E-LEARNING – EXPERIENCE FROM THE "ENERGY ACADEMY" DISTANCE TRAINING PROGRAMME

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ABSTRACT

Academic and professional education programmes currently available in the areas of energy and environment cannot fully satisfy market demands. Furthermore, closed and isolated systems, such as islands, face additional problems due to geographical discontinuity.

The role and the potential of e-learning in both instructor-led (synchronous) and online (asynchronous) course delivery in such isolated systems are investigated. The discussion focuses on the "Energy Academy", a distance learning programme of continuous education and training on Renewable Energy Sources (RES) and Energy Savings for local administration officials and for persons involved in the formulation of energy and environmental policies in the Aegean islands of Greece.

The programme has been developed by the Environmental & Energy Management Research Unit, School of Chemical Engineering - National Technical University of Athens, and Ios-Aegean Energy Agency, a nonprofit organization focusing on increasing the islands' energy production from RES and promoting energy efficient technologies and practices. The main characteristics of the programme and of the web platform that supports it are presented. From the experience gained during the first two years, it could be said that the programme has come to fill a training need and satisfy an existing demand. The increasing number of participants and the programme's evaluation by them, have shown that it has achieved its goals, at a great extent. Some failings, however, like the high dropout rate and the rather low percentage of the target audience in the participants, should be taken into account for the programme's continuation.

Introduction

The evolution and the continuous changes of the statutory and financial framework in the areas of energy and environment can not be fully covered by the academic and professional education programmes currently available. Hence, in addition to them, there is a need for life-long learning programmes addressed to all involved in those sectors, in order to fully satisfy market demands. Furthermore, closed and isolated systems, such as islands, face additional problems due to geographical discontinuity and difficulties in accessing knowledge.

Distance learning, which offers knowledge to students who are not physically present in a traditional educational setting such as a classroom, can be very helpful under these circumstances. Chung (2006) notes that an online lecture offers a series of advantages over traditional lecture delivery. His study suggests that students believe

that on-line lectures are as effective as, or sometimes even more effective than, in-class lectures due to:

- Capability to pace oneself listening to the lecture
- Capability to replay parts of the lecture
- Finding the most suitable time to listen to the lecture for better concentration.

Although e-learning may increase access flexibility, eliminate geographical barriers and improve convenience as well as effectiveness for individualized and collaborative learning, it suffers from a number of drawbacks such as lack of peer contact and social interaction, high initial costs for preparing multimedia content materials, substantial costs for system maintenance and updating, as well as the need for flexible tutorial support (Wu et al., 2010). Various concerns have also been raised regarding internet connection reliability and, for specific individuals, a need for more natural communication (Makropoulos et al., 2009). Cantoni et al. (2004) also point out that a classroom teacher can receive and analyze a number of visual cues from their audience in order to adjust the lecture so as to meet the needs of the class.

Blended learning appears to be the solution to these problems because it mixes synchronous and asynchronous course delivery (Buzzetto-More and Sweat-Guy, 2006). As synchronous, one can describe a mode of delivery where all participants are "present" at the same time, such as live lectures, in-class discussions and active group work. Asynchronous mode of course delivery consists mainly of web-based educational technologies such as online course modules, assignments, discussion boards, and other web-assisted learning tools, where participants access course materials on their own schedule. The degree to which the design of blended learning courses uses traditional classroom and online learning environments varies largely depending on the subject matter and the overall nature of a course. Regardless of that, such courses may be expected to be delivered in both an asynchronous and synchronous manner, and are becoming increasingly widespread in today's society (Wu et al., 2010). Blended learning has been described as "the most prominent instructional delivery solution" since it provides the academic world with the flexibility of fully online learning along with crucial collaboration achieved through face-to-face student-student and student-instructor interaction (Mitchell and Forer, 2010).

The aim of this paper is to investigate the usefulness of both synchronous and asynchronous course delivery as a tool for training professionals. The experience gained from the operation of the "Energy Academy", a distance training programme for local administration officials and for persons involved in the shaping of energy and environmental policies, will be used as the basis for this analysis.

