Application of a Model of Asynchronous Web based Education (WbE) in the Agricultural Engineering Sector

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Abstract: - Nowadays, the use of Web based Education (WbE) in distance learning education is considered to be an innovative method of learning. Supporters argue that WbE renews educational practices through the use of computers and their applied methodology, as well as the technologies provided by the use of the Internet. In this article we study a WbE field and propose a research theoretical model (AETCM) that aims at delivering online Agricultural Engineering courses (i.e. Agricultural Automation Applications course), offering a flexible use of means and tools. Additionally, this model allows a synthesis of selected bibliography that covers the issue cognitively, develops cooperative spirit and individualises the learning procedure and also uses the Web 2.0 tools' functions and dexterities for the communication between trainer-student.

Key-Words: - Agricultural Engineering Education, Web based education, Web 2.0, Webquest

1 Introduction

The Web based Education (WbE) provides new opportunities for teaching and learning and a sufficient variety of digital based means for both students and teachers. In WbE platforms, students must be at the centre of their own learning (student-based learning) and these systems must be well designed to facilitate learning process. WbE offers new educational environments, where anyone can learn anytime, anyplace and get quality education. In WbE the instruction could be either "synchronous", meaning that the communication between teacher and learner is simultaneous, or "asynchronous" which means that the student is able to interact at any time, without teacher's presence. The WbE instruction could also be based on a mixture of the above two modes [1], [2].

The term Web 2.0 concerns a new Web version, which, in reality, doesn't involve any upgrades to the technical specifications but to cumulative changed in the manner in which computer programmers and end-users makes use of the Internet. It is comprised by three parts: RIA (Rich Internet Application), SOA (Service-oriented Architecture) and Social web. The Web 2.0 Internet sites incorporate the following characteristics and technologies: search, authoring, tags, extensions and signals. Web 2.0 includes the ever increasing collection of new and emerging Web based tools. Many of these are similar in function with relating computer desktop applications and they are aiming to promote the use of browsers and the Internet by the users instead of a locally based installed in the computer software. Many of these tools are free and available for everyone and can be categorized as follows: social networks, blogs, wikis, multimedia sharing, etc.

Training in agricultural engineering is a composite process. It's a composite knowledge subject matter that combines theory and practice on one hand and plant biology, mechanics, electronics telecommunications, automation and informatics on the other. Additionally, the level of training increases the complexity level in training design. In the present paper, the application (theoretical design) of a Web based Education (WbE) Model in the agricultural engineering education with the help of Web 2.0 tools, is suggested. In particular, there will be an academic research on the use of the WbE methodology on the didactics of relative cognitive subjects. The recommended model was developed in theoretical level, for the purpose of technological course tutoring including both academic and practical teaching parts. The learning difficulty in the agriculture practice is a complex issue as it includes complicated learning procedures (memory, analysis, composition, decision process, etc.) and technology's purpose is to help improving these procedures in perspective with the traditional tutoring practice [3].

2 Review

The utilization of the Information and Communication Technologies (ICT) expands the horizons in didactics and at the same time enriches the Educational Sciences with new more powerful learning tools. There are many educational models-theories of tutoring and learning. Among them are the following [1], [2], [4]:

- *Behaviorist.* Is based on the idea that learning is a form of observable behavior and the result of a stimulant reaction (Stimuli→Reaction).
- *Cognitive approach*. Is based on the idea that in the basic relationship of the previous models enters the term "learner" and as a result comes the new relation: Stimuli→Learning→Reaction. The central poles of this approach are the attention focus, the information processing, the codification, the storage and retraction of information.
- *Constructivism*. In that model, the learner must have or obtain the ability to manage the learning process. Thus, learning is guided and evolved via social interaction accomplished during learning, as the teacher creates and uses the knowledge resulting from actions adapted to the course content.
- *Models of situated learning and communities of practice*. In the model of the situated learning it is necessary to place and communicate knowledge in genuine environments-frameworks that is to say in frameworks that include knowledge within experiential conditions. Also, it is considered that new knowledge and learning is inside the communities of practice and demands social reaction and team work.

Comparing recent pedagogic models in a Merrill study (2003) the result is that the most drastic learning environments are those focusing on the solving of problems (problem – centered) and that there are distinctive stages of learning. Furthermore in Merrill's «*Basic Tutoring Principles*», learning is promoted when [5]:

- The students are engaged with resolving of real problems.
- The precedent experience-knowledge of the student is activated and used as a basis of new knowledge.
- New knowledge, skill, is presented to the student.
- The new knowledge, skill, is applied to the student.
- The acquired knowledge and skills are embodied on the learning world of the student.

