learning activity

Fundamentals concerning the use of ICT by teachers in the context of Open and distance learning.

Detailed description of the activity: suggestions for completing the assignment

Having read the UNESCO (2004) text (ref. lesson activity 1.1):

- Write a brief critique (600 words, or two pages at 1.5 line spacing) responding to the major challenges faced by teachers in Open and distance learning, as presented in the text.
- Illustrate, in a table, the competencies required of, and the ideal profile for an Open and distance learning educator.

Formative evaluation

The evaluation of this activity will focus on both content and presentation. 60% will be dedicated to the quality of the analysis, and 40% to its presentation, particularly the competency table.

Learning activity 3: Summary of critical reading.

Tchameni Ngamo, S. (2006). Tchameni Ngamo, S. (2006). Principes pédagogiques et Théories de l'intégration dans l'Education. AVU. Atelier de développement de Contenu pour formation d'enseignant. Nairobi - Kenya, 21st Août au 2 Septembre.

Summary of the learning activity

The theories and guiding principles of the pedagogical integration of ICT in education.

Detailed description of learning activity: suggestions for completing the assignment

Read thoroughly the text on the fundamentals of ICT integration in education, and write report that briefly (in two pages, 1.5 line spacing) presents the important aspects of ICT integration, as outlined in the document.

In an additional section, critique the text, and relate its themes to professional development for educators.

Formative evaluation

The evaluation of the learning activities is based on the quality of the learner's analyses, arguments, and examples, and the depth, richness and variety of their ideas. As well, the structure of the submitted work, how well it is organised, its style and language and presentation, are important. In line with these expectations, the evaluation of this activity will be weighted as following:

- Report on the reading (50%)
- Critical analysis and link to professional development (50%)

Learning Activity 4: ICT impact "success stories". Reference for the readings

Becta (2005). The Becta Review 2005: Evidence on the progress of ICT in Education. Becta ICT Research

Becta (2002). ImpactCT2: The Impact of Information and Communication Technologies. ICT in Schools Research and Evaluation Series - No. 7, Department for education and skills.

Summary of the learning activity

Various positive impacts of ICT use in mathematics and science.

Detailed description of the activity: suggestions for completing the assignment

Begin by reading the two Becta (2005, 2002) texts on the evidence of positive impacts of ICT on learning, then:

- Write a one-page synthesis report and create a PowerPoint presentation on the positive impacts of ICT on the process of learning.
- Present two success-stories related to teaching using ICT (or two personal accounts of the same). Note links to the advantages outlined in the text. The accounts must highlight the important lessons to be learned (while noting significant risks and challenges).

Formative evaluation

The evaluation of the learning activities is based on the quality of the learner's analyses, arguments, and examples, and the depth, richness and variety of their ideas. As well, the structure of the submitted work, how well it is organised, its style and language and presentation, are important. In line with these expectations, the evaluation of this activity will be weighted as following:

- Production of the synthesis report and PowerPoint presentation (50%)
- Presentation of success-stories/accounts (50%)

Learning activity 5: Report on reading of your choice

Detailed description of the activity: suggestions for completing the assignment

Choose two readings available on the Internet, draw from them two opposing or contradictory scientific opinions. Now report (in 600 words, about two pages) information from various sources – what does this demonstrate? For example, both Darwin's theory of evolution and Creationism are found on Wikipedia (www.wikipedia.org). Your report should conclude by drawing out the challenges you may face in this context, as a teacher working with students.

Formative evaluation

- The authenticity of the readings (20%)
- The brief resume of the two texts (40%)
- The critical analysis of the readings (20%)
- Presentation of the material, within the defined parameters of the assignment (20%)

Learning activity 6 (specific to physics): using an Excel spreadsheet to calculate physical quantities

Teaching hours : 15 hours

- 10 hours to familiarize with Excel
- 5 hours to answer questions, exchange with peers, and write the reports.

A tutor is recommended to arrange the work schedule of the students.

Guidelines :

For this activity, if you have at least $\frac{3}{4}$ of the points, you have done very good work, and you may continue with the module.

If you have less than half of the points, you must re-read the lectures, and redo the activity.

If you have more than half of the points and less than $\frac{3}{4}$ of the points, you have done good work, but you must make an effort to improve in the future.

Specific learning objectives:

the learner must be able to:

- Organize an Excel spreadsheet
- Calculate physical quantities from a worksheet in Excel
- Copy a formula to other values from the bottom or the right.

Abstract

In this activity the learner will have access to an Excel spreadsheet will configure it according to their needs. He or she will calculate the sum, product, or the relationship between two physical quantities using the formulas in Excel. The learner may need to modify certain values of these physical quantities and see the influence of these changes in the formula.

Key Concepts

Spreadsheets: calculation software

Workbook: a file or document produced by Excel, whose name ends in .xls

Worksheet: each workbook contains several sheets accessible by tabs at the bottom of the workbook

Cell: it is the intersection between a column and a line, contains a value or a calculation. Example: cell A24, cell M50

Field: selection of two or more cells. Examples: A1: B1, A3: D5

Chat: communication tool in real time (synchronous) in writing

Required readings

- UNESCO (2004). Technologies de l'information et de la communication en Education : Un programme d'enseignement et un cadre pour la formation continue des enseignants. Division de l'enseignement supérieur. ED/HED/ TED/1
- DIOUF S. (2006). Initiation à Excel. Université Cheikh Anta DIOP de Dakar. Faculté des Sciences et Technologies de l'Education et de la Formation (FASTEF ex ENS). Sénégal. Cours inédit

http://www.lino.com/~vmartino/Excel/Excel_ba.htm : Excel de base

Abstract

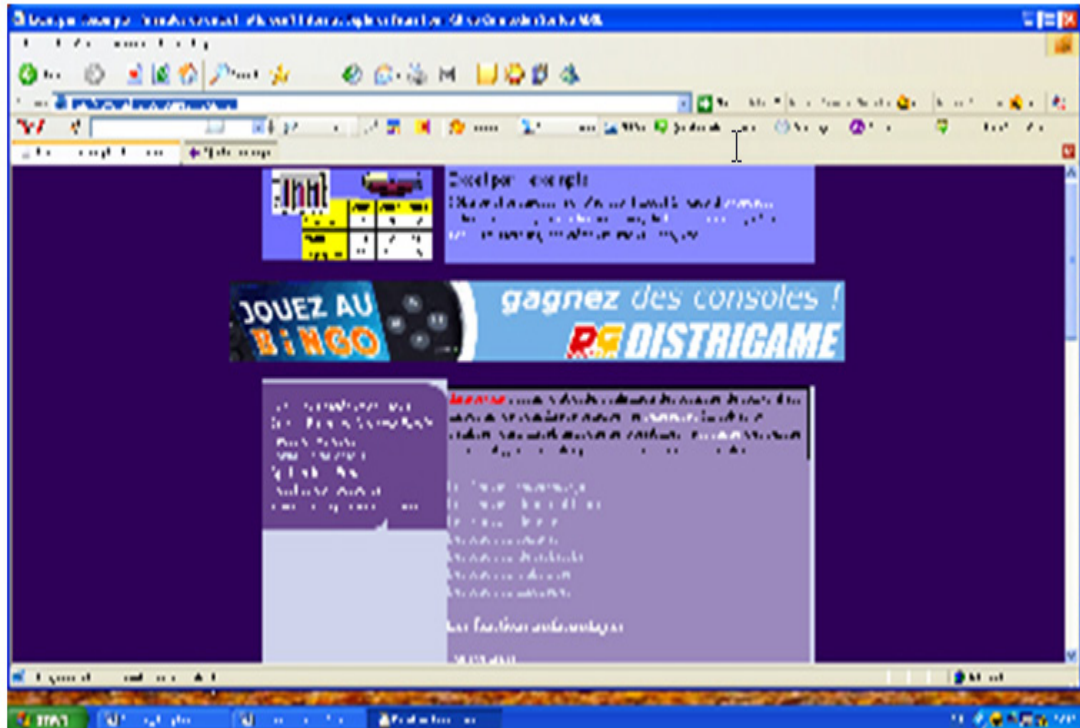
These lectures enable learners to have some knowledge on the application of ICT in education, and to be familiar with the basic knowledge of Excel.

Rationale

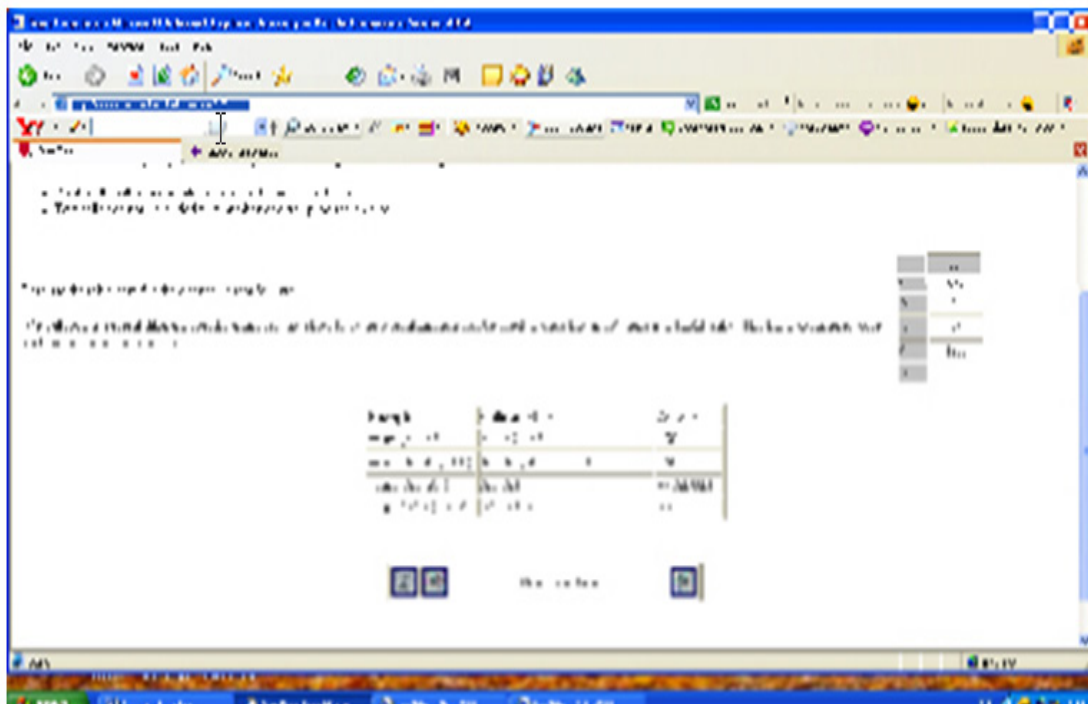
These readings are of importance because they allow learners to prepare for the different exercises they will encounter in this activity.

Useful and important links

<http://www.admexcel.com/formules.htm>



<http://www.usd.edu/trio/tut/excel/15.html>



<http://www.gpcservices.com/formation/Excel>



Abstract of links

These links contain information that enables learners to learn the basic skills of using an Excel spreadsheet.

Rationale of links

Visiting these links is necessary for any student or any learner who wants to master the basic skills of Excel in order to complete the calculation exercises.

List of important resources

Aide-mémoire Excel de base, document pdf

This resource explains some features of Excel: The utilisation of a spreadsheet, and how to insert formulas.

Introduction to the activity

Imagine a learner in physics that must repeatedly compute values of physical quantities on several bodies, writing reports on some of these physical quantities, and exploring relationships that exist between the physical quantities. He or she may take several hours without reaching its end. A very quick and very effective method of performing these tasks is to learn to use an Excel spreadsheet.

Detailed description of the activity :

This activity will enable learners to master the basic knowledge of an Excel spreadsheet. He or she will be able to make calculations. The learner will discover the components of a spreadsheet (rows, columns, cells) and its menu bar, which is slightly different from the Word processing menu bar. The learner must understand when, how and why to use a spreadsheet. The learner will choose the appropriate function in the "Insert" menu to do their calculations. Learners can do collaborative work to gauge their understanding of different topics, and compare their results.

