

Evaluation process of the Computerized Educational Program in Heat and Power Technology: Elements of comparison between Sweden and France

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Taking advantages of the developing progress in Multimedia during the last decade, KTH has developed an educational CD-ROM in connection with Heat and Power Technology.

The main objective is the improvement of knowledge of the students at two taxonomic levels: conceptual, operational.

The intention is the proposal to Universities of various countries. In Sweden, it is currently used in two manners: collective - as a presentational tool for the teacher during lectures, and individual - as a tool to repeat the lectures and revise the examination.

In agreement with T. Fransson, leader of the project, it was decided to evaluate the individual use.

A first step of browsing was necessary to identify the needs for students and teachers. It was carried out in France (Ecole Centrale de Lille, Ecole Nationale des Arts et Métiers, Institut Catholique des Arts et Métiers de Lille) and in Sweden (KTH) by open discussions. Three groups were built up: engineering students (2 French, 3 Swedish), former engineering students (2 French, 4 Swedish) and professor in the field of Turbo machinery (2 French, 2 Swedish). This publication will include a summary of those discussions from a Swedish and a French point of view.

This so-called exploratory phase emphasized the object of the evaluation:
Is the CD-ROM, as tool to repeat the lectures, more effective than traditional documentary sources?

The first step was to check that the students had the required knowledge to use the CD-ROM. This was measured by a basic test: 60% had a grade above the critical threshold of 8/10. It thus appeared that the content of the CD-ROM had to take the 40% remaining into consideration.

The second step was to measure the gain of knowledge and its taxonomic degrees, generated by the use of the CD-ROM.

The measuring instruments were the grades at the examination (theoretical and open questions), a prerequisites test to build up homogeneous groups of students. The database of the CD-ROM gave the possibility to differentiate those who had revised with the CD-ROM from the others.

The results are the following: the students using the CD-ROM during their studies could not achieve better results than the others.

The utility of the CD-ROM as a distance-learning tool has not been checked yet.

The third step consisted in measuring the utility (pedagogy) and the usability (ergonomic) of the CD-ROM, by means of a grid of satisfaction: Swedish and French students filled this grid.

The following is the referent analysing the results

From 80 to 100%, the CD-ROM is regarded as an excellent individual learning tool

From 60 to 80%, it has aspects interesting in spite of certain weaknesses

From 40% to 60%, this CD-ROM has an average quality

From 0 to 40%, do not use this CD-ROM

The general results were 69% in Sweden, and 66% in France. The variation of 3% leads to the conclusion that needs of the French and Swedish Students are the same ones.

These results implied weaknesses in ergonomics:

- Homogeneity (67%). It was corrected by the conception of templates, as graphical rules, taking of account defects related to the overload of information (74%) and the readability (70%).

- General navigation (68%). It was too complex whereas it should be erased in front of the users interaction. A task analysis with users gave the possibility to identify the weaknesses and to improve them.

With regard to the pedagogical aspect:

Swedish as French express a particular interest for the constructivist pedagogy: the users find simulations excellent (82%).

The bringing together between the Educational Objectives of the CD-ROM and those of the lectures are not completely clear (67%). In the same way for the bringing together between the educational objective of simulations and the lectures (65%).

In addition, the hypertext links are not sufficient enough to explain the content of the slides (61%) and must allow navigation between the chapters of CD-ROM. The conception of a functional architecture map made it possible to connect the elements of the content to each other.

This weakness from a pedagogical point of view led us to recommend a new structure in which the student has a central place. This structure must allow:

- A training session about how to use the CD-ROM, the consultation or the database of Frequently Asked Questions
- Collaborative training by small groups in which each one has a definite role (proposer, opposer, archivist...) Here, the knowledge should be achieved within the group. The training would introduce a significant social component for the valorization of the student within the engineers' community.
- An individual preparation for the next course, during which the students should send their questions to the teacher before the lecture. This would prepare his course according to their questions: benefits would be a saving of time and an individualized training. The taxonomic level of the interactions would exceed simple theoretical knowledge to achieve a higher standard of education in general.