Today, in the didactic systems design and development it is widely used a non linear model greatly based on constructivism [1], [2].

Bibliography indicates that the benefits of using Web 2.0 in the educational process seem to be positive. Under the cooperation of an organized curriculum, proper training and utilization of educators, and within the framework of a proper educational design, the following benefits and goals can be accomplished: Cooperation environment through the creation of an internet learning community, knowledge and question structure, motivation for learning through an increased interest amidst the students, development of the ability to use Web 2.0 tools and other Internet services for personal publication, professional communication and learning speed through familiarization with the tools resulting in saving valuable time and energy in order to use their intellect for real learning. Despite all these, there still exist researchers who view with skepticism the educational use of the Web 2.0 tools claiming that it does not add up to the training goals of formal education. Respectively, other researchers suggest utilizing the Web 2.0 services independently from the official educational systems. Nonethelss it has been noted that the student's involvement with Web 2.0 tools it rooted steadily in his everyday life, incorporated in social situations such as the home, school and university [6], [7], [8], [9], [10].

2 Educational Model

The proposed model (Asynchronous Education of Technological Courses Model - AETCM*)* concerns the teaching of technological cognitive objects (research subject). The technological class or teaching material includes not only theory but concretisation skills too that presuppose the use of all senses, and aren't only servile work. In addition the process of learning in such a cognitive object cannot be characterized from simple activities as memorization, rationalisation and rethinking. It should also include more composite processes, such as creation, experimentation and feedback. This model has the following characteristics [1], [2], [11], [12], [13], [14]:

- Educational Material (course material, bibliographic sources and self-assessment material).
- Media (in digital form: text, pictures, animation, video).
- Tools (educational software and Web 2.0 tools).
- Teaching Methods (lecture, demonstration, individual work, group work, discussion with the instructor and assessment).
- Time of Education (At the beginning of each course an overall course time load is suggested to the students. This time is not obligatory for the students and it can be increased or decreased depending on the rhythm of learning. However, it should not exceed a concrete time limit that is set by the teacher for the overall assessment of the course).
- Learning Theories (Each course is conditioned according to the training frame of the proposed model - the model of cognitive approach and the constructive process of teaching material based on Blooms theory are applied in the content of the educational material).

In the learning procedure of a cognitive subject with theoretical and technological/practical dimensions, the practical knowledge should be counted as well, as it is a basic element of the general knowledge of the subject. On that point, it's necessary to refer to the simulation procedure as a learning procedure and "substitution" of the practical knowledge with the laboratory practice (laboratory education) or work places (studentship) with a "visual environment" created by a computer. The *simulation* as an imitation technique of a system's behavior by another system holds a prominent place within the limits of the educational applications of the Information and Communication Technologies (ICT). Especially in the digital image area that side is evident. However simulation doesn't only have to do with vision areas. It expands in other extremely complex areas, such as human voice and sound, the scientific behavior of models, the social and economical system evolution and finds the ideal area of application, in electronic games and education. The centre is knowledge (theoretical, practical) of proposed model, expected to acquire in a technological course and the educators takes the place of an intervener-coordinator between knowledge-students. The training framework based on AETCM is comprised of the following interlinking elements (Fig.1):

- Relationship between trainer-student-diagnosis of knowledge level-manners of communication-internet,
- Relationship between trainer-students-individualized learning-internet
- Relationship between student—cooperative learning-internet
- Selection of teaching method-method of communication (web 2.0 tools)-internet,
- Relationship between lesson goals with dexterities-aptitudies-material organization-educational material-internet,
- Connection means-multimedia-educational software-practical knowledge through a virtual lab-educational material-internet, and,
- Connection between evaluation-learning results-connection between lesson goals with dexterities-aptitudes-internet.

