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### **CALIS (Computer-assisted learning for information searching)**

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#### ***Abstract :***

*The present project is submitted by the Swiss Virtual Campus. We are developing an internet-based CAL package for students in economics and in dentistry. Its goal is to teach students how to utilize the information resources provided by university libraries in a systematic and efficacious manner. This applies to all types of electronic or written media: dictionaries, reference books, web sites and/or electronic journals.*

*In consideration of the abundant supply of scientific information, it is of prime importance to prepare students to*

- understand and qualify their information needs*
- acquire a working knowledge of available information resources in the field of economics and dentistry*
- conduct efficacious retrieval searches*
- critically appraise and utilize the information retrieved.*

*The objective of CALIS is to teach students the concepts and skills required to identify pertinent sources of information and to conduct effective search procedures. The expertise thus acquired should meet the student's as well as the future professional's needs.*

*The original aspect of this project is the learning concept, organized in three modules.*

- First module deals with the formal knowledge of resources, tools and techniques of information searching.*
- The second module gives access to a practical know-how in retrieval strategies.*
- The third module teaches how to use and cite the information retrieved.*

*Each module can be used independently and will be submitted for accreditation.*

*The training can be use in two ways: entirely on-line (for continuing education) or as a support to students in the library.*

## 1) The origin of the CALIS project

CALIS means « computer-assisted learning for information searching ».

This project is one amongst the 50 projects which have been retained within the frame of the Swiss Virtual Campus.

The Swiss Virtual campus is a national programme designed for the universities and Higher Schools : Polytechnic schools and Higher Specialised Schools. The main objective is to develop distance courses by :

- Encouraging the use of information and communication technologies for higher education
- Improving the quality of teaching with the diversification of pedagogical methods and with the introduction of more diversified and more participative learning.
- Increasing the collaboration between the different Swiss Higher Schools
- Facilitating the reciprocal equivalency of achievements, to allow students to validate distance learning.

This programme has been voted at the national level, and the parliament provided the universities with the sum of 30 million for the period 1999-2003, for the funding of the Swiss Virtual Campus. Two calls for projects have been sent to the universities and Higher Schools as a whole, in 1999 and 2000.

The project has been proposed by Mrs Esterman, Head of the Department of Documentation and Library Science studies at the School of Business Administration in Geneva. This school belongs to the group of Swiss Higher Schools. The project was started on May 1st 2001, under the previous name of « Design of a CAL package teaching students effective information retrieval strategies », which became CALIS afterwards.

Two statements are at the origin of this project :

- First statement: collections are very important in Swiss libraries (books and prints, but electronic resources as well : data bases, electronic reviews, CD-ROMs, the internet)
- Second statement: these collections are underused, even unused by the students who have very little knowledge of the resources, and of the research tools and strategies !

Now many experiments conducted in the universities, and related to personnel management, let us know that, at the present time, information literacy is a competency required from the first year in academic studies and it is particularly important for essays and thesis. It is also required during professional activity, in view of lifelong learning.

This competency, called in French « culture de l'information », and in English « information literacy », implies for everyone the awareness of personal information needs, and the capacity of identifying, assessing and using adequately the results of one's research.

That is the reason why Higher Schools considered as a prime necessity to prepare students to :

- Determine their informational needs
- Know the information resources in relation with their subject
- Search information adequately
- Process the information retrieved with a critical mind

Teaching these competencies is the purpose of the CALIS project.

## **2. What is ...CALIS ?**

CALIS is a pedagogical package. There are many existing packages, some of them proposing games, others compiling information, such as encyclopaedias and learning materials.

CALIS is a learning package to help students identify resources and research information. The acronym CALIS consists of two elements. « CAL » for Computer-assisted learning » and « IS » for information searching.

The qualification of pedagogical package can be applied to CALIS, because we propose an academic course in the field of strategies for information searching.

The advantage of this material, compared to other learning supports, can be found in the opportunity given to students to have access to the course in the distance. Let us be precise that when we call this type of course « e-learning », we are not using the appropriate term, because what is electronic is the communication, not the teaching!

### **CALIS users**

In the first phase of conception and development of the project, 3 subjects, and one group of students have been targeted :

- The subjects are Economics, Dentistry , and Library Science.
- Students attending the different faculties where these subjects are studied are the target group.

When the phase of conception and development is over at the end of 2003, pedagogical software will be proposed for the continuing education of information professionals and others, depending on the available subjects in the package. Other subjects will be taken into account for further developments.

### **CALIS partners**

Every project belonging to the Swiss Virtual Campus has been developed with diverse partners, as required from the start.