The "Energy Academy" Programme

"Energy Academy" is a continuous distance training programme in RES and Energy Savings, addressed to local authority organization officers, regional administration officers, engineers, researchers, investors, university and technological institute graduates as well as to all those involved in formulating energy policies for islands. The main concerns of the programme are new technologies and their statutory framework. The programme has been organized by the Environmental & Energy Management Research Unit, an educational and research unit at the School of Chemical Engineering - National Technical University of Athens, and Ios-Aegean Energy Agency, a nonprofit organization focusing on increasing the islands' energy production from RES, as well as promoting energy efficient technologies and

practices. The programme was funded by Ios-Aegean Energy Agency, but the cost has been kept at a very low level, since most of the development work, as well as the teaching, have been offered free of charge.

The main incentive for the development of this programme was the signing of the Pact of Islands, a political commitment of European islands to developing Local Sustainable Energy Action Plans and identifying bankable green projects, by 11 Greek island municipalities. Implementation of the above commitment presupposes the existence of well trained technical and administrative personnel in energy and environmental issues. Within this educational framework, the aim of Energy Academy is:

- The training of a large number of people towards obtaining a general knowledge about RES, energy savings, new technologies and the statutory framework around them.
- The development of trainees' skills in participating in the energy planning process at local level through the writing of a thesis and the exchange of experiences.

In June 2011, the programme has completed its second year of operation. During its first two years, the following topics were covered:

- European policies and financing in energy
- The electricity market: Statutory framework and licensing in the islands
- Wind energy: Capacity, penetration and land use
- Cost-benefit analysis in energy investments
- Desalination with RES
- Hybrid renewable energy systems
- Energy management in buildings
- Integrated biomass management – Energy production at local level
- Monitoring greenhouse gas emissions and selecting actions for their reduction at local level
- Decentralized power generation from RES and smart grids

A student is considered to have successfully completed the programme, if he has dealt with all courses, comprising the annual curriculum, and has answered successfully four on-line assessments for every one of those courses. In this case, he will be awarded an attendance certificate for the programme. Additionally, he can write a thesis for each course. If the thesis is successful in at least one of the courses, the student will be awarded a training certificate for the respective course.

All the material of the programme is uploaded in the programme's website, which is accessible at the following address: http://environ.chemeng.ntua.gr/energyacademy. The programme's initial website structure is shown in Figure 1. The programme has an announcements module, a library, a discussion forum and a calendar, accessible to all participants, students and instructors. It consists of a number of courses, each one having its own anouncements module, calendar and discussion forum. Every course is divided into a number of steps, each of which includes teaching material, assessment material and useful links. Furthermore, it has a thesis section, where the students can find all the details concerning the thesis they have to prepare.

Apart from the online activities, the annual timetable includes three face to face meetings:

- Kick off meeting: It takes place before the start of the programme. In this meeting, instructors, administrators and students meet each other and introductory lectures are given for every course.
- Intermediate meeting: It takes place after the completion of the first two steps in all courses. The students' progress is monitored and the topics of the theses are presented.
- Final meeting: It takes place after the completion of the study programme. The programme' s results are commented upon and the certificates are awarded to the students who have successfully completed the programme.
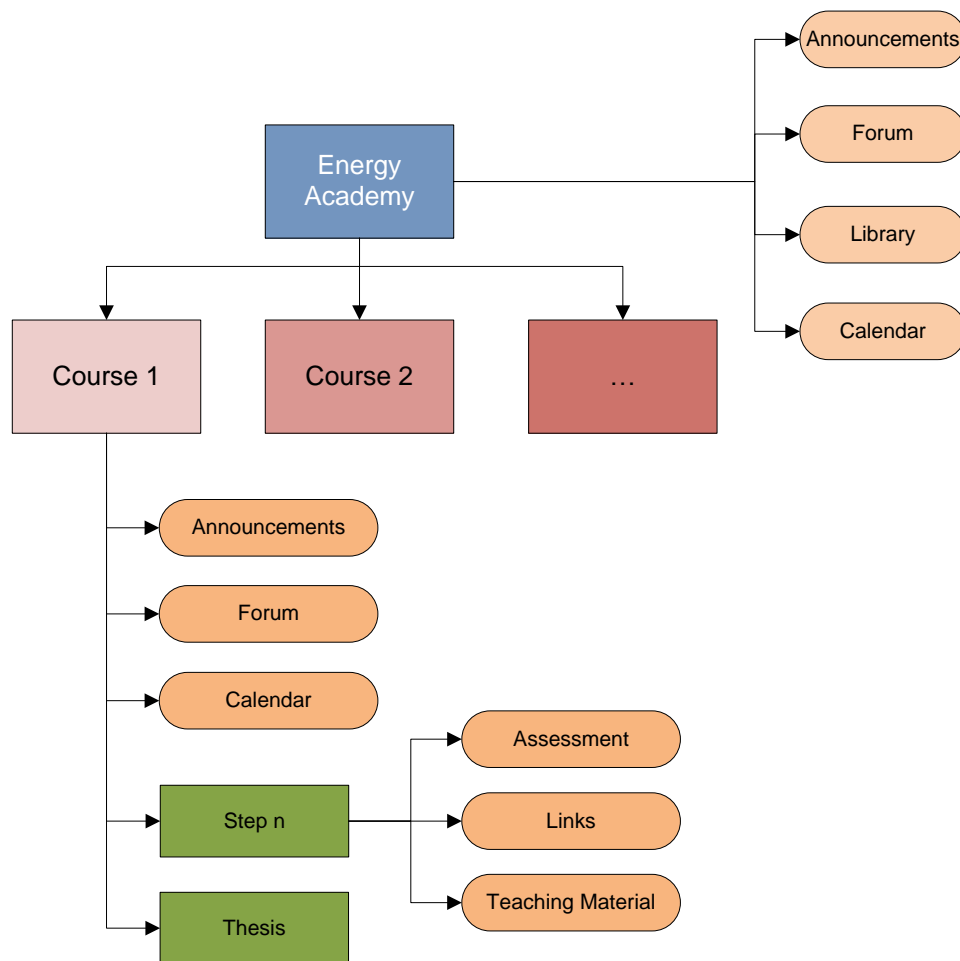

Figure 1. The Energy Academy initial website structure

Results of the Programme's Implementation

Participants Backround

During the first two years of operation, over 150 persons were interested in participating in the training programme. The number of participants who were registered and have completed the programme, by receiving at least an attendance

certificate, are presented in Table 1. The number of registered participants increased while the dropout rate decreased significantly during the second year of operation but still remains at a hign level. The high dropout rates are mainly due to the fact that the students, especially those of the first year of operation, were not prepared for such a demanding programme while it was easy for them to drop out when they faced the first difficulties, since there were no fees.

Table 1. Number of participants

	2009-2010	2010-2011
Registration	32	78
Successful Completion	13	44
Dropout Rate	59.3%	43.5%

The participants were asked to complete a detailed curriculum vitae before the beginning of the courses and an online evaluation survey after their completion. The following statistics refer to users who have sucessfully completed the programme. Their age distribution shows that the programme attracts rather young employees who have some knowledge on computers (Figure 2).
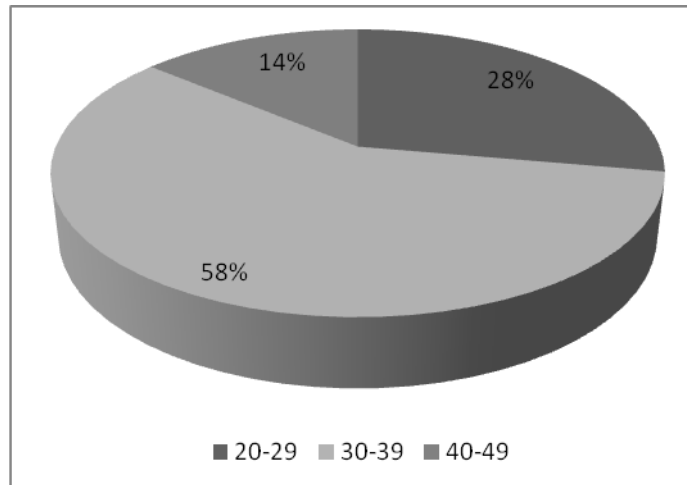