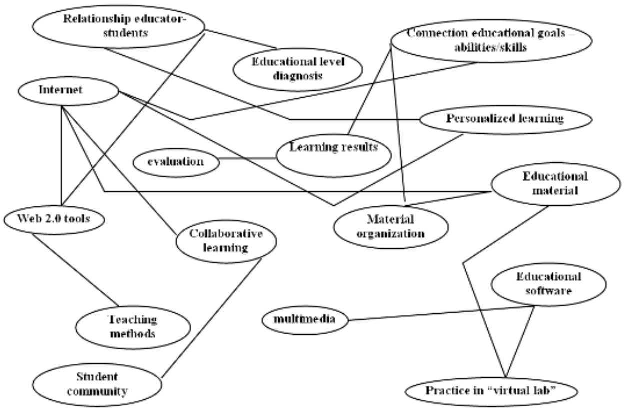

Figure 1. Educational framework of AETCM

The kernel (Data Base, Theoretical and Practical knowledge) of AETCM model that represents the potential knowledge of the technological cognitive subject is a dynamic whole that interacts with the students/s with energies via their educator. In addition the proposed model is also influenced by the following factors because of its realization in WbE system: *(a)* e-learning design methodologies (system structure, use of multimedia, educational material, simulation, asynchronous education, synchronous education), *(b)* the methodology of development of the educational material that accompanies the proposed e-learning system and is based in combination on the cognitive approach model where stands the relation Stimuli→Learning→Reaction based on which it is emphasized the data procession, the coding, the storage and the data retraction (internal cognitive procedures), the *cognitive theory* of constructivism where learning evolves through teaching and *Bloom's taxonomy* regarding the cognitive sectors (knowledge, comprehension, application, analysis, composition, evaluation) and the emotional sector (inception, response). The education material will consist of digital material, appropriately structured (gradually evolving) in order for the student to take in the whole of the course content and comprehend in a satisfactory level and at the same time to conduct applications or experiments (practical part), by composing and analyzing the information-knowledge received. In addition the student will be given the possibility through sources (via internet) and projects to seek and search subjects related to the cognitive subject. Finally, in the Stimuli→Learning→Response relation, *Stimuli* is a theoretical material (theory or laboratory), the Learning is the educational material study and Response is the projects & tests realization and evaluation. The final factor (c) is the set of restrictions and possibilities of e-learning via internet (WbE): the «impersonal learning», a self-learning, a cooperative learning, connection with credible and non-credible sources, the use of a great amount of data and the use of software teaching tools [1], [2], [13], [14], [15].

The theoretical AETCM consists of two sectors: the theoretical sector that includes the theory and the laboratorial sector that includes the hands-on (practical) education of the technological course (simulator, intelligent tutorial systems etc.). For the design of the course, elements from relevant models and theory of asynchronous education were used including. The AETCM's general structure is outlined in the following diagram (Fig.2) [1], [2]:

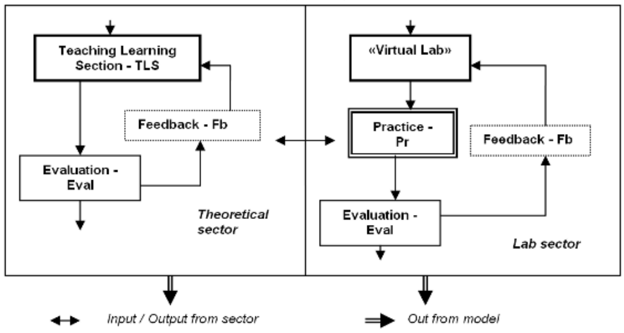

Figure 2. AETCM model structure

The *Teaching Learning Section* consists of three educational levels [1]:

- *Basic infrastructure level - BIL (obligatory, when failing the diagnostic test).* This level is obligatory for those who lack adequate knowledge. Therefore, it provides educational material properly organized in progressive and linear structure, to cover the gaps of knowledge.
- *Educational level - EL (obligatory).* It consists of courses in linear order. These courses are mandatory for all students, since they provide the necessary educational material of the technological course. Each course is divided in thematic educational units presented sequentially. The student should complete the previous unit in order to continue to the next one (typical procedure). At the end of each course the students are assessed.
- *Specialization level - SL (optional).* This level is addressed to students who wish to broaden their knowledge, provided that their teachers advise them to do so. Educational material structured in units with detailed analysis and exercises is provided. Also, tutorial courses

are offered to enhance analysis and look into case studies. The structure of Teaching Learning Section (TLS) is illustrated in Fig.3.