The 3 main partners of CALIS are the Universities of Geneva, Lausanne and Montreal. The School of Business administration in Geneva (Department of Information and Library Science) is responsible for the project and is in charge of the co-ordination.

- In Geneva, we are working with the faculty of Social and economic Sciences and more particularly the Library of the Medicine Faculty, section of Dentistry.
- In Lausanne, we are working with the Regional Academic Library (section of Economics) and the Centre for the use of technologies in education and training.
- The EBSI of Montreal (The School for Information and Library science) is one of our partners too.

And last, we are working with RERO, the catalogue of the Romand Libraries network.

Each partner is a direct participant through funding, or an indirect one through the collaboration of people who give time to the project.

This multiform partnership was the opportunity to constitute a team with three types of competencies :

- Pedagogical competencies : transmitting knowledge in a distance learning environment

- Technological competencies : choosing the platform, integrating contents, working around the interface
- Information competencies : searching and assessing sources, implementing research strategies...

About fifteen persons are members of the team :

- The pilot is working for the project for 20% of the time. She supervises the financial and communicational aspects.
- The co-ordinator works for the project for 80% of the time, and she is in charge of the conception, the realisation and the implementation of the pedagogical contents.
- Three assistants help with the computers and the information science aspects.
- Librarians specialised in the fields of Economics and Dentistry are members of the team too (7 persons as a whole).
- And last, faculty staff, specialised in these fields, are associated with the piloting group.

These people mainly work part-time on this project (between 5 and 20%), and in 7 different locations.

### **3. CALIS : Conception and realisation**

At the beginning, we defined more precisely what we wanted to teach students (the contents of CALIS), the way we wanted to organise these contents (general conception), and the functionalities of the tool to be used for the teaching (the platform).

#### **a) The contents**

Four main aims have been defined for CALIS :

First aim : Implementing a systematic method for information research.

Second aim : Identifying the information which could be used.

Third aim : Using every type of information resources available: documents in print, directly available in the academic library, or electronic on-line documents.

Fourth aim : Knowing the specific resources in the subject field.

To obtain more confidence in the accuracy of these aims, we agreed to utilize the five principles for information literacy, as established by the Association of college and research libraries (ACRL, January 2001), and we refined the required competencies (performance indicators).

The translation of each competency into performance indicators, and into cognitive objectives, according to the Bloom taxonomy, allowed us to make a clear statement of what was required (knowledge, skills, or behaviours) and to determine the learning types.

As a matter of fact, the learning strategies are different, according to the learning types, the latter being more or less student-centred, and indicating the interactivity level to be implemented in the software.

The 5 principles (ACRL) :

An information literate student can :

- 1) Recognise information needs and determine the nature and the impact of the needed information
- 2) Access efficiently to the information needed
- 3) Assess with a critical mind information and information sources, in view of integration to his own knowledge
- 4) Use information efficiently, in view of a precise goal, individually or in group
- 5) Comprehend and apply the ethical, legal and social considerations in link with using information

The performance indicators derived from these principles allowed us to translate concretely what the students were able to realise.

For example, the first principle (« Recognise information needs and determine the nature and the impact of the needed information ») can be declined with the following performance indicators :

The student can :

- Determine and explicitly state his information need by formulating it under the form of a question
- Identify a range of types and formats for potential information resources
- Identify the diverse modalities to retrieve information and choose the more appropriate ones
- Re-assess the nature and the extent of his information need.

Bloom defined successive levels for cognitive objectives :

- The cognitive objective of acquiring knowledge (the students can feed back what you told them)
- The objective of comprehending (the students must be able to explain a concept with their own words)
- The objective of applying (the students must be able to solve a problem)
- The objective of synthesis (the students must be able to create new solutions )
- The objective of assessment (the students must be able to practise critical thinking)

Starting from these indicators, we determined the level for the cognitive objective the student had to achieve. In that way, the indicator 1 (Determine and explicit his information need by formulating it in the form of a question) includes the cognitive objectives of comprehending and synthesis.

This type of analysis allowed us to construct the scenario for the use of the software.

### **Analysis example for the first principle**

Defining the required competencies, the performance indicators, the cognitive objectives and deducting the types of knowledge (synthesis).