Formative evaluation

Use a table with the following values

F (Newton)	0	0,8	1	1,5	2,3	3,4	15,7	23,8	35,4	42,6
d (meter)	0	0,52	0,8	0,97	1,7	2,7	8,5	11,6	19,3	23,8
W (Joule)										

Record these values in an Excel spreadsheet (20% of the points)

Calculate the product $W = F \cdot d$ by using a formula in Excel (50% of the points, of which 20% are for introducing the formula and 30% for the numerical calculations)

Discuss in « chat » the various techniques used (30% of the points)

Learning activities

Learners must keep track of their growing knowledge of Excel; to do this:

1. They must visit the sites listed (for those who do not have basic knowledge of Excel).

Once these basic skills are acquired, learners are organized into working groups as follows:

2. Collaborative work: learners are separated into sub groups with a tutor to guide discussions, and learners exchange ideas in a chat on the following topics:

- identification of a cell;
- how to insert or write a formula;
- how to copy a formula to other cells in the bottom or right side;

Once their knowledge is evaluated by the tutor, a member of each subgroup shall write a report for the subgroup, and place it in a workspace labelled as «Student», which is reserved for them. Once this collaborative work is completed, learners complete the following activities one after the other.

3. Opening an Excel sheet

4. Configure the Excel spreadsheet by putting your first name, last name, year of study, courses, group, and subgroup, and then save it under a descriptive name;

5. Naming two successive columns in the worksheet where you want to enter the data from the table of the exercise. The first can be called force (F), and the second distance (d)); The names will be written in the first cell of each column;
6. Fill the two vertical columns with the values from the table of the exercise;
7. In the next column that will be named Work (W), insert or write in the second cell a formula to calculate the product: $F * d$
8. Calculate the formula in this cell by pressing the OK or Enter key;
9. copy the formula down: for this, first select the cell containing the formula and move the mouse pointer to the bottom right corner of the cell and click-drag down the column to cover all other values;
10. Formatting the cells by clicking on Format / cell / edge;
11. Save after each operation;

The tutor will ask each student to send the saved file by email attachment, or place it in a designated space for the faculty to correct.

Correct answers

1. rentrer les données du tableau de valeurs en remplaçant les virgules des nombres décimaux par des points (si vous avez la version anglaise d'Excel) ;
2. The formula to insert is $= a_i * b_i$; (all formulas are preceded by an equal sign (=) a is the name of the column containing the values of F, i is the number of the line containing the first value of F ; b is the name of the column containing the values of d,
i is the number of the line containing the first value of d

3. The values of W that should be calculated are :

W (Joule)	0	0.416	0.8	1.455	3.91	9.18	133.45	276.08	683.22
	1013.88								

Self evaluation

The learners note the difficulties they have encountered in order to avoid making the same mistakes, by doing the following exercise which is not graded but may enable them to evaluate themselves: Calculate the ratio of length A 'B' of an object and that of its image AB obtained by a convergent lens by using an Excel spreadsheet

AB (m)	10	15	25	30	42	78	97	109	125
--------	----	----	----	----	----	----	----	-----	-----

A'B'(m)

A' B'	10	20	43	55	65	121	145	175	204
-------	----	----	----	----	----	-----	-----	-----	-----

AB

For this exercise, the correction will focus on the formula $= C2/B2$ (C2 is the cell that contains the first value of 'B', B2 is the cell that contains the first value of AB)

Teacher's guide

The teacher will correct the work of learners by focusing on:

- The formulas used to calculate the different values required;
- The fact that each formula is preceded by an equal sign (=);
- A copy of these formulas to other cells in the bottom of the 3rd column of each table of values.

He or she will send a feedback email confirming the correct response or corrective feedback to each learner.

The grade assigned to each learner will account for 20% of the evaluation of the module and will be recorded by the teacher in a space reserved for the faculty.

Learning activity 7 : using Excel for drawing curves

Time : 15 hours

Guidelines

For this activity, if you have at least $\frac{3}{4}$ of the points, you have done very good work, and you may continue with the module.

If you have less than half of the points, you must re-read the lectures, and redo the activity.

If you have more than half of the points and less than $\frac{3}{4}$ of the points, you have done good work, but you must make an effort to improve in the future.

Specific learning objectives

The learner should be able to :

- Fill in an Excel sheet
- Graphically represent the relationship between physical quantities
- Write the title of a figure
- Label axes of a graph
- Communicate via Internet with peers.

Abstract

After becoming familiar with Excel, learners can visit the menu bar, identify the Chart Wizard and see the different possible representations with Excel. For each physics course, they will be able to make a graphical representation of a physical quantity as a function of another that varies with it.

Detailed description of the learning activity

From an array of values between two related physical quantities, students open an Excel spreadsheet, copy down the values of these two quantities in two successive columns, while taking care to name these columns by the names of the two quantities. They then select these two columns with the mouse from their computer, click on the Chart Wizard icon from the taskbar icon, and choose the tab «Scatter». The window that opens immediately shows them different types of curves. They will choose one.

Key Concepts

Chart Wizard: Icon having the appearance of histograms in the icon bar of Excel

Curve: A set of graphical representations of the Chart Wizard used if you want to know the evolution of a variable

Scatterplot: all graphical representations of the Chart Wizard used to determine the variation of a variable y as a function of another variable x eg: $y = f(x)$

Appropriate readings

- DIOUF S. (2006). Initiation à Excel. Université Cheikh Anta DIOP de Dakar. Faculté des Sciences et Technologies de l'Éducation et de la Formation (FASTEF ex ENS). Sénégal. Cours inédit
- http://www.lino.com/~vmartino/Excel/Excel_ba.htm : Excel de base

Abstract

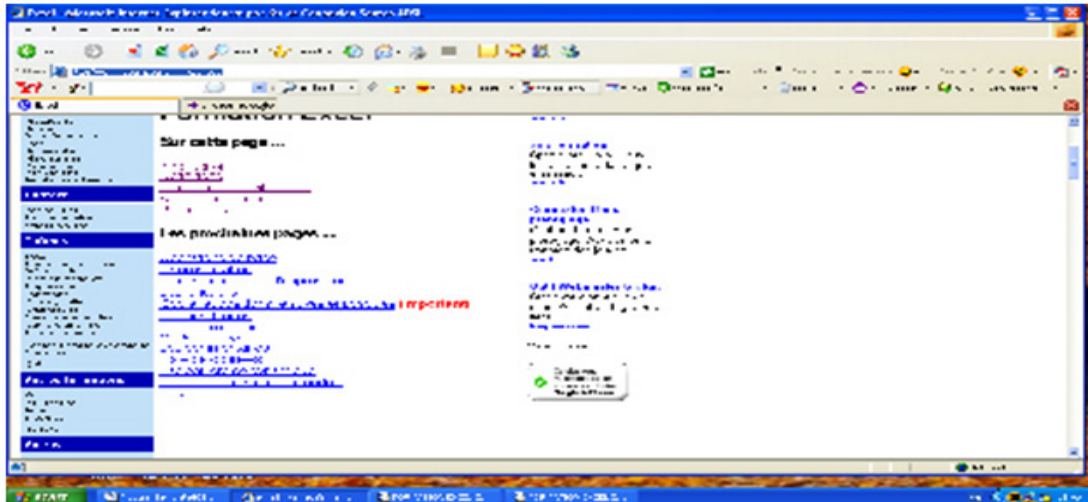
These readings contain some theoretical background related to the various exercises in this activity.

Rationale

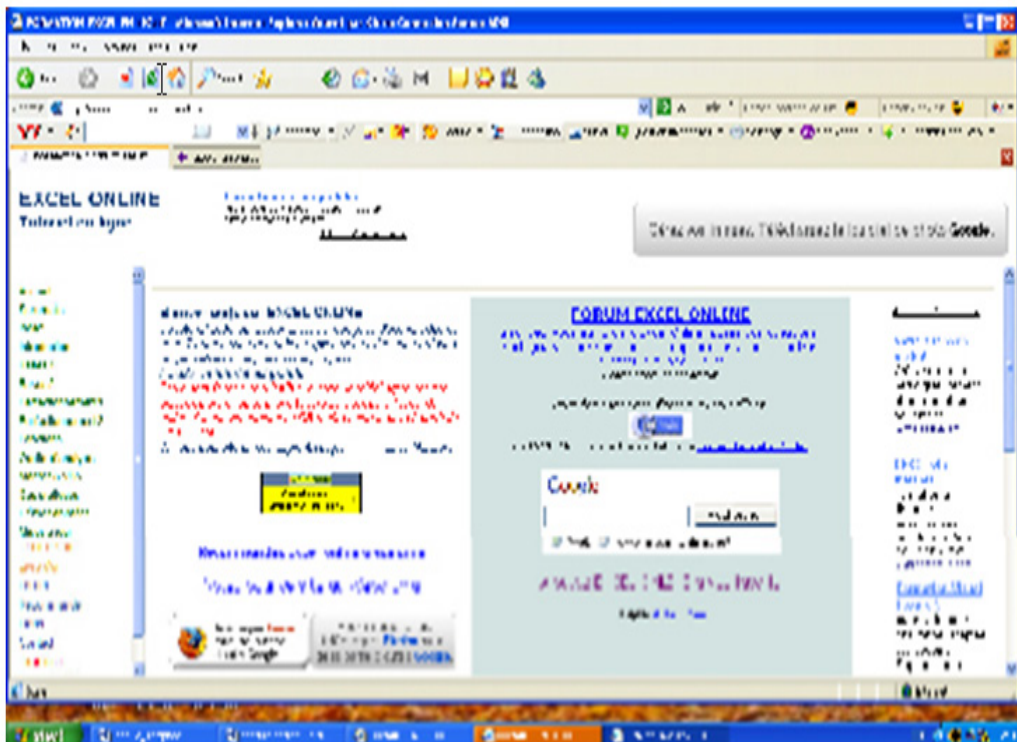
These readings are of importance because they enable the learners to master the basic knowledge of Excel and prepare for the different exercises they will encounter in this activity.