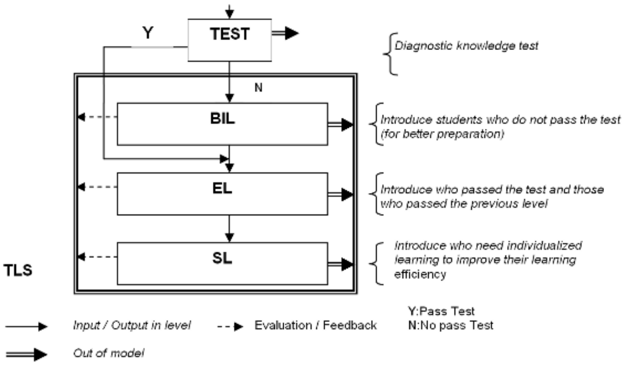

Figure 3. TLS structure

Each educational level is divided in *LESsons (LES)* with linear order (LES_i with i=1..n) and each LES is divided in thematic *Educational Units (EU)* that follow a linear order in their educational presentation (EU_j with j=1..n). The student must complete his/her first course in order to continue to the next (typical procedure) and respectively to the parts (from the first part goes to the next). In the end of each LES he/she may look at the corresponding valuation test and in the end of each level there is the final (total) evaluation that is necessary (if positive) in order to successfully complete the educational material of the cognitive subject (if in specialization level) or curry on to the level of specialization (if in basic structure level). Since the educator discovers weaknesses in the final evaluation he/she may pass the student to the level of specialization in a specific LES or if the student wishes may enter any LES wants. In the level of specialization there are repetition courses that emphasize on the detailed analysis and exercises (solved and unsolved). The internal structure of a typical EU consists of the following elements:

$$EU_i : \{P_1, P_2, \ldots, P_n\} \quad (1)$$

$$P_i : \{LEC_j, DEM_j, PP_j, TW_j, CONV_j, E_j\} \quad (2)$$

Presentation: (*a*) *LECture (LEC)* (text, diagrams, photos, sound), (*b*) *DEMonstration (DEM)* (video, animation), (*c*) *Personal Project (PP)* (web 2.0 tools/email using), (*d*) *Team Works (TW)*(web 2.0 tools/email using), (*e*) *CONVersation (CONV)* (web 2.0 tools/email using) and *Evaluation (E)* (tests). Where j = 1 .. n the number of instruments used in each training method has a presentation (e.g. P = {LEC } => j=3 means that the paper makes use of 3 media). Every *Training Method (TM)* contains:

$$TM_j : \{\text{educational software, text, sound, picture, animation, video}\} \quad (3)$$

The structure of the knowledge presentation means lies in the centre of the model Database (kernel).The structure formation is linear based on material order of each cognitive subject. In all it consists of the data and the presentation means. Their restoration is conducted by the educator via interface and the student as well based on his/her personal educational level.

4 Communicating the Model

The feedback section relates to the communication section between student(s) and the educator and has the format of partial bidirectional communication serving the following needs:

- Evaluation tests' and results' transfer.
- Questions', lesson feedback transfer.
- Educational evaluation of the system by the user—students (questionnaire transfer from the educator to students and vice-versa).
- Project assignment/follow-up.
- Publication of educational instructions in the internet by the trainer.

Data transfer is accomplished via the help of Web 2.0 tools/email through the internet since we are talking about an asynchronous system and telephone communication. The trainer can use a blog to publish instructions, a wiki to further expand the work subject matter for the students, email for immediate communication or multimedia sharing services to provide additional training multimedia material. In the next figure you can see the communication format for the feedback section.

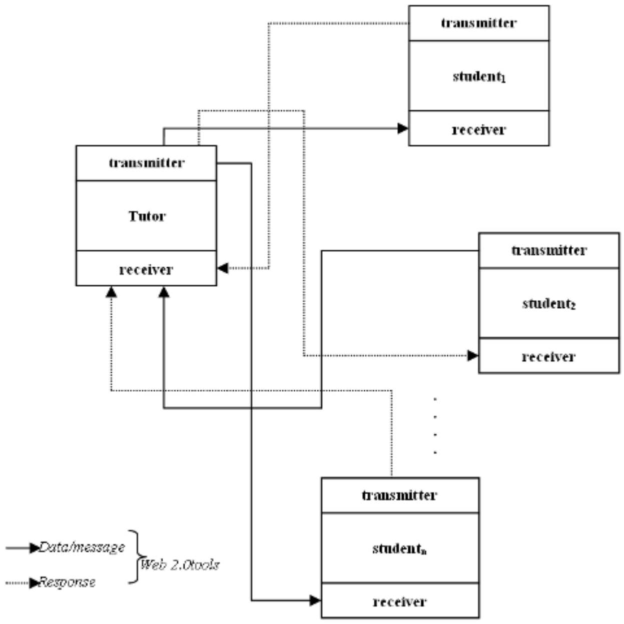

Figure 4. Communication form of AETCM model (web 2.0 tools)