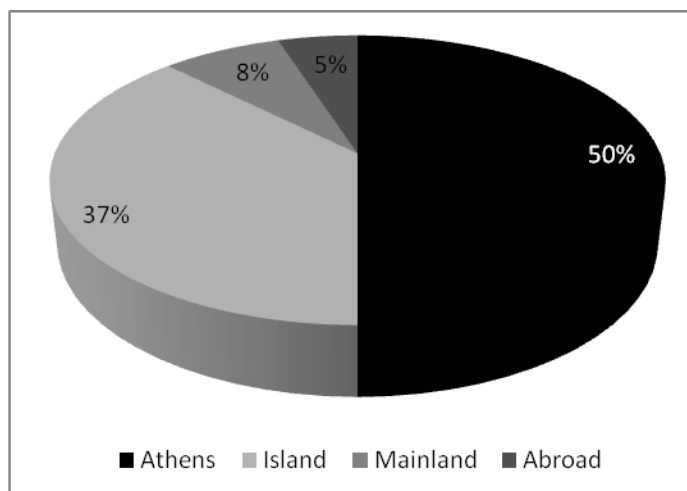**Figure 2. Age distribution of the participants**

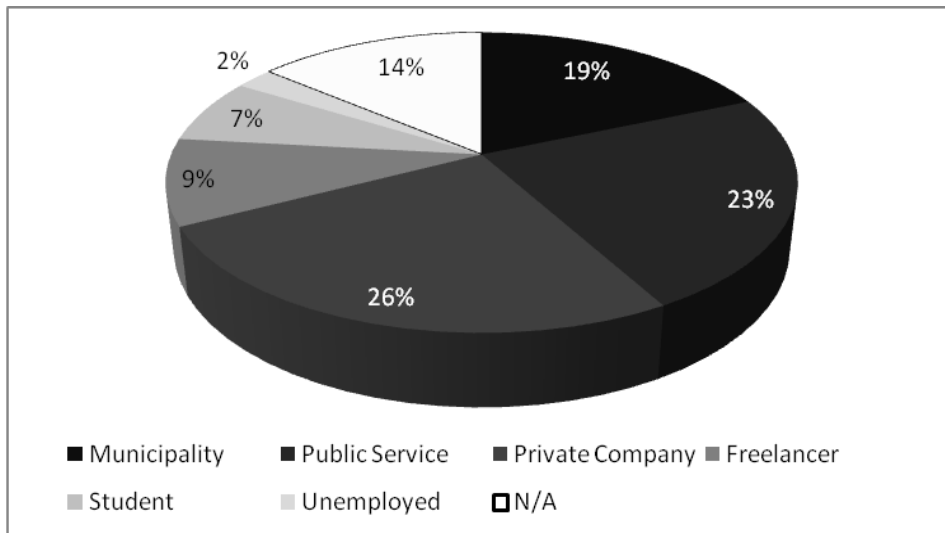**Figure 3. Place of residence of the participants**

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Figure 4. Occupation of the participants

The majority of participants come from the capital city of Greece, Athens, or from other big cities of mainland Greece. However, a significant percentage (37%) lives in remote island regions and a much lower percentage lives abroad (Figure 3). The high percentage of participants from Athens is expected since almost half of the country's population lives in the Greater Athens area. The percentage of remote island participants, although lower than the respective of Athens, is quite satisfactory, if one considers the remote islands' population as compared to that of Athens.

Regarding the professional occupation of the participants, almost 70% of them are employed in the public and private sector (Figure 4). However, only 20% are employed in municipalities, which indicates that further effort should be made in order to achieve the initial target set. Nevertheless, all of those participants are island municipalities employees, which constitute the primary target of the programme.

Programme Evaluation by the Participants

The design, organization and the overall level of the programme have been assessed by the participants through an online questionnaire. It should be noted that the programme was designed focusing on islands and their characteristics without prior analysis of the potential participants backround and expectations.

Figure 5 shows that the overall assessment of the programme is positive. The most critical issue was the ease of website navigation, which has led to the redesigning of the structure, presented in Figure 1, towards a much simpler scheme.