Useful links

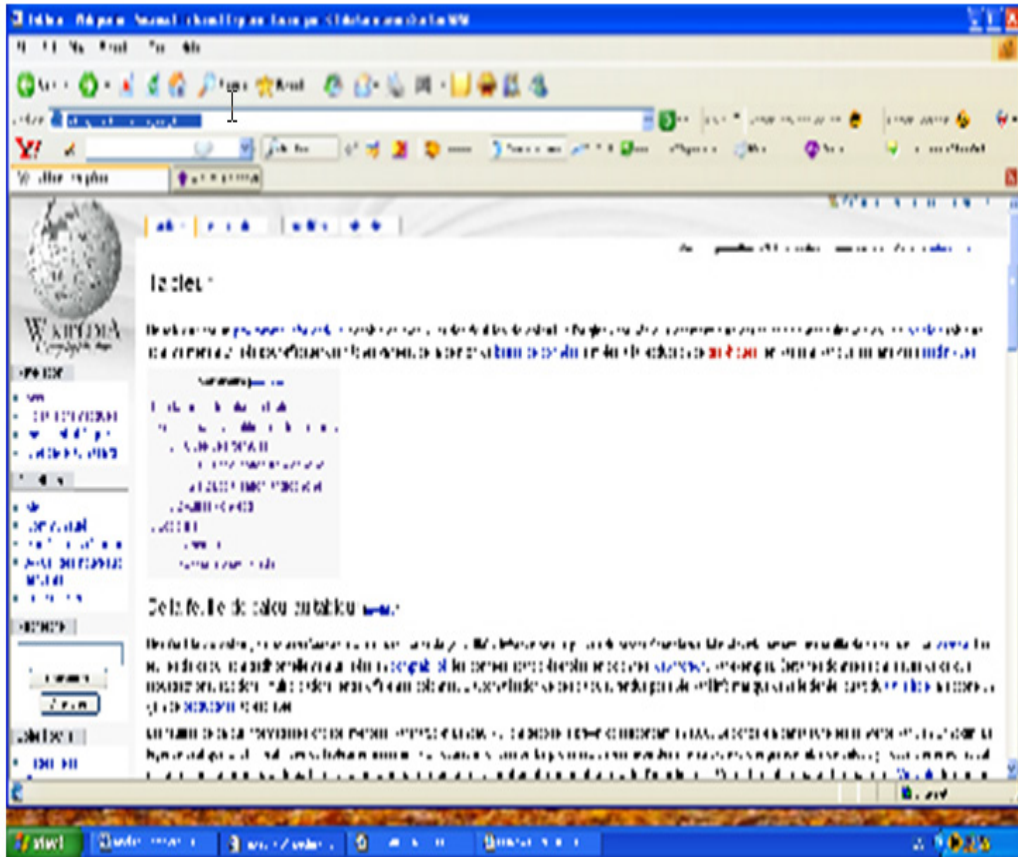
<http://www.lecompagnon.info/excel/>



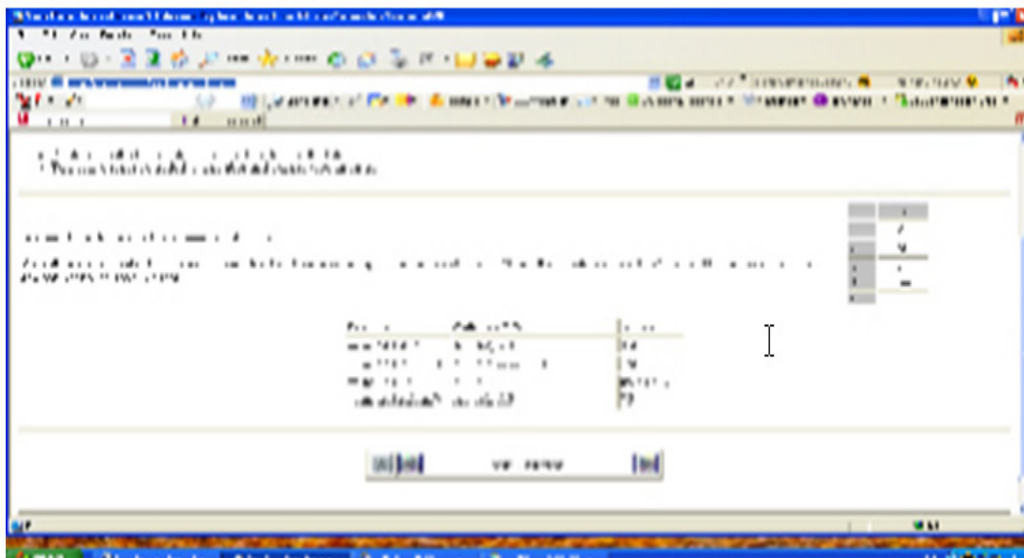
<http://www.excel-online.net/index2.htm>



<http://fr.wikipedia.org/wiki/Tableur>



<http://www.usd.edu/trio/tut/excel/15.html>



Summary of links

These links contain information on the contents of the software: some definitions, mathematical formulas and calculations (sum, product, division ...). Examples to guide the learners are treated.

Formative evaluation

Consider the following table of values between the kinetic energy of a material point and the velocity of the material point:

Ec (Joule)	4	16	36	64	100	144	196	256	324	400
484	576	676	784							

Velocity

(m/s)

V2 (m/s²)²

1	2	3	4	5	6	7	8	9	10	11	12
13	14										

Calculate v2 using the tab function in Excel using the Insert menu in the menu bar(30% of the points)

Use Excel to draw the curve $E_c = f(v^2)$ (70% of the points, of which 20% is for group work)

Learning activities

Beneficiaries of the training open Excel by double left clicking with the mouse of their computer on the desktop icon. If the Excel icon is not present on the desktop, they will click on the «Start» menu, then choose All Programs, Micro- soft Office, and Microsoft Office Excel

In the window that opens (a spreadsheet) each learner writes their frst and last name. They choose three successive columns: one will be called kinetic energy (spelled out or abbreviated), the second will be called velocity, and the third will be called squared velocity.

They will then enter values from the table vertically in the frst two columns

In the next column, they will insert the function that allows them to calculate

V2.

They will then copy down the formula down for all other values of velocity. They will select the two columns named, respectively, kinetic energy and squa- red velocity, and click the Chart Wizard icon from the taskbar icons.

They choose «Scatter Plot» and click on a sample curve of their choice in the window that opens.

Click on «Next» and observe the shape of the curve.

If you do not have the values of Ec in ordinates, change the letters in the sheet

ranks (eg in absolute references replace B by C and vice versa).

Click in series and then click Add and write the name of the second variable, squared velocity and then click Add and then click delete to remove the name series that is not a variable in the graph.

Click on «next».

Choose a title and label axes.

Click on «Next» then click Finish, and the curve is displayed on the worksheet

Save the curve.

Group work : learners will exchange ideas in chat to explain their procedure and their results. This chat will be supervised by a tutor, who can organize them into sub-groups. If they or did they not choose the same curves from the»Scatterplot» tab, they will be able to discuss what differentiates their results and come to terms with what they think is best. Learners who have difficulty will ask questions in the chat regarding their problems. Those who can help with these questions will post their answers in the chat.

Once all problems are identified, and the remarks included, each learner will send the outcome by attachment to the teacher, or drop it off in a designated workspace.



Correct answers

1. The function to use to calculate the square of the velocity is $= b_i * b_i$, if b is the column that contains values of velocity and i the number of the cell containing the first value of this velocity.

2. The squared velocities are the following :

V2 (m/s ²) ²	1	4	9	16	25	36	49	64	81	100
	121	144	169	196						

3. Title : Graphical representation $E_c = f(\text{squared velocity})$

4. Name the axes : Ordinate : Kinetic energy .

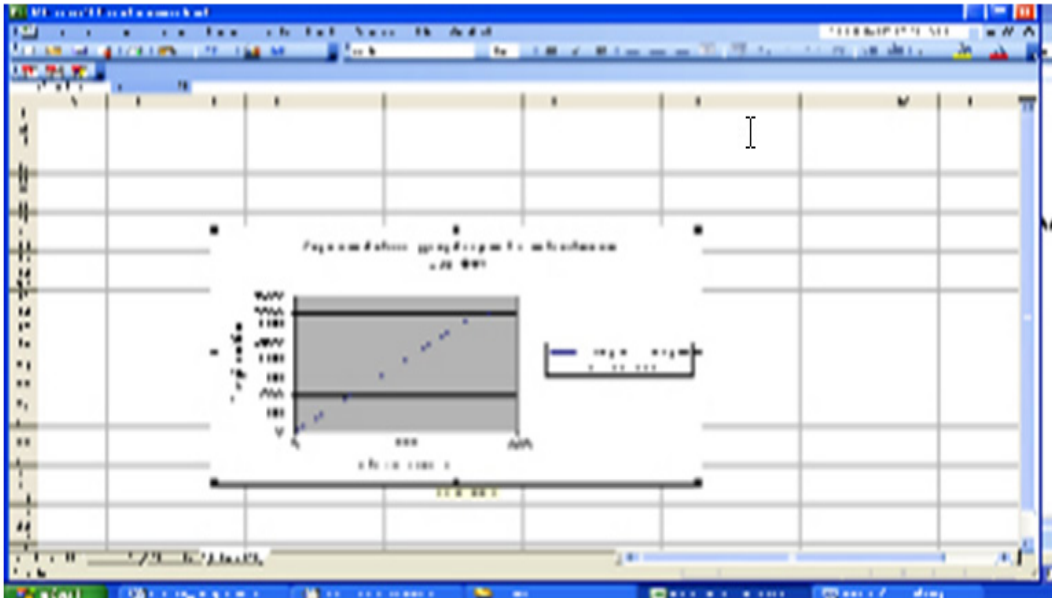
Abscissa : Squared velocity

5. The curve plotted is a segment through the origin of the coordinates.

Self evaluation

Learners and learning should note any difficulties they have encountered, and they can improve by doing the following exercises:

Plot $E_c = f(v)$. We obtain half a parabola through the origin of coordinates.



To recap the two learning activities, learners can assess themselves by doing the following exercises that are not graded.

Calculate the ratios $\frac{P}{I}$ and $\frac{E_p}{h}$

Draw the curves $P = f(I)$ and $E_p = f(h)$ for the following tables of values.

P is the power in watts, I the intensity of the electric current in amperes, E_p the potential energy in joules, and h the height of the fall in meters

Register this assignment under the section « Student ».

1)

P (watt)	0	2.	5	7.	10	12.5	1
I (ampere)	0	12	22.5	34	46.5	38.5	70

\bar{I}

2)

E_p (joule)	2	4	8	10	12	14	2
h (meter)	4	8	15	20	23	28	40

E_p

h

For these two curves, the result is a segment passing through the origin of the coordinates.

Teacher's guide

The teacher will correct productions of learners by focusing on:

- The formulas used to calculate the different values required;
- The fact that each formula is preceded by an equal sign (=);
- A copy of these formulas to other cells in the bottom of the 3rd column of each table of values.

He or she will send a feedback email confirming the correct response or corrective feedback to each learner.

The grade assigned to each learner will account for 20% of the evaluation

of the module and will be recorded by the teacher in a space reserved for the faculty.

Learning activity 5 : using the draw tool

Learning time : 15 hours

Guidelines

For this activity, if you have at least $\frac{3}{4}$ of the points, you have done very good work, and you may continue with the module.

If you have less than half of the points, you must re-read the lectures, and redo the activity.

If you have more than half of the points and less than $\frac{3}{4}$ of the points, you have done good work, but you must make an effort to improve in the future.

Specific learning objectives

The learner should be able to :

- Draw patterns of physical devices
- Communicate via Internet to their peers

Abstract

This activity is to familiarize beneficiaries with training on the drawing tool integrated in Word, and to use these tools for drawing vector quantities, geometric shapes and diagrams of the apparatuses and objects used in the regular course of physics.

Activity description

In this activity, learners will study the readings, links and resources available to have some basic knowledge of the drawing tool. They will then open the drawing tool built into Word to do the hand and then start drawing the different patterns of devices and circuits that will be asked of them.

Key Concepts

Line : used to draw lines or segments that can represent connections

Rectangle : icon used to draw a square or a rectangle

Ellipse : used to draw circles and ellipses

Selecting objects : clear arrow (form of a mouse cursor) used to select objects

Draw : contains tabs such as :

« Group » associate drawn objects to create one common object

« Dissociate » the opposite of group

« Order » allows you to place a letter or object in the background or fore- ground

Text zone : icon symbolized by the letter A, allows the creation of a rectangle that can contain writing

Arrow : can directly draw arrows

Style of arrow : allows one to choose the type or direction of an arrow.

Important readings

http://fr.wikipedia.org/wiki/Image_vectorielle

Abstract

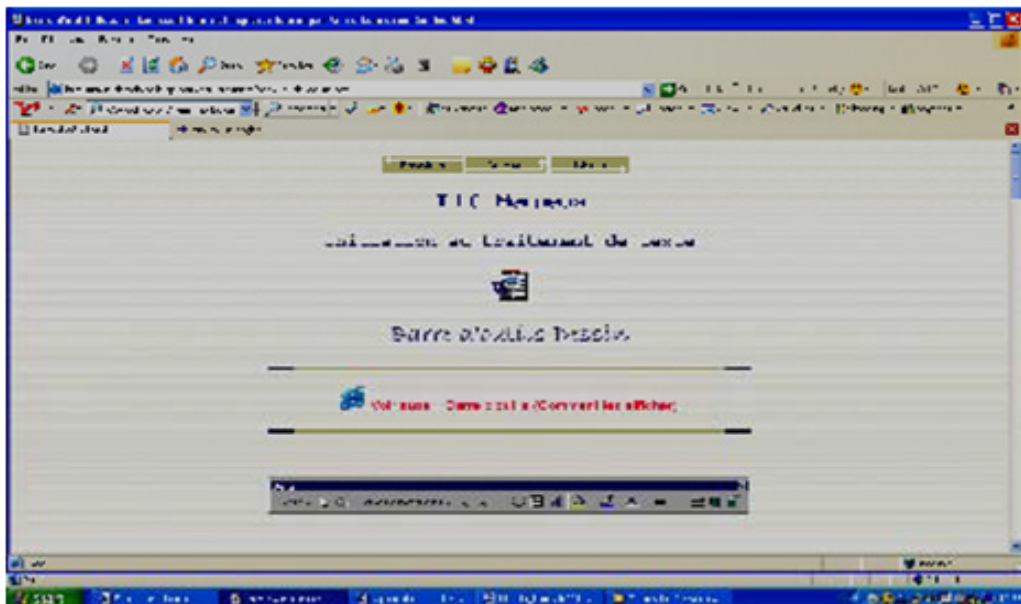
This reading presents vector drawing and bitmap drawing with emphasis on their differences. It also presents some drawing software.