The web tools/email selection for AETCM was done because for a lot of people these are the most effective asynchronous cooperative tools. It has a lot of advantages, such as: User friendly, familiar, reliable and cheap. The Asynchronous Education of Technological Courses System (AETCS) is the structural version of the AETCM. The building AETCS based on web pages. Each building block of AETCM implemented in the form of site: (a) Presentation-site, (b) EU-site, (c) LEC-site, (d) Level-site, (e) Practice-site and (f) diagnostic test-site. Moreover, the choice has helped AETCS to better serve the user in navigating the system. The AETCM is connected with a Data Base which contains the knowledge elements. Επιπρόσθετα, το AETCS περιλαμβάνει τα αντίστοιχα web 2.0 tools που επιλέγει ο εκπαιδευτής (blog, wiki or other) [1], [2].

5 Case Study

Agricultural Engineering education (agricultural informatics, electronics, telecommunications, automation, precision agriculture, artificial intelligence, etc.), as it is noted, requires complex learning procedures. Depending on the education level, the complexity of the subject matter grows and more dexterities and aptitudes are required. Agricultural education was not in the edge of the educational revolution through the use of new technologies. But it followed the developments and, consequently, a multitude of technological applications have been developed in that field. Historically, land grant universities and their colleges of Agriculture have been discipline driven in both their curricula and research agendas. In the last years, the some of important Agricultural Universities of the world focus in automation, precision agriculture, smart and wireless sensors and the principles of Sustainable Agriculture. Sustainable Agriculture is an interdisciplinary field of study that offers a potentially effective organizing structure with which to address many of the complex societal and environmental problems in the agri-food system that have heretofore been unapproachable by single disciplines. The last decade has witnessed important changes in the agricultural community, consumers, and society as a whole. Sustainability issues focused on human health and the environment are broadly acknowledged as of increasingly important. One economic metric of this response has been the development of the organic food market sector in both California and the US with sales growing 15%–20% per year both statewide and nationally in the last decade. Over the past decade, the international organic sector also grew at 20% per year, while the conventional food sector grew by 5% annually during this same period. Nevertheless, increasing producer and consumer awareness and attraction to the concepts and products associated with sustainability appears to be encouraging the agriculture universities to examine and promote sustainable agriculture (SA) in an active and systematic manner. Over the past two decades, SA education has expanded from the academic margins. In the following table it is shown the connection between learning difficulties – professional & scientific knowledge in the agriculture engineering field and new technologies and SA in education as it is resulted by a corresponding connection in the field of agricultural education (with the necessary adaptations) [2], [3], [16], [17], [18], [19], [20].

Table 1. Examples of areas of mapping between cognitive and learning sciences and educational technology

Learning Requirements (LR)	**Cognitive and learning sciences**	**Agriculture cognition**	**Educational technology**
LR1-MEM	Memory	Basic Science & technology aspects knowledge (e.g. calculus, physics, fluid	Decision aids and reminders (interactive multimedia systems)

		mechanics, circuit design etc.)	
LR2-KO	Knowledge organization	Mental schemata & scripts (environmental & health aspects and impact in crop production) (e.g. pollution, fertilization etc.)	Knowledge and data representation (multimedia system)
LR3-PS	Problem – Solving	Identification problem and design technical (e.g. precision problems, etc.)	Simulator
LR4-HS	Heuristics and Strategies	Reasoning strategies for sustainable agriculture (e.g. CO_2 impact etc.)	Simulator, Intelligent Tutoring Systems (ITS)
LR5-DM	Decision-Making	Choice of technologies and design methods that will follow SA	Simulator, Intelligent Tutoring Systems (ITS)
LR6-CL	Collaborative Learning	Student learning in teams	Collaborative tools

The LR as it is registered show the wealth of technologies required to achieve a high level of education. The proposed model may cover most requirements and in addition it offers a new dimension in education: Distance Learning by Web (Fig.5). That might provide education without requiring great infrastructures from the side of universities or colleges and on the other hand might be a very helpful and supportive tutoring tool towards the student. It is surely required the evaluation of use of such tools for a better assessment.