<b>Information literacy competencies</b> The information literate student can	<b>Performance indicators</b>	<b>Cognitive objectives (Bloom)</b>	<b>Types of knowledge</b> ( knowledge, skills, behaviours, know-how)
<b>First principle:</b> « Recognise information needs and determine the nature and the impact of the needed information »	Reformulating	Comprehending	Know-how
	Knowing information resources	Acquiring knowledge	Knowledge
	Knowing information research tools	Acquiring knowledge	Knowledge
	Knowing information research strategies	Acquiring knowledge	

### Putting types of knowledge together

Synthesising the types of « knowledge » derived from the 27 performance indicators allowed us to highlight the fact that the competencies to transmit could essentially be found among the « skills » (8/27) and « know-how » (10/27). These two types of knowledge can only be acquired if the student is engaged in his own learning. Then, we elaborated the learning scenario to obtain an ideal scenario with 5 phases.

The three first phases help the student to establish the pedagogical context and the learning to be achieved, while the two last are for enriching and consolidating the acquired knowledge.

- **1st phase** : preparing the learning

This phase is meant to clarify the starting point (environment) for the student, and indicates to him the learning environment, the objectives, the guidance, the assessment criteria and the modalities for the implementation of the learning activity.

- **2nd phase**: realisation

The focus here is on the activities to be undertaken as a whole to achieve the learning aims

- **3rd phase**: integration

The student is then placed in a learning situation he has already experienced, so as to be able to integrate properly what has been learned. He has to share this with other students, in peer-assessment, in group, or eventually, by the means of self-assessment. This integrating time is important and must specifically be enhanced in the scenario.

- **4th phase**: consolidation

This phase must allow the student to re-examine the knowledge acquired, especially if the goals have not been achieved, with the help of similar and complementary exercises.

- **5th phase**: enriching

The student should be able to transfer the knowledge acquired through related or more thorough investigations.

All these reflections : transmitting competencies, e-learning specificities and conditions for the realisation of a functional scenario highlighted two important aspects for the conception and the organisation of contents :

The general concept of the package must take into account the necessary common items for all the subjects (tools and research strategies), such as specific items in relation with each subject. It implies a lesson plan which presents separately the common knowledge items, and the specific ones.

Learning through this package implies for the student to be in charge. The package has thus to introduce and to conceive learning activities to be accomplished by students.

## **b) The organisation of contents**

The contents are organised within three different learning approaches :

- Learning centred on knowledge to acquire in view of information research : knowing the types of documents, sources and research strategies
- Learning more centred on reflexive thinking : analysis, assessment, synthesis...
- Learning centred on the « use » of information.

This can be found in the CALIS software through the elaboration of three separate modules :  
- **Module 1** : The lessons are centred on the essential knowledge required for pertinent information researches. That means theoretical knowledge about information resources, tools and techniques.

- **Module 2** : It is meant to teach the implementation of knowledge, skills and behaviours (the ones which have been put forward with the analysis of the types of knowledge)

- **Module 3** : The lessons deal with the use and the organisation of bibliographic results.

### ***Module 1***

The first module has been divided into 4 lessons. Each one is conceived within common core skills (independent from the subject), and specific skills (for each subject).

- Lesson 1 is about bibliographic, factual resources and guides
- Lesson 2 is concerned with research techniques
- Lesson 3 is entirely about on-line research techniques
- Lesson 4 proposes an on-line visit of the academic libraries participating to the project, so as to show the students all that is available on the website of his university.

Each lesson is associated with exercises, assessment and self-assessment charts.

### **Example derived from Lesson 1 - Module 1**

The 1st lesson of module 1 « information resources », has 2 objectives :

- Teaching a typology of the whole information resources which are common to the subjects
- Cataloguing the specific subject sources.

In the pages corresponding to the first and the second level can be found common knowledge items on information sources (all subjects put together) :

- Typology of sources : factual, bibliographic sources and bibliographic guides
- Criteria for assessing sources : notions of « cover », « authority » (fiability), of « novelty » (actuality), or notion of « public » to which the information has been designed .
- The types of documents : comprehending and defining the documents according to their type : periodicals, monographs, grey prints...
- Print and electronic documents : differences to be found in these types of documents, and consequences to be derived for information research, for example, the frequency of re-actualisation.

On this level, we can find illustrations of general resources, and of specific subject resources, so as links towards the characteristics and the specific criteria of this type of documents.