Rationale

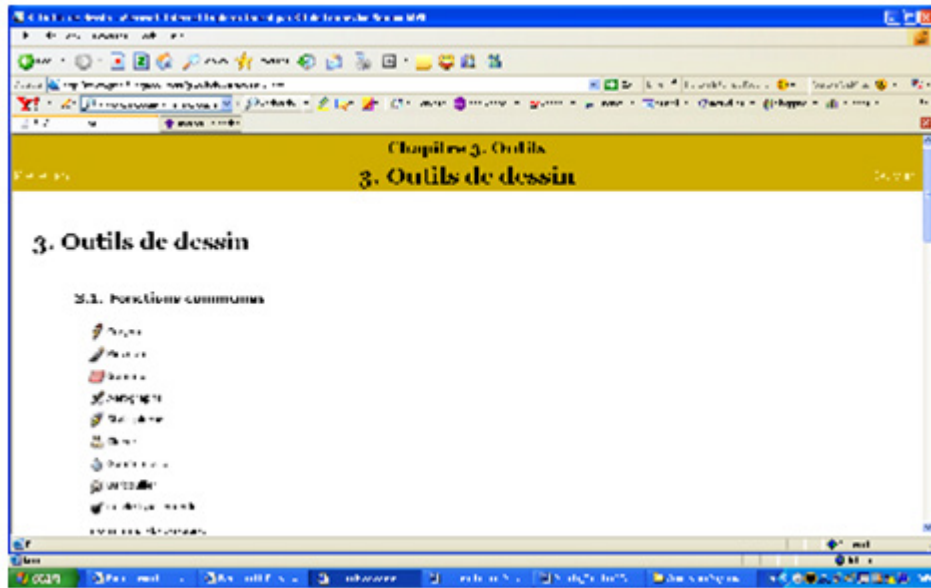
This reading informs the learner of the two types of design that exist in computers and various formats that exist. It allows the learner to understand the difference between the vector image and bitmap image.

Links (consulted on september 15, 2006)

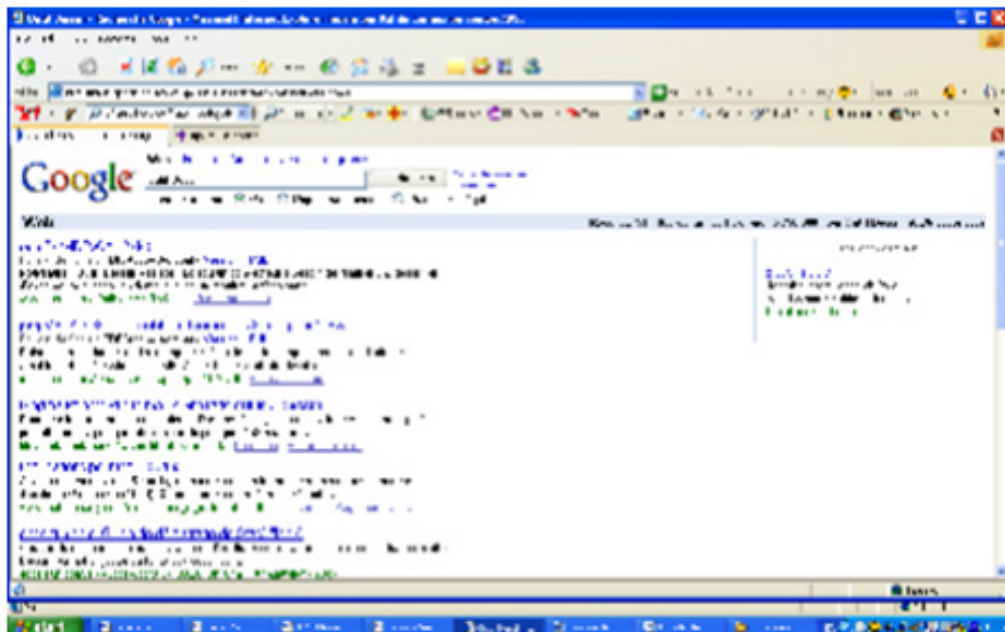
http://www.derochebelle.qc.ca/ticnerveux/word/barre_outils_dessin.htm



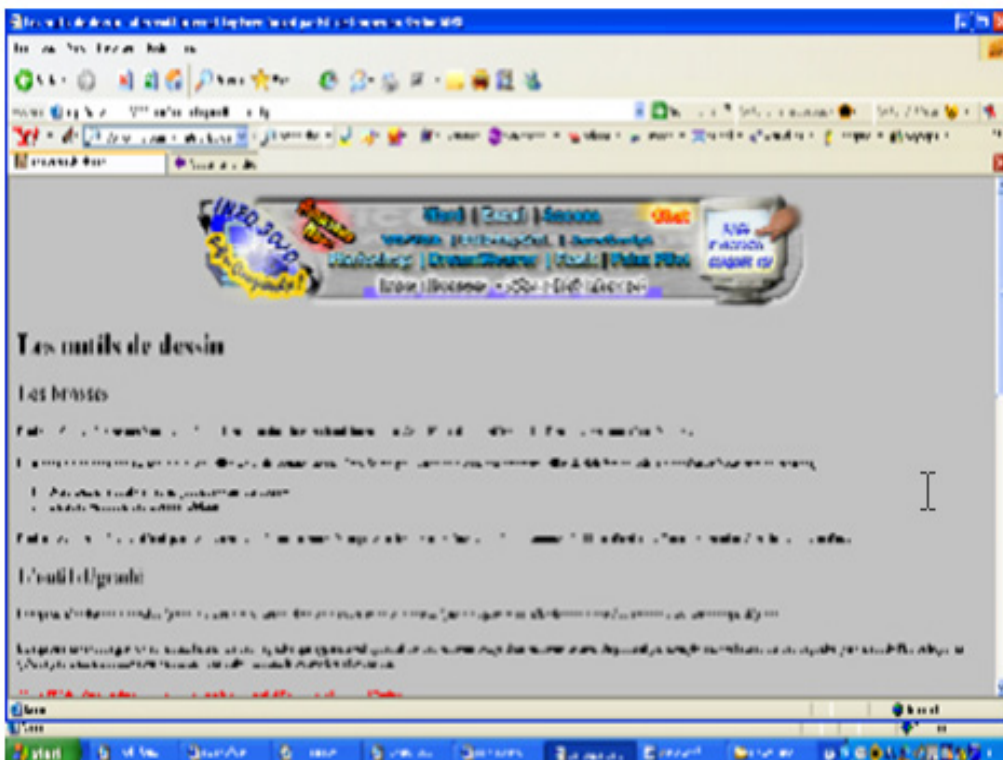
<http://www.gimp-fr.org/document/gimp-help-2/fr/ch03s03.html>



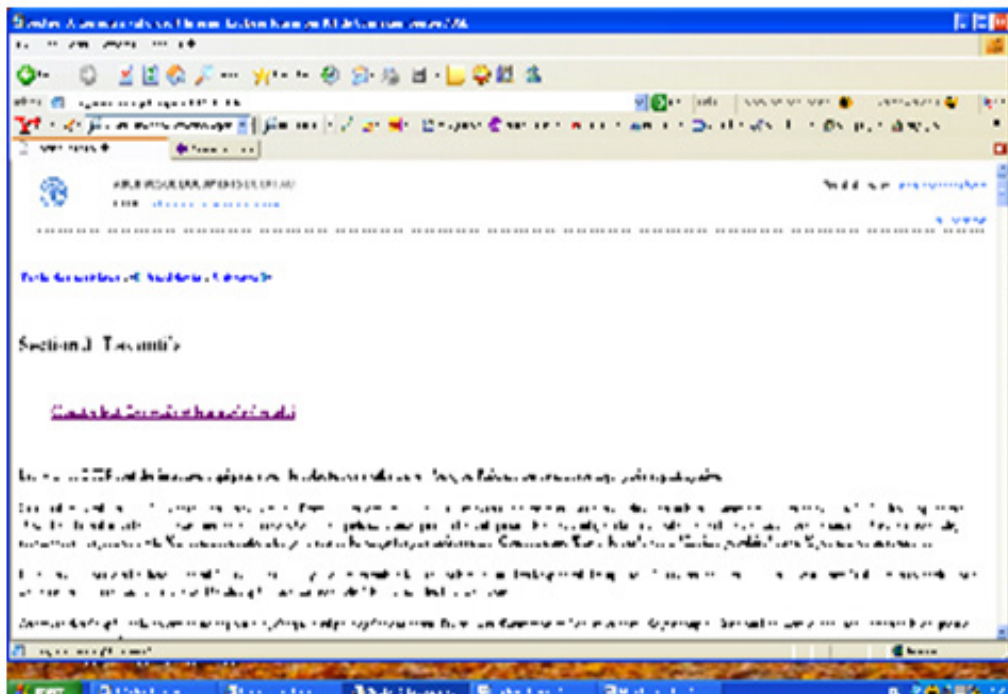
<http://fr.wikipedia.org/wiki/Dessin> <http://www.google.sn/search?q=Outil+Dessin&hl=fr&lr=&start=90&sa=N>



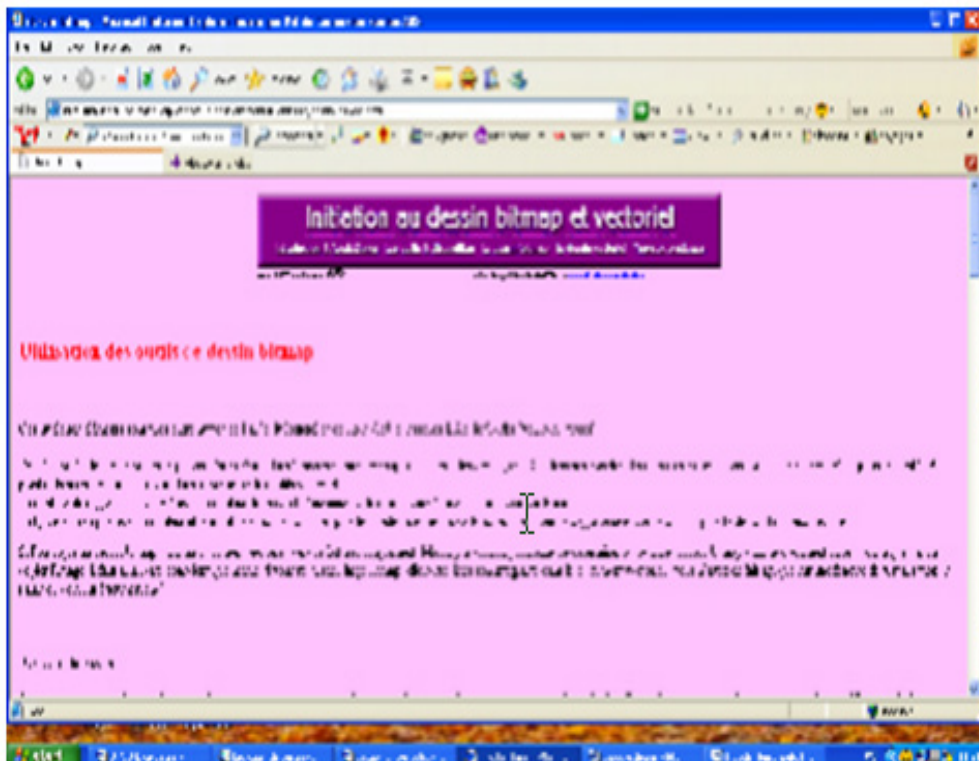
<http://www.info-3000.com/photoshop/outildessin.php>