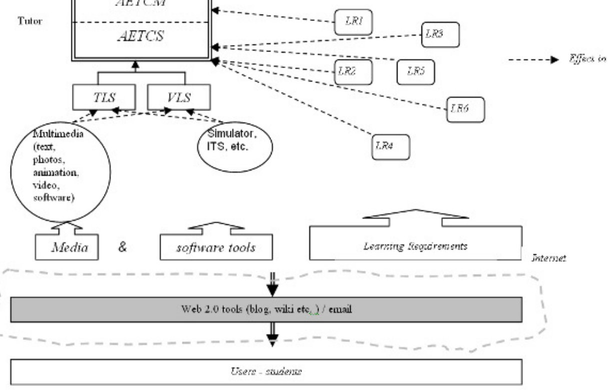

Figure 5. Relationships between LRs and AETCM – AETCS framework

5.1 Paradigm

The proposed example of theoretical realization (paradigm) of the AETCM model in Agricultural Engineering education regards teaching of a cognitive subject (supplementary or exclusively through Internet) in the Agricultural Automation application field. It particularly concerns the tutoring of the theoretical and laboratory Agricultural Automation Applications course (AAAs) in the Agriculture University of Athens, Department of Natural Resources Management and Agriculture Engineering as a basic course of the 8th Semester (M.Eng. level). The lesson offers the students an introduction in the field of applications for automation in agricultural production. It is a composite subject-matter that pre-requires knowledge on certain subjects from the curriculum (control systems theory, agricultural machines, greenhouse cultures, livestock production, hydroponics, climate regulation, sensors-measurements, electronics, telecommunications, informatics, artificial intelligence, etc) and aims at properly combining these for the development of integrated applications for sustainable development (avoiding environmental problems, high level product quality and functions for green energy). This course contains: (a) Basics of control systems, methods of control, PID controller, identification and regulation, non linear systems, application (greenhouses, livestock units, farming equipment, irrigation networks, agricultural machines κ.α.). It is divided in two sectors. In the theoretical sector regarding the theoretical principles of control systems & techniques and in the laboratory sector regarding the use of tools for the design, analysis and simulation an agriculture automation system (e.g. using robots in greenhouse for precision aspersion).

5.2 Educational Requirements

The paradigm's Educational Requirements (ER_i) are determined by the following: (a) ER_1-Syllabus (Tab.2), (b) ER_2-Lab Practice (Tab.3), (c) ER_3-Educational purpose of the course (the student can design and develop a small integrated automation application) and (d) ER_4-Learning targets (Fig.6). Furthermore, the paradigm should have, and the following, Technical Characteristics (TC_i): (a) TC_1-

system server (connected to the Faculty server),(b) TC_2-multimedia elements, (c) TC_3- simulator software (e.g. Matlab), (d) TC_4-system server security and (e) TC_5- Web 2.0 tools.

Table 2. AAAs Syllabus

No	Syllabus
1	Basics
1	Principles of SA
2	Techniques
3	PID controller
3	Sensors
3	Precision Agriculture
4	Control system design & analysis
5	Applications

Table 3. AAAs Practice.

No	Practice
1	Presentations (agriculture application)
1	Lab exercises in fundamental theory
2	Project Design (team work)
3	Simulation

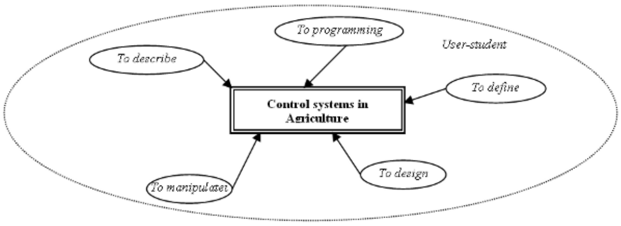

Figure 6. Learning targets

5.3 Educational Procedure

The educational procedure in the AAAs paradigm consists of the following educational levels (based on the proposed model):

I. Theoretical Sector .

- BIL level. That level includes the students that the diagnostic test ordered to attend courses of preconditioned knowledge on the AAAs course (math, physics, chemistry, etc.). On that level an educational material is offered on sectors of Calculus for Control systems, agriculture procedures, electronics, agriculture informatics etc.
- El level. That level includes the students that succeeded in the diagnostic test and attend the course of AAAs based on its educational content.
- SL level. On that level there is a close examination of a cognitive subject (AAAs course) with the presentation of specific knowledge and applications (greenhouse, AI in agriculture, Data Acquisition Systems, mobile systems etc.).