Commun knowledge

Animation of source

SOURCES BY DISCIPLINE

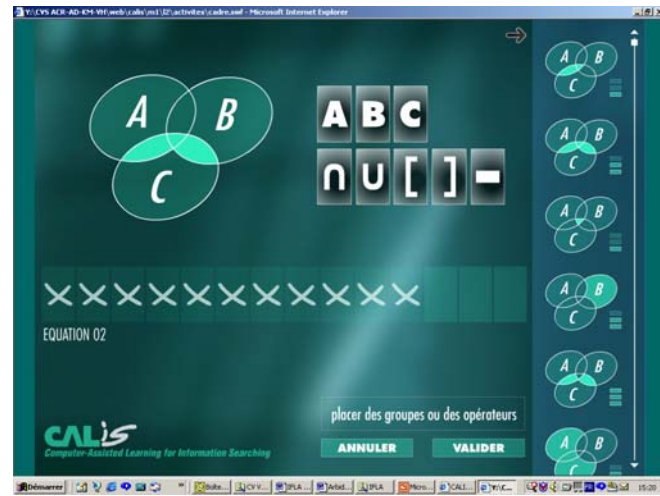
In the example which is given, we opened a pop-up by clicking on one of the illustrated animated sources: the « Universal alphabetical and analogical Dictionary of family names ». The reason is to illustrate the mentioned book (with a photograph) and to show the student a specifically how it is linked to the book. For that purpose, we always indicate a question at the top of the page (Here: When was Pius IX born ?) which allows the student to place the animation in context, and to animate the research (with an index, an alphabetical list, links...). Here, the research is a simple one, and only two steps are required. The first step indicates the page where Pius IX can be found, and the second step is an animation about the contents: a portrait of the pope and a short biography.

The « animated » documents are only those considered as essential. We allow the student to spend a little time consulting this document to increase his interest and his faculty for memorisation.

The other documents are just illustrated.



Exercises correspond to every lesson.



## Module 2

Module two is the implementation of knowledge and skills developed during module 2.

The two main objectives are :

The first one to equip the student with an information research methodology.

The second one to help him realise real information researches in relation with his subject (skills and know-how).

To conceive this lesson, we had to ponder upon :

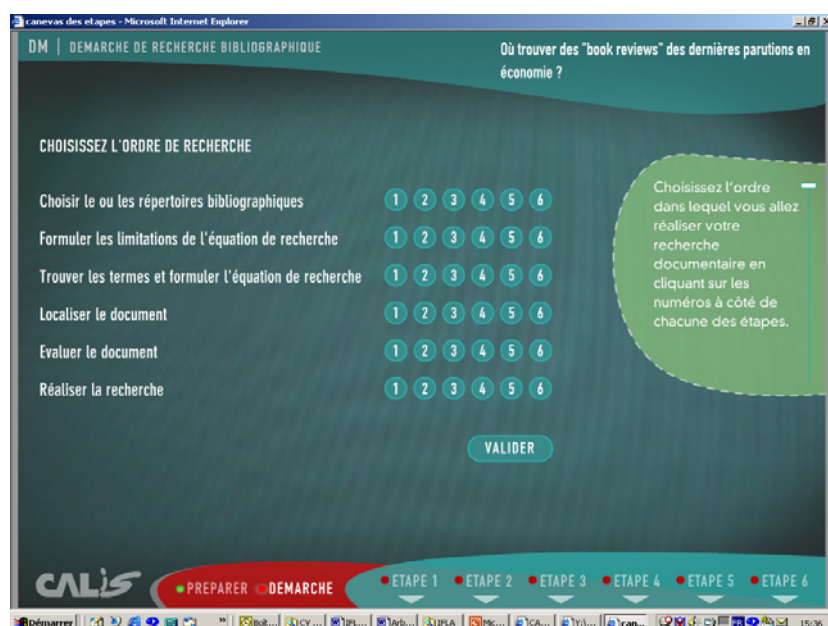
- 1) How to bring students to apply information research strategies with the help of the whole realm of resources and tools available ?
- 2) How to place students in a real information research situation, without getting them lost (especially when they use the internet !)
- 3) How to provide students feed-back on the researches made, while the results which have been obtained on-line never are the same...

This module has been organised depending on 2 specific subject lessons :

- The first lesson is centred on the methodology of the research strategy. It is called « Accompanied researches ». With the help of questions in the field of Economics or Dentistry, we propose student accompanied research, that is to say that we help him to develop research strategies, thanks to interactive activities, so as to enable him to comprehend how choices must be made among resources, tools, or assessment criteria.

- The second lesson is called « Free researches ». Students are placed in the situation of real researches, and feed-backs are given on the research procedures (and not on results). In this lesson, every student has to answer questions, in view of using the whole range of information tools and resources available through the platform, the catalogues (local and collective), and the internet.

## Example derived from Lesson 1 - module 2 :



The student uses a framework to make his research, starting from a question in relation with his subject (Economics or Dentistry). There are three different levels for questions (depending on the complexity of the research).