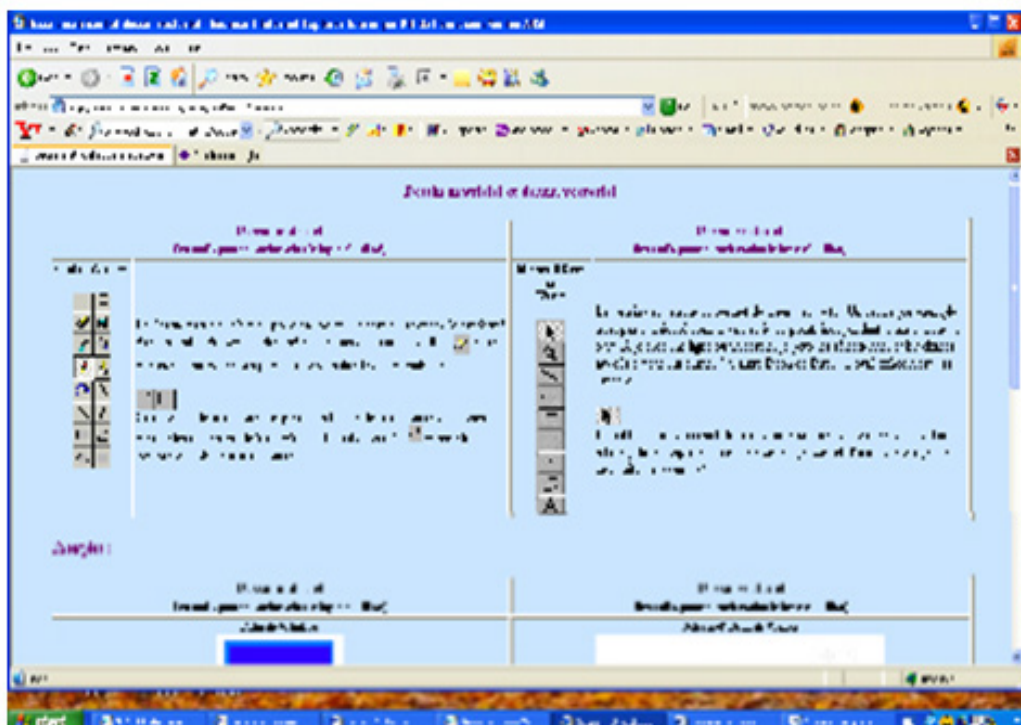
<http://www.fao.org/docrep/u5810f/u5810f0a.htm>



http://www.wedu.ge.ch/cptic/prospective/enseignements/sic/dessin/dessin_bitmap.html



<http://weco.csriverraine.qc.ca/cemis/tic/Dessin/dessin.htm>



Abstract

The links provided to learners explain the roles of different tools and icons that are used to draw or create schematics. Some links offer other drawing tools (Corel Draw ...) and explain the difference between drawing bitmap and vector graphics. They can be viewed by those who want to learn more.

Rationale

Visiting these links enables learners to become familiar with the icons of drawing tools and their instructions.

Formative evaluation

Give some names of Drawing Tools (30% of the points)

Represent a series circuit comprising a generator G, an open switch K, a resistor R, a lamp L, an ammeter, a rheostat Rh, and an electrolyzer E. (70 % of the points)

Learning activities

The beneficiaries of the training are oriented towards the required readings. They spend 3 to 4 hours of time browsing these readings to learn the basic skills of the drawing tool. They will then exchange ideas on the different functions of these tools in the chat (eg. how to draw straight lines) for an hour. It

is only after this that or they can open the drawing tool by clicking on the icon menu in Microsoft Office Word.

They choose the tool that they want to use first.

They may or they choose to draw schematics of the different appliances offered by clicking on the circle or rectangle.

They may then place the schematics one after the other like devices are in series.

After they or they click on the line to make the connections between the devices. They then select it or the whole entire circuit and put it in a group (inseparable block). For this they will click after selecting the tab «Draw» from the toolbar, and choose the tab «Group».

Their responses will be deposited into the student workspace, with the name(s) of the designer(s) under each schematic.

Correct answers

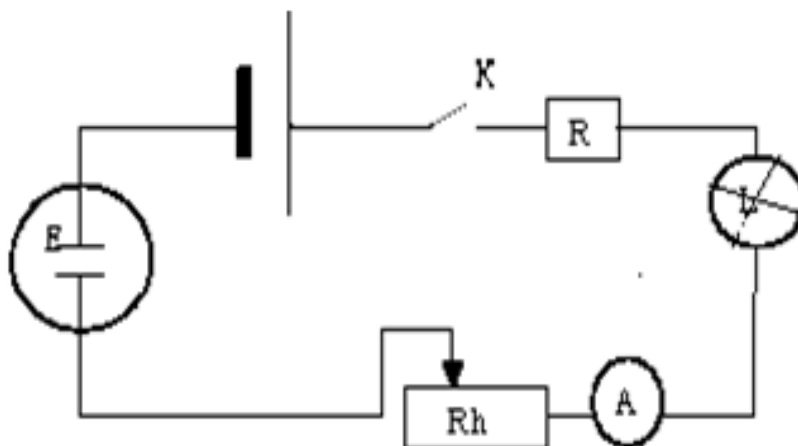
The arrow: Good answer, because the arrow is used to draw arrows (oriented lines)

The line: Good response, we use the line to draw horizontal, vertical, oblique, and broken lines

The circle: The circle is used for drawing circles or ellipses

The rectangle: The rectangle is used to draw squares or rectangles

The circuit diagram is as follows



Note. For the evaluation of this schematic, it should be noted that for the generator, the two terminals do not have the same length or the same thickness. As for the electrolyzer, the conducting wires arrive at the electrodes (two horizontal lines in E). It will also ensure that the circuit diagram forms an inseparable unit.

Self evaluation

Note any difficulties encountered, and make diagrams of the following objects: a converging lens, a diverging lens, the resultant of two vectors of rectangular forces.

Make a note of this activity and file the report in the student workspace.

Teacher's guide

The teacher will check if the lines are properly drawn: the horizontal lines and vertical lines should not have the form of broken lines. He or she should check if the generator is represented by two vertical lines of different length and thickness.

He... or she will check if the whole circuit forms an inseparable unit.

The correction will be made and adequate feedback sent to the designer of each schematic.

The grade given to each learner will account for 20% of the evaluation of the module.

Learning activity 6

Title of the activity : simulation of a physical phenomenon

Learning time : 15 hours

Guidelines

For this activity, if you have at least $\frac{3}{4}$ of the points, you have done very good work, and you may continue with the module.

If you have less than half of the points, you must re-read the lectures, and redo the activity.

If you have more than half of the points and less than $\frac{3}{4}$ of the points, you have done good work, but you must make an effort to improve in the future.

Specific learning objectives

The learner must be able to:

- Find information from a portal such as Google
- Establish an observation grid
- Communicate via the Internet with peers.

Abstract

In this activity, it does not consist of creating simulations, but to find sites dealing with computer assisted simulation (CAS). The learner will be directed to two types of simulation with different functions. They must make an observation grid comprising mainly of the opportunity of the simulation (a fast phenomenon, slow, difficult to achieve due to nonexistent or expensive equipment, presenting a danger ...), advantages and disadvantages of the simulation.

Important readings

DIOUF, S. (2006). Les TIC dans l'enseignement des sciences. Université Cheikh Anta DIOP de Dakar. Faculté des Sciences et Technologies de l'Education et de la Formation (FASTEF ex ENS). Sénégal. Cours inédit.

CHARLIER, B. (1999). Utiliser les TIC, une occasion de changer sa pratique ?

SYNITC, CTA-HORNU.

PERREAULT, N. (2003). Rôle et impact des TIC sur l'enseignement et l'apprentissage au collège I. Collège Edouard-Montpetit

Abstract

These readings inform the learners on ICT integration in education and opportunities for enhancing learning through ICT.

Rationale

The various experiments discussed in these books can be a motivator for learners.

Activity description

Learners and learning will observe physical phenomena that have been simulated. Some simulations are used to illustrate a way to help see what is impossible or difficult to see with the naked eye, others most of the observed phenomena allow learners to practice. For each case, the learners will notice the benefits and limitations that the simulated phenomenon presents.

Key Concepts

Simulation : action to make something seem real

Computer assisted simulation (CAS): uses possibilities of calculation and display of the computer to simulate an experience or phenomenon and represent it on the screen with different levels of complexity, interactivity and realism.

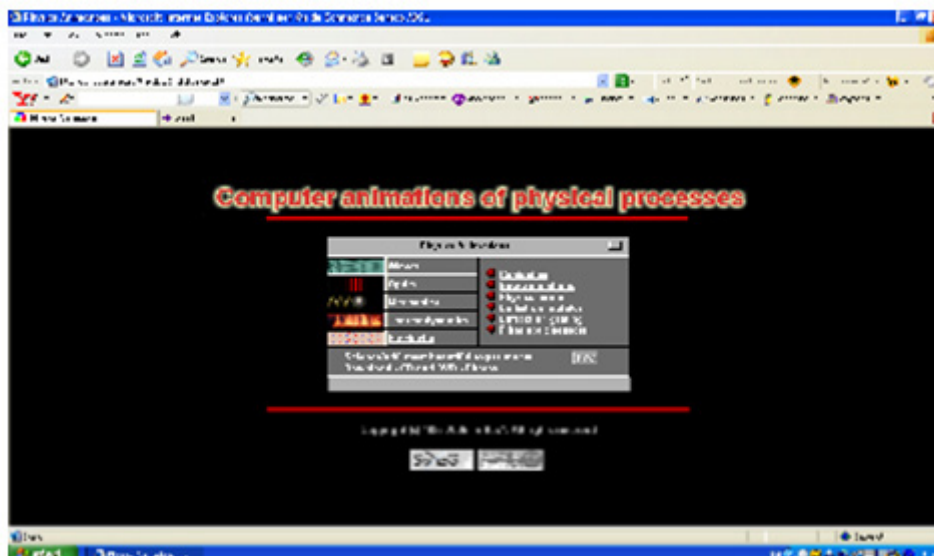
Animation of a physical phenomenon : any creation of moving images by using many different techniques. The movement is decomposed into a sequence of images whose vision at a given frequency gives the illusion of continuous motion.

Links

Summary of links

The following sites show simulations of phenomena to illustrate a lesson on waves, optics, mechanics, thermodynamics, electricity. All simulations are accompanied by an explanatory theory. Once one enters this site, they traverse the different tabs to display the corresponding simulation. To see the corresponding theoretical explanation, they must click on Video. Some sites show simulations of physical phenomena with the possibility of doing exercises. You can change parameters and see some curves, values ...

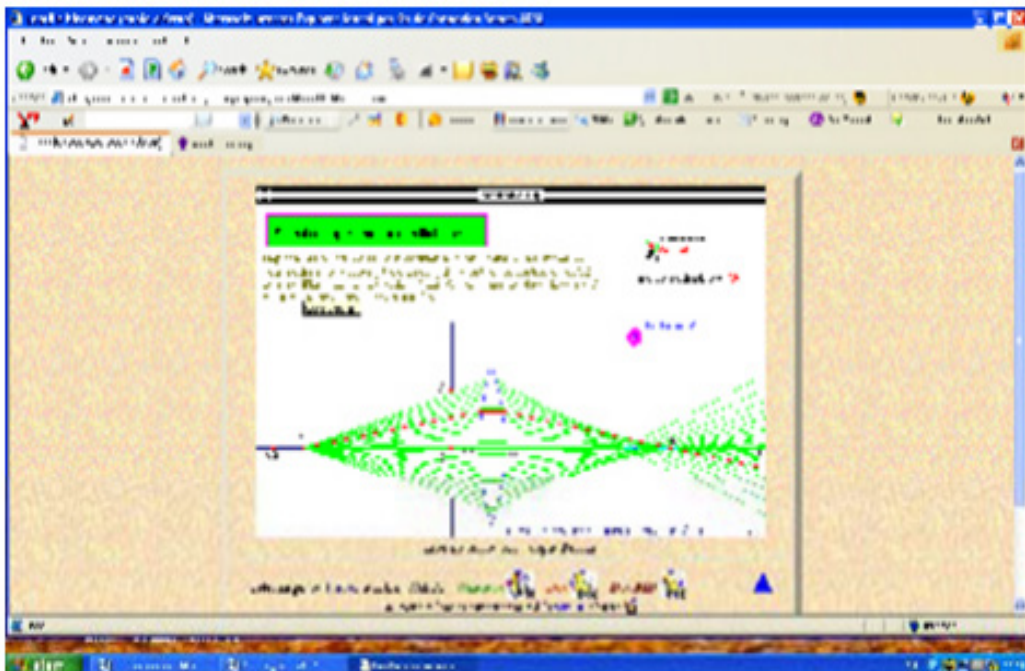
<http://www.infoline.ru/g23/5495/Physics/English/waves.htm>



Simulated optical phenomena.