II. Lab Sector.

- Virtual Lab. Divided into two parts:
  1. Lab Theory
     - BIL level**.** That level includes the students that the diagnostic test ordered to attend courses of preconditioned knowledge. On that level it is offered educational material on practical issues regarding mathematical & physical principles, electronics, measurements and control theory (in Matlab).
     - El level. That level includes the students that succeeded in the diagnostic test and are going to attend the laboratory course of AAAs based on its educational content (design, analysis and simulation).
     - SL level. On that level there is a close examination of a laboratory cognitive subject with the presentation of specific exercises and applications with SA application (greenhouse, crops etc.).
  2. Simulation software. That software is used by a student in order to analyze control systems aspects.
- Practice. Divided in three levels according to the levels of Laboratory Theory:
  - -BIL level (basic exercises in fundamental theory, applications presentations)
  - -EL level (exercises for design, analysis and simulation in a scenario-project)
  - -SL level (exercises for SA applications, IS & AI in agriculture)

The selection procedure of each level in each field will be based on a test that will define the theoretical knowledge background of each student and thus he/she will be classified to the appropriate level. In addition the student's registration to each level will be completed with filling up a relevant form provided by the educator to the candidate students and in turn they will sent it back to the educator via email for a further processing and storage in his/her database.

5.4 Paradigm structure

The architecture structure for the application is based on the structure of model, as it appears, in next figure:

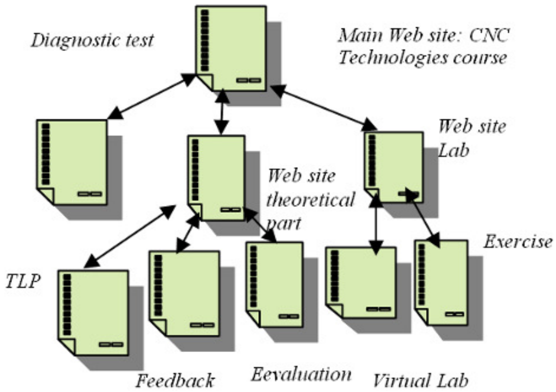

Figure 7. Architectural Structure of pilot application

The implementation of the example can be done in environment Frontpage (or in other computational tool for creation of web pages). For the production of educational material the following computational tools are used: Word, Powerpoint, Flashmedia, Video, Photoshop, Photos, Director, CoolEdit, 3D Max. The technical resources that will be used for the materialization of the system are given in the following diagram.

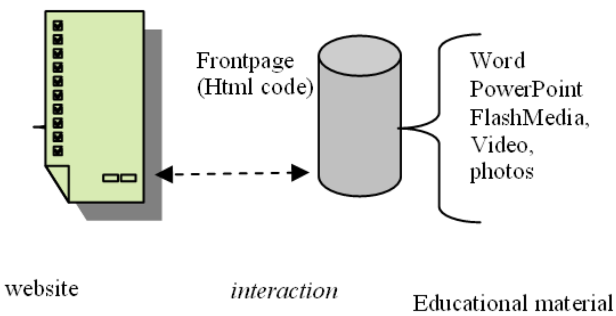

Figure 8. Technical resources of application

The teacher communication with users is done based on web 2.0 tools. The structure's interface of model was design in software for web design. The interface has easily navigation and ergonomic (Fig.9). It is offer: simplicity, analogy, and balance. The text has: good readability, using legend with different colour and bold writing, black colour in main text, using bold, italic and colour in keywords, using text in array size, and using photos with text.