When the participants were asked whether they have obtained useful knowledge, more than 85% answered that they obtained more than they expected. Furthermore, more than 65% of the participants think that it is possible to use the knowledge acquired in their job (Figure 6).
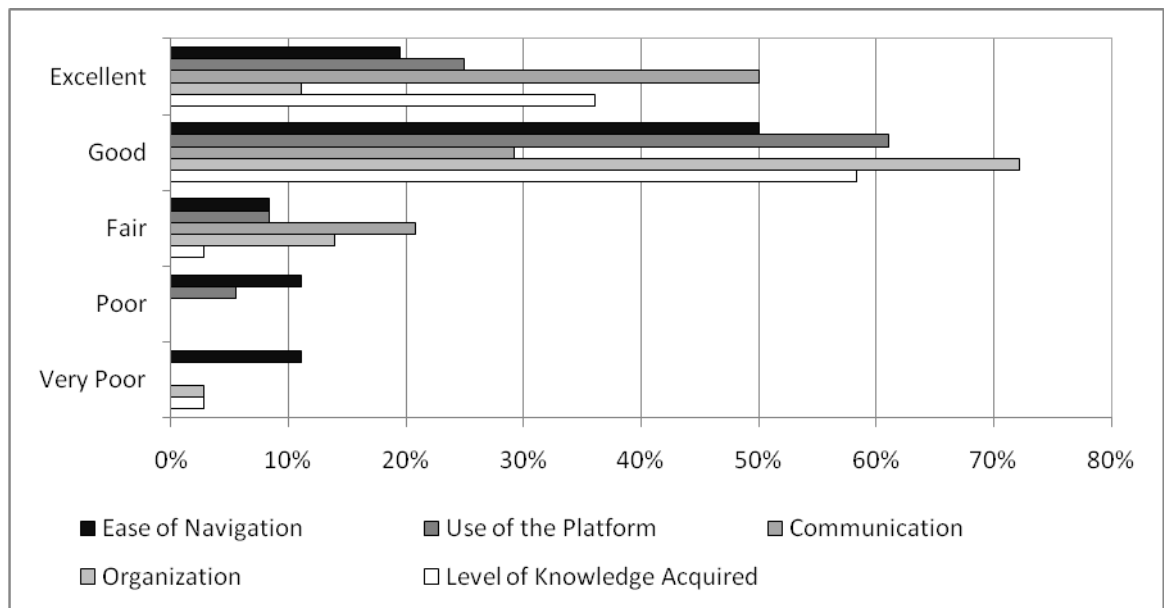
Figure 5. Rating of the e-Learning programme and the platform

Figure 6. Evaluation of knowledge acquired

Lesson Learned

Looking at the variation of daily logins during a year (Figure 7) one can observe that logins increased considerably as the date of the overall evaluation of students was approaching while they remained at a low level (20-40 daily logins) for the rest of the period. We may therefore conclude that the platform does not operate as an open community of professionals who discuss the problems they face, but mainly as a tool for receiving the material and submitting the assessments. Hence, participants should be encouraged to use the platform in order to increase the interaction between them.