<http://www.sciences.univ-nantes.fr/physique/perso/cortial/bibliohtml/biconv2.html>

Stigmatism approached by a convex lens.



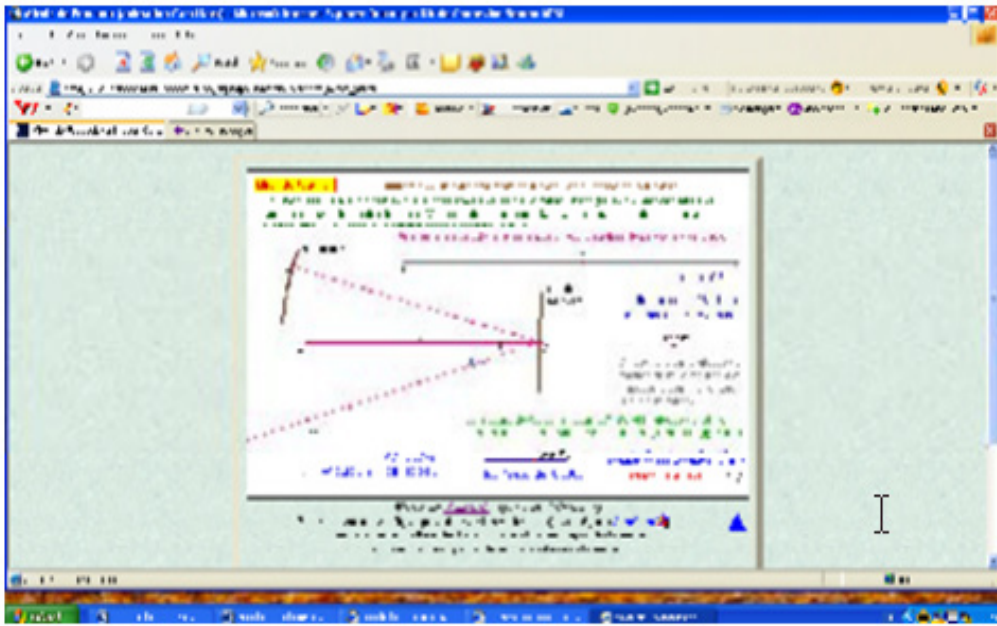
<http://www.sciences.univ-nantes.fr/physique/perso/cortial/bibliohtml/retrjn.html>

Night-day viewer.



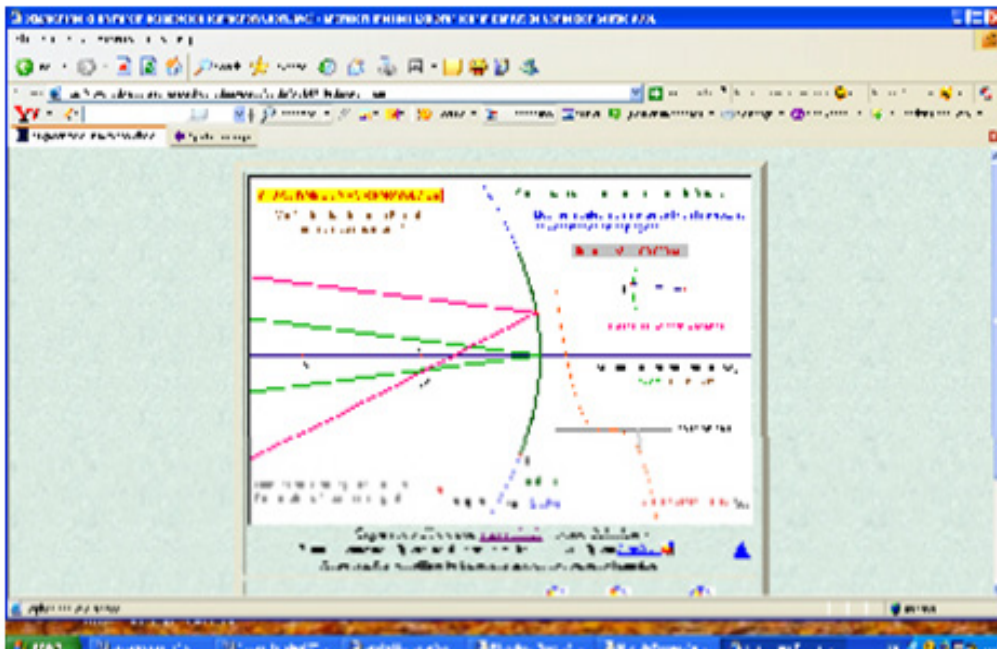
http://www.sciences.univ-nantes.fr/physique/perso/cortial/bibliohtml/mirfct_j.html

Foucault mirror



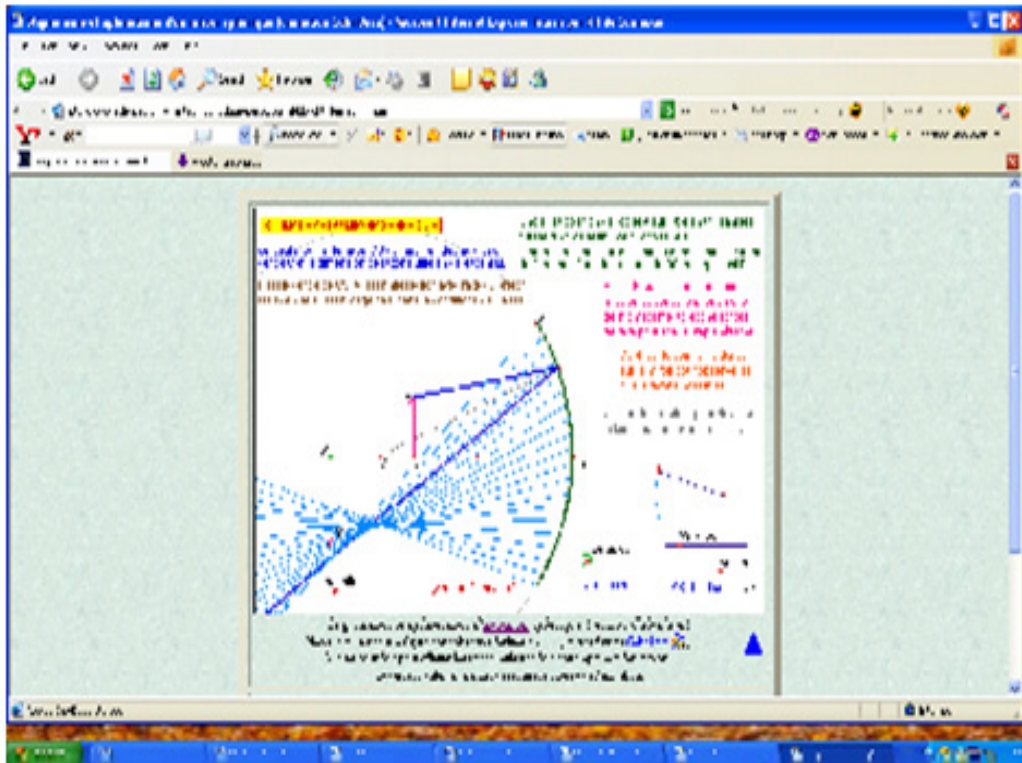
http://www.sciences.univ-nantes.fr/physique/perso/cortial/bibliohtml/stigpara_j.html

Stigmatism of a parabolic mirror



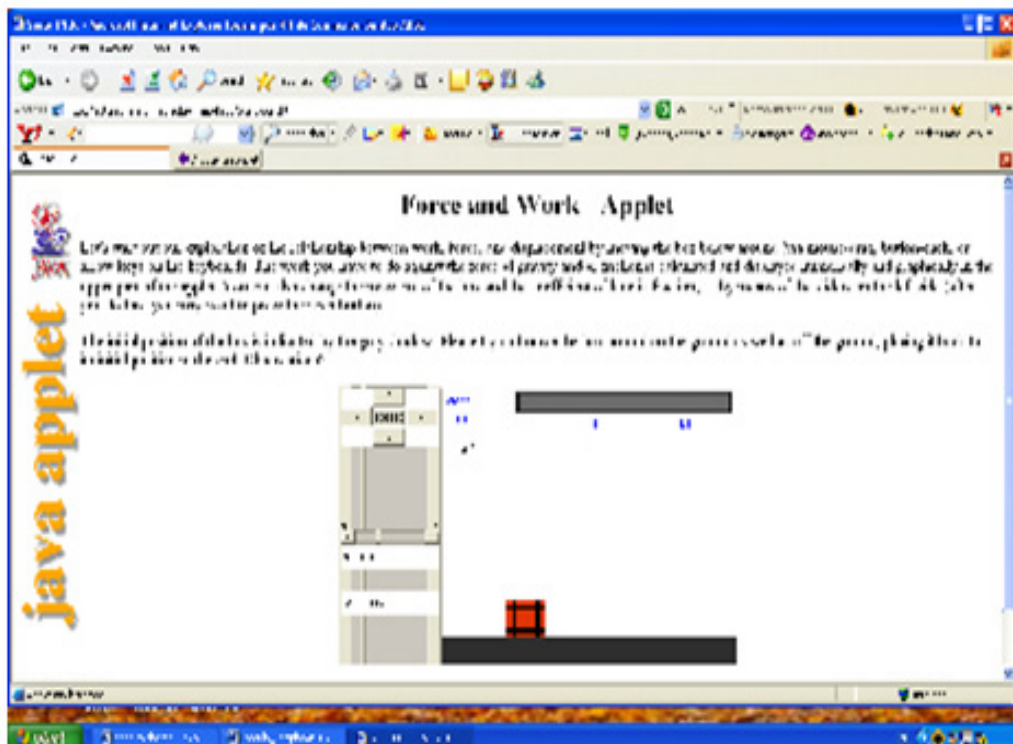
http://www.sciences.univ-nantes.fr/physique/perso/cortial/bibliohtml/mirsph_j.html