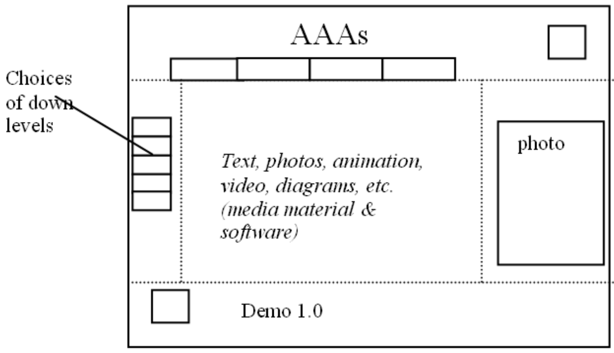

Figure 9. Structure's interface of model

5.5 Scenario

The pilotage, for the case study, is interactive and identical with that of an electronic book and also has additional interactive multimedia tools such as: use of pictures, sound, text and video. Following a flow diagram is given for the application:

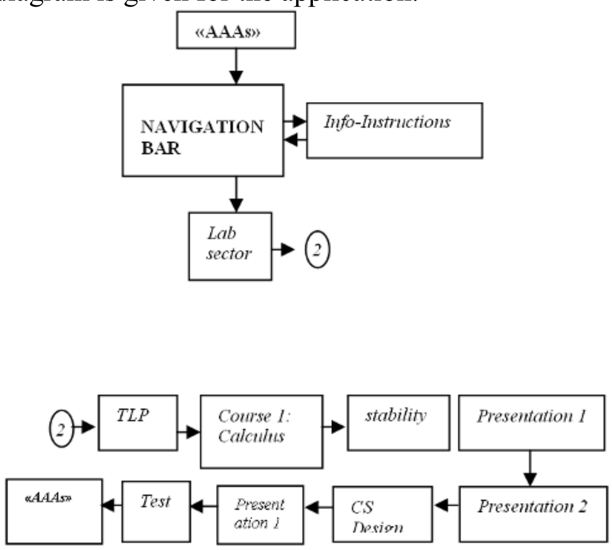

Figure 10. Data-flow diagram

The trainer selects the web 2.0 tools he/she desires to use. In this scenario the trainer via email encourages them to study the 2 units relating to the Stability & Control System Design (Fig. 11). The students enter the system's main website and receive the related presentations. The trainer setups a blog in which every student can upload questions regarding his/her study. Respectively the trainer replies and at the same time the answer is published for everyone (transparency). Also the trainer makes a wiki in which, per team, the students complete the received exercise-subject. Specifically, using MatLab, they design a temperature, humidity, aeration and Ph control system using Control System techniques according to the SA principles. In the wiki, they complete, per team, a complete technical and financial study for all the sections – levels of the exercise defined systems. The subject is given under the form of a Webquest, encouraging the students for every team to seek suitable sensors, control formats and types of greenhouses, commercial products and cost estimates. The Webquest is defined as a form of investigative learning in the framework of which the amount of processed information by the learning subjects comes from the internet. Webquest sets itself apart from other forms of internet exploration because it aims at the use of information and on problem based learning, which helps in the exercise of the upper cognitive functions (analytical, composite and critical abilities). According to constructivism, learning presupposed understanding which can be built through the actions of the user-student. When the students complete all these actions, it is considered that they have comprehended and acquired the dexterities-aptitudes of all the related sections [1], [2], [21].

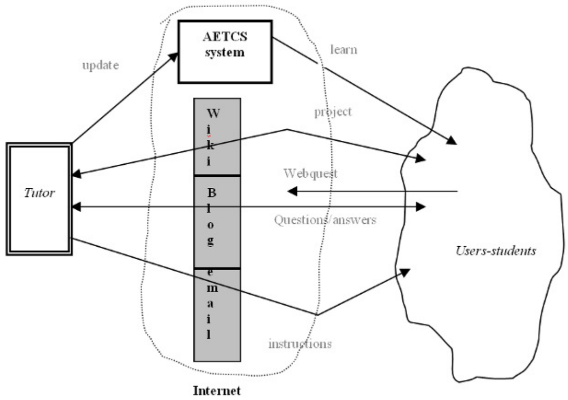

Figure 11. Scenario structure.

6 Conclusions

The integration between information and telecommunication technologies has supported distance learning by providing learning situations that are accessible to individuals at any time and anywhere. The issue of assisting people to "learn how to learn" has been an active research area, and now there is a growing acceptance that understanding the way students learn is the key to improve the education process.

The proposed model (AETCM) and its concretisation system (AETCS) will focus on a learning trying to offer flexibility, cooperativeness and individualization. Furthermore, there will be offered a specialized environment of technological cognitive subjects like agriculture engineering courses that play an important role in distance learning. The main objective of the designers is the completion of this model and the development of the concretisation system and its evaluation in factual action. Online collaborative learning extends learning beyond the classroom and creates relationships between learners which construct their learning through collaborative learning environments and at their own learning speed.

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