At the same time, based on logins' variation on a weekly basis (Figure 8), a reduction is observed during the weekends. This is the opposite of what it was expected, taking into account that all participants have a job and they have more free time during the weekends.
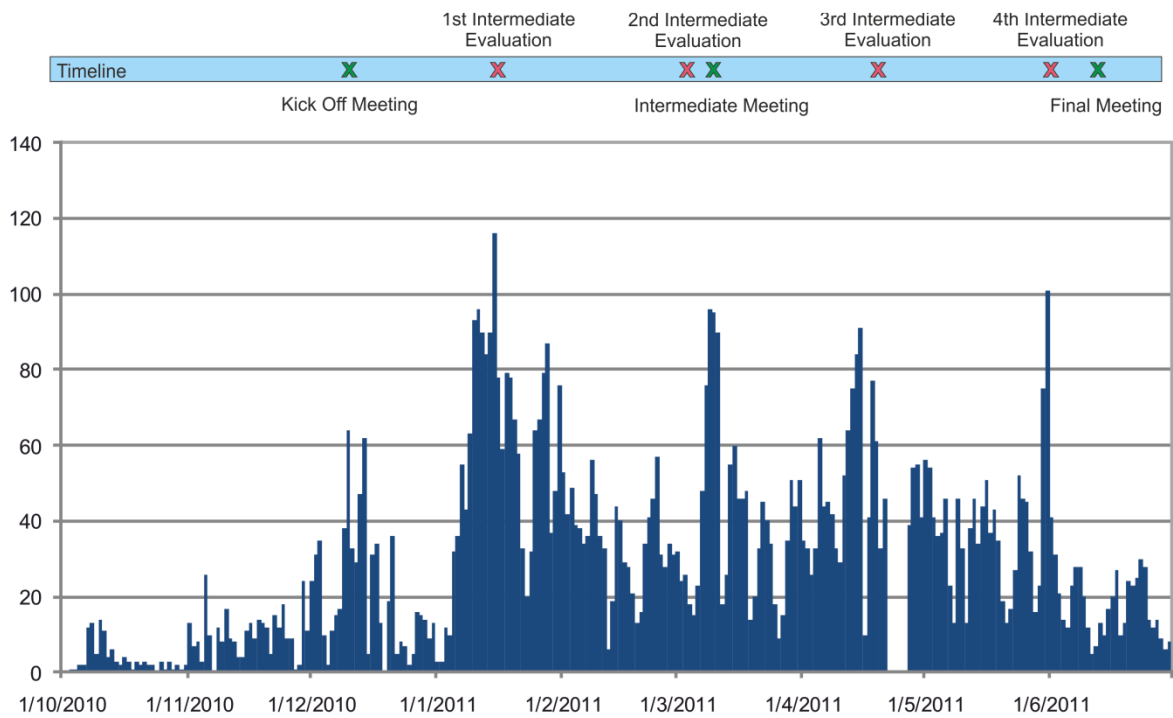
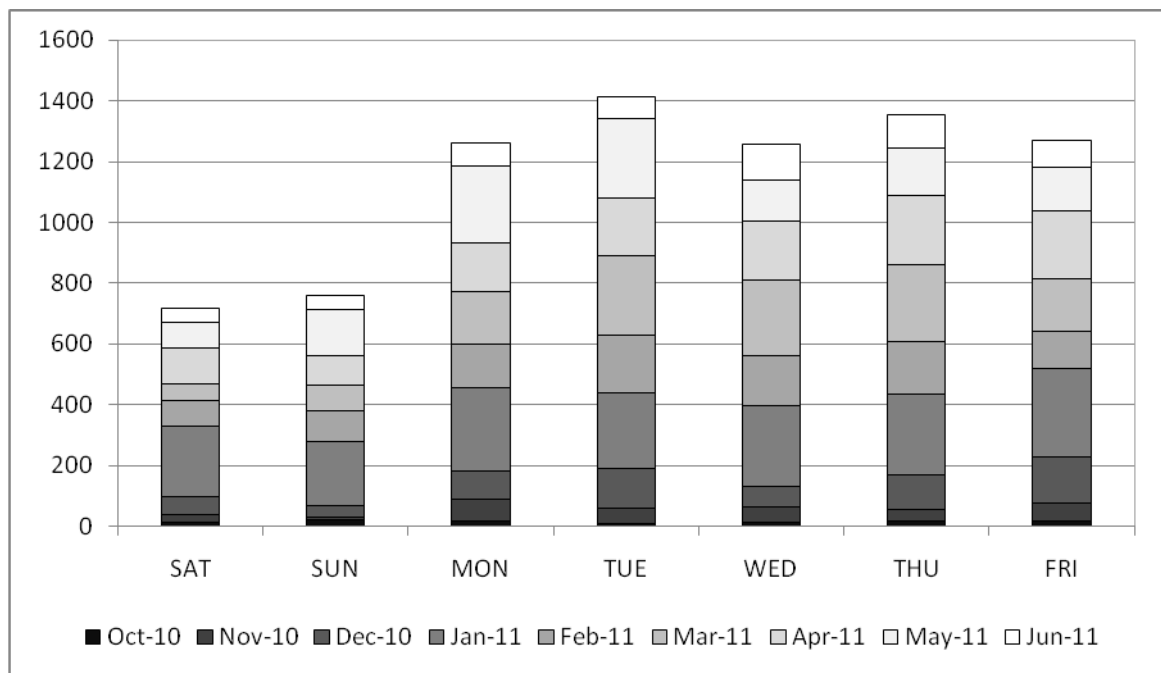**Figure 7. Daily logins during the second year of operation**