Stigmatism of a spherical mirror



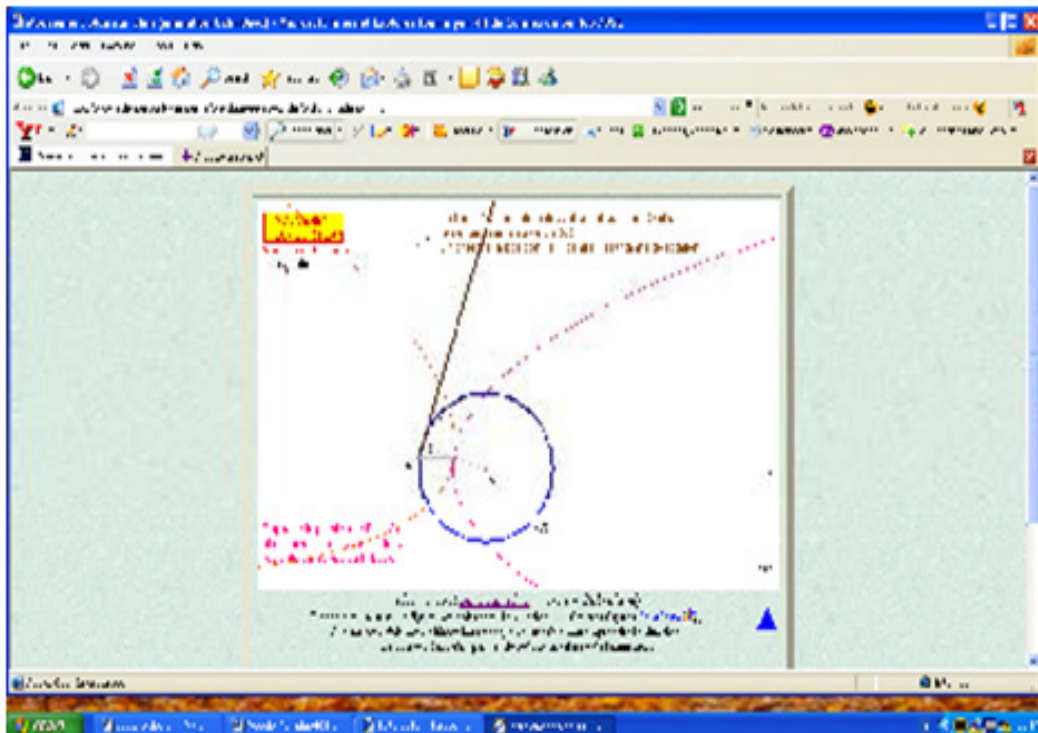
Simulated mechanical phenomena

<http://lectureonline.cl.msu.edu/~mmp/kap5/work/work.htm>



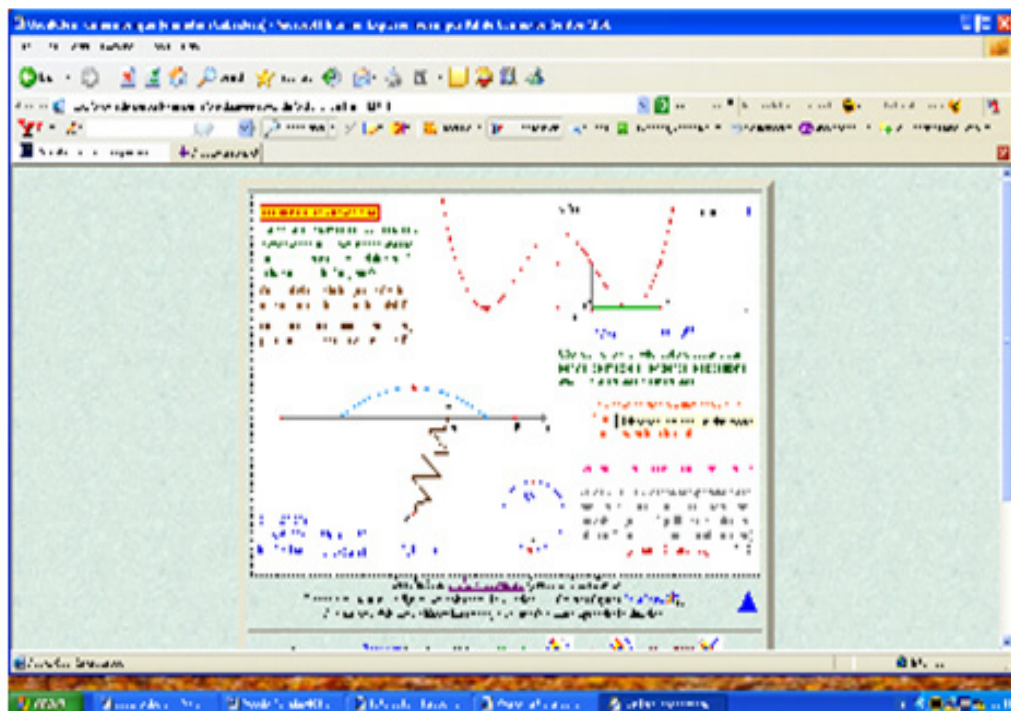
http://www.sciences.univ-nantes.fr/physique/perso/cortial/bibliohtml/planpl_j.html

Plane on plane movement



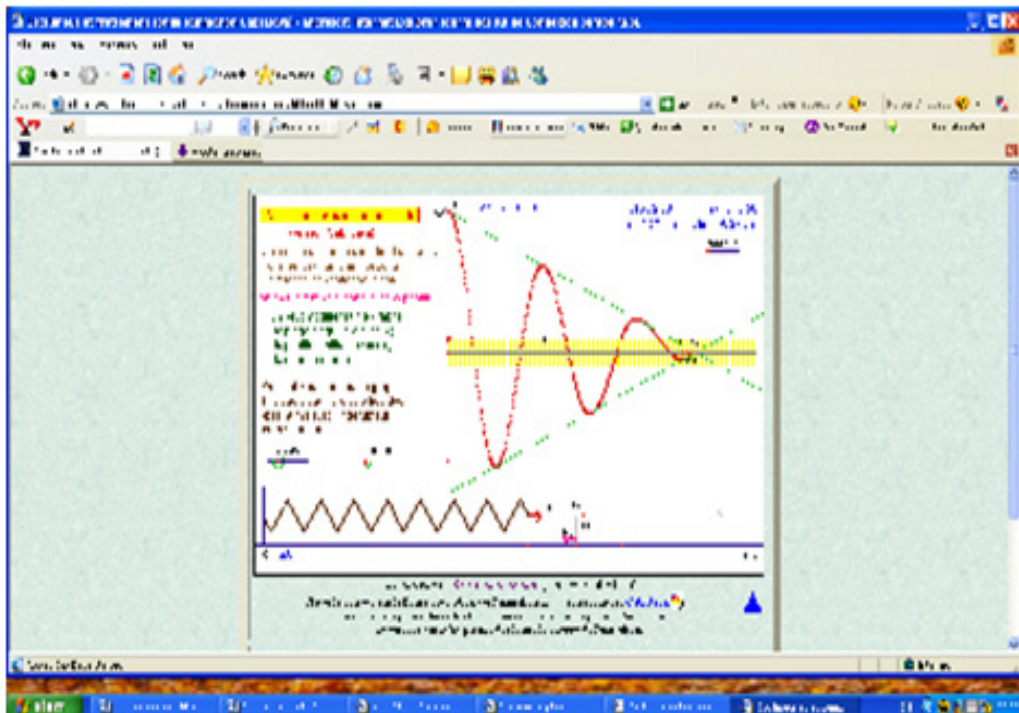
http://www.sciences.univ-nantes.fr/physique/perso/cortial/bibliohtml/anharm_j.html

Anharmonic oscillator



http://www.sciences.univ-nantes.fr/physique/perso/cortial/bibliohtml/frtsol_j.html

Oscillator and solid friction



http://www.sciences.univ-nantes.fr/physique/perso/cortial/bibliohtml/frofu_j.html

Oscillator and fluid friction



Important resource

<http://archive-edutice.ccsd.cnrs.fr/edutice-00001008/en>



This resource is a theiss in ICT. Once on the site, the learner will click on : 2005

Riopel thèse publiée.pdf . They will consult chapters 1 and 3 pto have an idea on the characteristics of CAS (advantages and limitations) to prepare their ob- servation grid.

Formative evaluation

The frst site visit is required. Type the URL address on the Internet. GO through the different tabs and note the advantages of the observed simulations (50% of the points). From the other available sites, choose one dealing with mechanics and one dealing with optics. Read the instructions and keep note of the observed phenomena (50% of the points).

Learning activities

Learners spend between 3 and 4 hours to do the readings proposed. These readings will test their knowledge of various kinds of simulation, and the advantages and disadvantages of each. After these readings, they will discuss in chat for at least

2 hours to discuss the elements of an observation grid. Once the grid is stabilized, they browse the simulations indicated. It is acceptable if they are working on the same simulation. They will keep note of the different simulations observed, do the exercises if necessary, and carry out their observation grid. They should note their degree of satisfaction with their expectations. Or when they have fnished, they will consign the URL of the site, and send their results via attachment to course professor.

Correct answers

There are two types of simulation: those that have the role of demonstration and illus- tration of a course, and those that have more exercises.

The learners will have an observation schedule which includes the name of the site, the benefits observed in the simulation, its drawbacks and the opportunity to simulate the physical phenomenon (very short experience, very long experience, expensive equipment, dangerous experiments, non-existent material, conditions of experiments not feasible ...) instead of an actual experience in a laboratory. The learner will have a grid with these topics.

URL :

URL :	Advantages	Limitations	Opportunity of t
Simulated physical phenomenon	(note what the simulation helps to see or understand, and if your expectations were satisfied)	(note what a real-life situation helps to see or understand, and which expectations were not satisfied)	Necessary, since: expensive material dangerous experience too slow fast experience not necessary since real-life experience is easier to understand....
.....
.....

Self evaluation

The teacher can organize a peer review by placing learners in sub-groups and give each group the URL of a simulation that has not been observed by a member of the subgroup.

The sub-groups observe and comply with their grid avoiding the difficulties they encountered earlier and then drop off their results in the student area (s) available to other learners.

Teacher's guide

The teacher who receives the attachments will correct the productions of each learner and subgroups. The teacher will correct the different grids produced by learners, and will place the corrected productions in the student workspace. The grade assigned to each learner will account for 20% of the evaluation of the module.

Synthesis of the Module

Summary of the principles and theories of pedagogical ICT integration

The scientific literature contains a broad range of statements on the principles and theories of ICT integration into instructional practices. This module identifies 28 key principles regrouped into 5 main orientations, each comprising a set of professional competencies to be developed in a teaching/learning context. Accordingly, teachers must be able to:

1- Exercise critical judgment and sensitivity regarding the real benefits and limitations of ICT as teaching and learning resources.

This first orientation includes 5 key principles:

1. Vigilance and careful assessment of the impacts of ICT on their students and on their own work
2. Alertness to social inequality or exclusion resulting from inability to access resources
3. The principle that ICT are not of themselves generators of innovative educational change
4. The principle that ICT serve the behaviourist, cognitive, constructive, and instructive approaches equally well
5. The principle that ICT should facilitate learning integration and transfer, make learning more meaningful, and help students develop their talents, imagination, resourcefulness, creativity, and the like.

2- Identify and assess the potential of computer software and networking technologies to develop targeted educational competencies.

The 5 key principles stemming from the second orientation are:

- Exploring a number of educational sites to identify appropriate resources in the teacher's subject area or teaching field
- Maintaining an activity bank to help students with their learning and to support other educational practices
- Assessing resources not designed for instructional purposes and adapting them for the competencies targeted in the study program. Evaluating tools and selecting those that best develop the intellectual and relational competencies targeted. An assessment of the potential of computer software and networking technologies to develop targeted competencies would appear to be critical for achieving educational targets, seeing that many commonly used resources (grammar checkers, Web sites, audiotapes and videotapes,

CD-ROMs, etc.) have not been specifically designed for educational purposes.

- Determining instructional needs and equipment requirements and eliminating items that are attractive but of little educational value.
- A thorough analysis of educational software to evaluate the content breakdown, presentation of learning and/or problem-solving steps, tracking reportage, and data handling.

3- Identify and communicate with a variety of appropriate multimedia resources (e.g., email), collaborative tools to which ICT can make a significant contribution.

Using ICT effectively, teachers can build networks for information sharing and professional development in their teaching fields and practices, bringing together the work and reflections of individuals with similar interests but from different locations. This orientation includes 9 pedagogical principles of effective communication that generate a "collective intelligence":

- Collaboration, teamwork, joint action, and utilization of the collective intelligence of individuals located at a distance
- The use of thematic, research, peer email, discussion group, databank, image, and sound networks.
- Selection of interactive resources and audiences for specific objectives
- The necessity of establishing selection criteria for professional development resources
- The use of collaborative peer networks to help train new graduates as well as colleagues
- Building networks of teachers who share the same expertise
- Guiding student-directed interactive learning
- Helping students' target, formulate, and refine their questions so that ICT information searches are relevant, meaningful and suitable.
- Careful precision in terms of the quality of language used.