The research is divided into 8 steps ( 2 preparatory steps and 6 operative ones). At each step, the student can interact and validate his results.

### **Module 3**

Module 3 is about the use of information gathered by the students. The conception is the same as for module 1 : common core skills, separated from the subjects, and specific subject requirements (3rd level).

It is composed of 3 lessons : « Citing sources », « Writing a bibliography », and « Using a bibliographic tool ».

Two main objectives for the first lesson « Citing sources » : teaching students the minimal rules of author rights and making him aware of the negative impact of illicit copy ! The increasing « cut and paste » habits are becoming a major issue in the academic works produced by students.

Lesson 2 « Writing a bibliography » deals with the bibliographic rules to know so as to write academic essays.

Lesson 3 « Using a bibliographic tool » allows students to learn the use of a specific bibliographic tool, « Procite ». This lesson is made of 3 parts : explanations about the software, animated demonstration, and exercises with Procite.

Self-assessment allows students to control the acquired knowledge and skills before the final exam.

### c) The support : choice of the platform

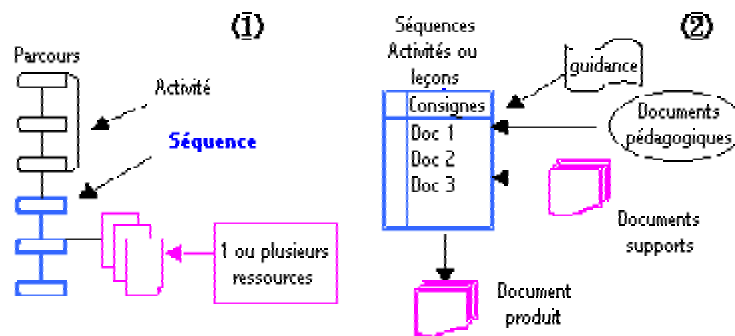
Together with the conception of the software, an inventory of the existing platforms has been made. As a reminder, the platform is management software to help with teaching (we use the term « tutoring» also) by offering the necessary tools to the educators, teachers, students/learners and administrators.

The platforms are of two types. The first type has an organisation based on contents (pedagogical route), and the second one is based on activities (workflow).

The pedagogical route (individual or in groups) is support-oriented. It can be decomposed into different files (lessons) with one or several sequences (Documents, activities). The names given at each presentation level are varied, depending on the platforms. The pedagogical resources are a black box except for those collected and processed through the AICC norm. In the activity-oriented route, the activities are presented as such, and the documents are supports to help them to be accomplished. A presentation of the activities to accomplish can be found in a chart.

Every platform gives the opportunity of self-training, and provides access to pedagogical documents on-line, within an individual or group route.

Here is an example of how these two organisations can be drafted : (derived from [www.preau.asso.fr/default2.asp](http://www.preau.asso.fr/default2.asp))



As far as we are concerned, the scenario we implemented is rather inspired by the second model, and we chose the platform offered by Archimed (Lille, France), which is called Virtual campus. This platform is adapted to our project and offers the whole functionalities that are generally to be found in this type of product, that is to say :

- Managing students
- Managing learning contents
- Managing assessments
- Managing integrated communication (e-mail and forum)

This platform has a supplementary particularity : there is an integrated data base inside, with a query interface allowing simple or multi-criteria researches.

At the present time, we have integrated 45 000 bibliographic notices from our collective Swiss catalogue, so as to be able to use them as an exercise support for researches.

And last, this platform will allow people external to schools and universities to become a student/learner by subscribing to e-learning courses.

#### **4) The future of CALIS**

The first phase of the conception and the development of CALIS will end in December 2003. The Swiss Virtual Campus programme has already looked at a second phase, from 2003 to 2007, to consolidate and implement projects in the curricula. We have already been working on the integration of CALIS in the academic curricula, and the graduation process.

As early as Spring of 2004 it will be used :

- In the post-graduate training of dentists in Geneva
- In the training of undergraduate students in Library Science at the HEG of Geneva
- In the universities of Geneva and Lausanne (as a pilot experiment)

The teaching sessions will be delivered within academic libraries. There are classrooms equipped with computers already, and they will be made available for these lessons.

The training will be accompanied by librarians and teachers, and supervised by professors. At last, CALIS will be proposed to continuing on-line training, according to the modalities which are presently discussed, as soon as possible.

More information? You can consult the website of the HEG, The Higher Management School in Geneva, at the address **[www.geneve.ch](http://www.geneve.ch)**, under the heading **laboratoire campus virtuel**.