Figure 8. Login record on a weekly basis

Furthermore on the basis of the programme's evaluation by the students and their demand for simple website navigation, the structure presented in Figure 1 was re-designed after the intermediate meeting. The number of modules concerning individual courses has been reduced. Specifically, the announcements module, calendar and discussion forum for the particular courses have been deleted (Figure 9) and their content has been transferred to the corresponding central modules. This change has resulted to a substantial increase of participants' involvement, an indication of which is the triplication of the number of posts in the central forum.
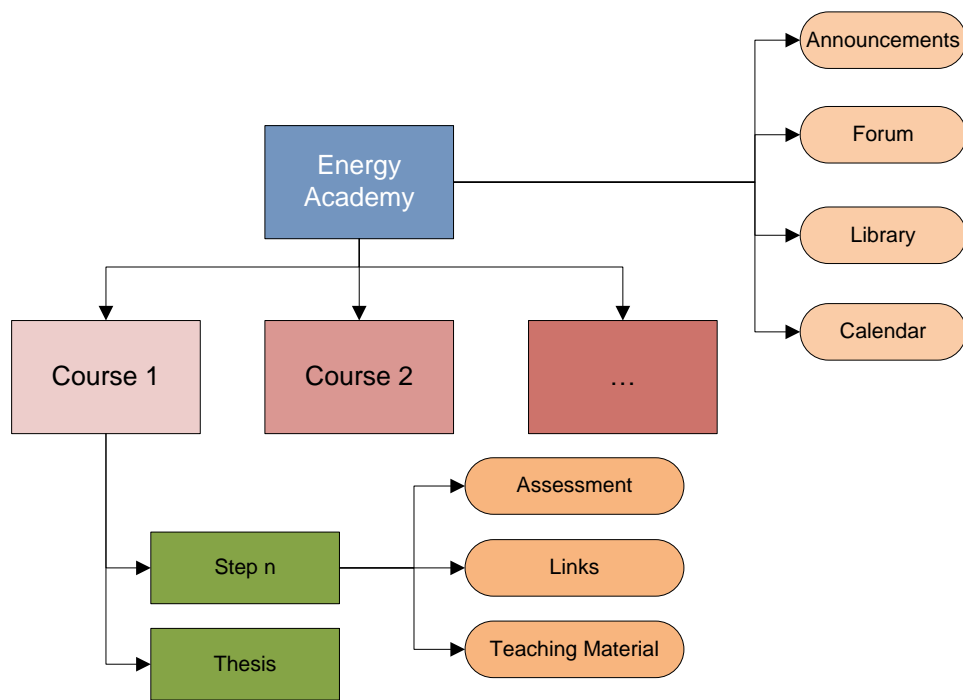
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Figure 9. The new Energy Academy website structure

Conclusion Remarks

The objective of this paper was to examine the usefulness of both synchronous and asynchronous courses delivery as a tool for training professionals. The experience gained from the operation of the "Energy Academy", a distance training programme for local administration officials and for persons involved in the shaping of energy and environmental policies, has been used at the basis for this analysis. The main findings may be summarized as follows:

- The programme was well-received. The number of participants who registered and the ratio of those who completed the programme successfully show a substantial increase in the second year of the programme's operation, as compared to the first. The higher participation rate in the second year is mainly due to word of mouth promotion and more advertising. On the other hand, the lower dropout rate on the second year is mainly due to the fact that new students, having learnt from past experience, were more prepared to face the difficulties of the programme.
- Twenty percent of the programme's participants were island municipalities' employees, which constitute the main target group of the programme. This is a significant percentage, but efforts should be made to increase it.
- The participants used the platform mainly as a tool for receiving the educational material and submitting the assessments. Efforts should be made to increase its use, as an open community of professionals who discuss the problems they face, in order to improve the interaction between them.
- A number of improvements have come as a result of the programme's evaluation by the participants. The most important of those was the participants' demand for simple web-site navigation, which has led to the redesigning of the website structure.

On the basis of all the above it could be said that the programme has come to fill a training need and satisfy an existing demand. The number of participants, their profile

and the programme's evaluation by them, have shown that it has achieved its goals, at a great extent. However, some failings (high dropout rate, rather low percentage of the target audience in the participants) should be taken into account for the programme's succesful continuation.

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