4 - Use ICT effectively to search for, interpret, and communicate information and to solve problems

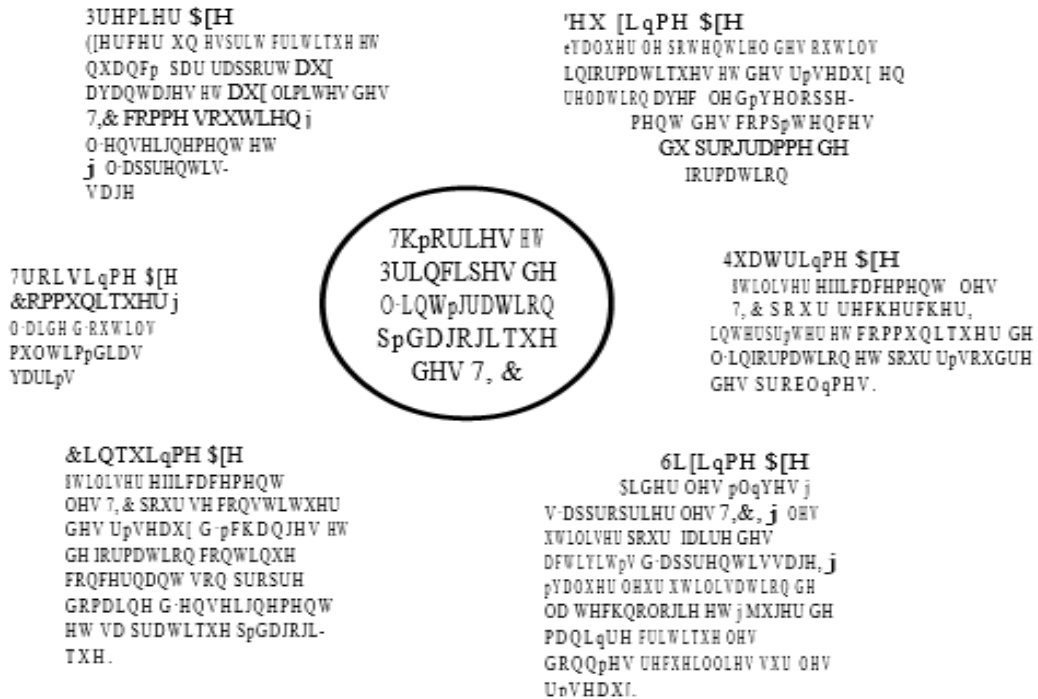
To better integrate learning resources, the information obtained must be converted into secondary culture (i.e. schooling) objects through the development of knowledge transfer competencies. The use of ICT therefore imposes new demands on teachers' ways of working: how they structure collective teaching, teamwork, individual work in the classroom, and homework. In this perspective, teachers must adopt 4 essential principles to help students use ICT productively for research and problem solving:

- Targeting of information, and critical analysis and conversion or transformation of useful resources into learning objects for educational activities
- Tracking of students' progress and interrupting their work as needed
- Raising awareness of Internet navigation and providing guidance, e.g., pointing out pitfalls
- Getting students back on track through suggestions, questions, and tips to help students develop critical search strategies.

5- Help students familiarize themselves with ICT and use it to carry out learning activities, assess their own use of ICT, and exercise critical judgment toward the information they find on the Internet.

Teachers must also have certain competencies and abilities in order to support student learning with ICT. Accordingly, 5 fundamental pedagogical principles must be applied:

- Developing basic and essential ICT competencies, with an emphasis on computer literacy: introduction to ICT functions and tools (familiarity with common software such as Word, Excel, PowerPoint, etc.) and basic operations (downloading, saving, and filing educational materials, compiling and organizing information).
- Choosing the appropriate tools for a given task, integrating a number of tools to solve actual problems, and using them on an everyday basis in a critical and productive way to serve as a model for the students.
- Using a diversity of ICT software to teach, learn, communicate, and solve problems in different subjects, and adopting clearly expressed, critical stance toward these technologies.
- Developing projects and the accompanying documentation (e.g., worksheets, digital portfolio) that integrate various aspects of the course content and extend the meaning of the information beyond the classroom.
- Evaluating the learning achieved through specific questions, effective work processes (e.g., integrated online self-evaluative learning, access to glossaries and extra class notes at Internet-accessible hypertext sites, etc.) The following figure illustrates the main orientations of the key pedagogical principles of ICT integration.



Learners should be able, through this module, to identify the key-concepts in the process of ICT integration, and to critically engage the required readings and resources (an important skill in Open and distance learning). Examples of learning activities, which can be modified to suit specific disciplines, are provided, as are a number of useful links (illustrated with screen captures), the latter presenting pedagogical resources and serve to guide educators and learners in their knowledge-seeking and training processes. A bibliography is provided to further support techno-pedagogical skills, facilitate research, lesson planning, teaching, problem-solving, professional development, and most importantly to enhance student's learning through ICT.

Synthesis specific to physics

After this learning module for integrating ICT in physics, the learner will be capable of using an Excel spreadsheet to:

- Draw curves between two physical quantities
- Calculate the sum, product, and the ratio of two or more physical quantities.

Learners can create the standard schematics and designs of any device or instrument used in physics.

The module will enable them not only to visit sites of simulation of physical phenomena, but also to refine their knowledge in simulation. Each of the four learning activities integrating ICT in physics contains a number of useful links to deepen the knowledge of the learner. Each link is characterized by a screenshot that shows the contents of the site proposed to them. The module contains a summative evaluation focusing on the mastery of certain concepts in ICT and the use of ICT in physics.

Summative Evaluation : ICT Integration in Physics

1. (1 point) From the following answers, choose that (or those) that allow synchronous communication between two or more individuals :

- a. a forum
- b. chat
- c. mail
- d. a CD ROM
- e. the white table

2. (1 point) Which of the following softwares allow(s) the drawing of curves ?

- a. Powerpoint
- b. Word
- c. Paint d. Excel
- e. Drawing tool

3. (1 point) A physics experiment takes more time than a session of courses.

In order for students to better understand, a teacher must :

- a. not discuss the experiment.
- b. show the students a simulation of the experiment
- c. show a schematic of the experiment
- d. describe the experiment theoretically

4. (2points) You must calculate the square of a physical quantity whose value varies with time, choose, from the following statements, those that fit this situation the best

- a. word processing software
- b. database software
- c. spreadsheets

Give the different steps of the calculations being asked for.

5. (2points) Classify the following communication tools in two categories :

those that use only the voice, and those that use only writing

- a. Video conference

- b. Forum
 - c. Skype
 - d. White table
 - e. E-mail
 - f. Yahoo messenger g. Chat
6. (2 points) Which is the correct statement from the following : I.C.T. stands for :
- a. Informal and Communication Technologies
 - b. Information and Communication Techniques
 - c. Information and Communication Technologies
 - d. Informal and Communication Techniques
7. (1 point) We define the Internet as :
- Connecting a large number of computers using networks, such as a telephone, to exchange information across the world.
- a. True
 - b. False
8. (1 point) We define the Intranet as :
- Connection restricted to a group of authorized users
- a. True
 - b. False
9. (1 point) A synchronous tool is a collaboration tool differed between people located in different places.
- a. True
 - b. False
10. (1 point) An asynchronous tool is a communication tool in real time between people located in different places.
- a. True
 - b. False

11. (2points) From the following communication tools, name two that are asynchronous.

- a. videoconference
- b. telephone
- c. forum
- d. e-mail

12. (1point) In the drawing tool built into Word there is an eraser

True or False

13. (2points) What does NITC signify ?

- a. Numerical information technologies and communication
- b. Number of information technologies and communication
- c. New information techniques and communication
- d. New information technologies and communication

14. (2points) ITCE signifies :

- a. Information technologies and communication for educating
- b. Information techniques and communication for education
- c. Information techniques and communication for educating
- d. Information technologies and communication for education e. Informal techniques and communication for educating
- f. Informal technologies and communication for education

The formative evaluation will count for 20% of the final evaluation.

Correct answers

For each answer, adequate feedback is given.

1.a. Think again, in a forum the other person can answer several hours or days after

b. Good answer. You understand that a chat's response must be immediate, or else there would be no chat.

c. Do not rush, you know that when you send an email to someone, they can not respond or wait several days to do so.

d. The CD ROM is not interactive.

e. Good response in a whiteboard, the students work simultaneously.

- 2.a. PowerPoint is a presentation software and it does not draw curves.
- b. Word is rather a word processing text
- c. Paint used to draw pictures and diagrams but no curves
- d. Very good, indeed the Excel Chart Wizard allows you to draw curves e. As its name suggests, the Drawing tool allows to make drawings and diagrams but no curves
- 3.a. Certainly not, he or she would do a disservice to their students.
- b. Very good. A simulation is recommended in this case because it allows a better understanding.
- c. The diagram is not enough. The teacher would not be helping the students. d. A simple description is inadequate because it is not lively.
- 4.a. Do not rush to respond, the software word processors are particularly suited to treat text.
- b. The software databases have a function other than to make such calculations c. Good answer, a spreadsheet like Excel is especially recommended for this type of calculation.

Process to follow:

vertically copy the values of the quantity in a column by replacing the comma (if present) with the points (if you have the English version)

In the 2nd column, enter the formula to allow a value to be multiplied by itself, while ensuring that the formula is preceded by an equal sign (=) If the first column is A, and the first value is in line 2, enter the formula = A2

* A2.

Press OK or type Enter to validate the formula

Copy the formula down: select the cell containing the formula and click on the right bottom corner of the cell containing the formula, then click to drag down the column.

Note: if a learner writes the same values in two successive columns eg A and

B, introduce the formula as = A2 * B2, and the rest remains unchanged.

5.acf are those that only use the voice, as they require a telephone system. bdeg are those that use only writing.

Good answers, you know the difference between oral and written communication tools

For any other answer as (abf, adf, bcf, dcf, ecf, gcf, abd, ADEG,) you are incorrect, reread the question.

- 6.a. Watch out, ICT is not informal
- b. Careful, there is a difference between techniques and technologies
- c. Very good, correct answer
- d. ICT are not techniques
- 7.a. Yes, in fact the Internet is a network of networks used in the world.
- b. Attention, please reread the question before trying again
- 8.a. Bravo, the Intranet is for an institution or a department. Only members of the department or institution have access.
- b. You confuse Intranet and Internet
- 9.a. Reread the question
- b. Very good, indeed, synchronous does not mean delayed. Synchronous means in real time.
- 10.a. Do not rush to respond.
- b. Very good response, asynchronous and real time are not the same. Asynchronous means delayed.
- 11.a. Watch out, videoconferencing is in real-time. It is therefore synchronous.
- b. You know the phone is live and not delayed. It is therefore synchronous.
- c. Correct answer, a forum is delayed and it is asynchronous.
- d. Good answer, email is delayed and it is asynchronous.
- 12.a. You confuse the drawing tool and other software
- b. Good answer, the eraser is in Paint
- 13.a. The NITC can process digital information but the N does not signify numeric.
- b. It is not a number of technologies.
- c. Beware the NITC are not technical.
- d. Good answer, you know what each letter of NITC represents.
- 14.a. Educating is a particular area where the ITCE are involved but they go beyond
- b. The ITCE are not only technical.
- c. The ITCE are not only technical and are involved beyond education
- d. Good answer, you know exactly what each letter of ITCE represents.
- e. ITCE are not only technical or informal
- f. Reread the question carefully, the ITCE are not informal.

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<http://www.infoline.ru/g23/5495/Physics/English/waves.htm> http://www.lino.com/~vmartino/Excel/Excel_ba.htm : Basic Excel http://fr.wikipedia.org/wiki/Image_vectorielle

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Salomon Tchameni Ngamo is the author of the introductory, conceptual framework, portion of this module. He studied Classics in his home country of Cameroon. In the four years since his MA in Education from Université de Montréal in Canada, he has developed expertise in the pedagogical integration of ICT. With a combined 15 years teaching experience in Africa, after winning an excellence prize during his own training, he is a department head at The National Institute of Youth and Sport in Cameroon, where he also instructs. In addition to his own research, he has co-authored course syllabi and research guides. As a research professional at the Canada Research Chair on Information and Communication Technology (ICT) in Education he coordinates joint Université de Montréal/ER-NWACA transnational research projects on ICT integration in Education in West and Central Africa. Also an online teaching assistant, he is responsible for several cohorts of African students in the Université de Montréal/UNESCO/ l'Agence Universitaire de la Francophonie distance learning micro-programs. Most recently, Salomon Tchameni Ngamo's expertise is being put into action in the development of Université de Montréal's first distance education PhD offering, while he is also finishing his own PhD thesis in Pedagogopsychology.

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ICT INTEGRATION IN TEACHING AND LEARNING PHYSICS

Required Readings

Sources: Wikipedia.org <http://cordis.europa.eu/ictresults/index.cfm?section=news&tpl=article&BrowsingType=Features&ID=80430> www2.unescobkk.org/education/ict/resources/.../Singapore_ICT.doc

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