ENHANCING SELF-LEARNING IN WEB-BASED COURSE USING PREDEFINED LEARNING PATHS

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Abstract

In this paper we propose a general framework that composes Predefined Learning Paths, i.e., predefined sequences of learning steps, making up a graph of learning "nodes" followed by potential learners. Predefined Learning Paths were developed to support not only potential designers (tutors), but also to provide learners (students) with both ad-hoc learning and supportive activities that are based on sound pedagogical strategies. Thus, the goal of our work is three-fold: (i) to support potential designers to enrich their teaching process (teaching procedure), (ii) to effectively support students in their study (especially in the framework of Distance and Adult Education), and (iii) to promote good practices by employing e-tools that are easy to use and understand. We have implemented Predefined Learning Paths by effectively and efficiently integrating e-learning tools that are available in LMS Moodle. Finally, we present preliminary evaluation results and we demonstrate our thoughts for future work.

Keywords: Distance Learning, Personalized Learning, Adult Learning, Self-Learning, Predefined Learning Path, Moodle.

1 INTRODUCTION

Nowadays, the evolution and the diffusion of Information and communications technology (ICT) in the Educational System (concerning teaching, learning and training) are undisputed. ICT has penetrated into formal educational and training settings and has led to the development of new training practices and modern theories in the learning procedure. Sound ICT applications, based on appropriate pedagogical frameworks and models, have incorporated into learning-supporting and self-learning activities in order to enhance Learning Management Systems (LMSs).

In general, advanced learning systems allow the individualized support of the students, while they provide teachers with analytical data that help the pedagogical design of learning sequences. The first step in this direction is the integration of the learning activities with digital tools that promote the decision-making process and enhance the Differentiated and Personalized learning within the learners' environment. Every approach of Differentiated and Personalized learning is extremely useful and very desirable. More specifically, the ultimate goal of such an advanced learning system is to provide learners with a digital learning environment in which they will be able to follow self-directed learning sequences. This is extremely vital in Distance Learning, where the need for new ways of dynamic adjustment of the learning flow is based on the particular needs and goals of each learner.

In this paper, we propose a general framework that composes Predefined Learning Paths (PLPs), i.e., predefined sequences of learning steps, making up a graph of learning "nodes" followed by potential learners. PLPs were developed to support not only potential designers (tutors), but also to provide learners (students) with both ad-hoc learning and supportive activities that are based on sound pedagogical strategies. Thus, our goal is threefold: (i) to support potential designers to enrich their teaching process (teaching procedure), (ii) to effectively support students in their study (especially in the framework of Distance and Adult Education), and (iii) to promote good practices by employing e-tools that are easy to use and understand (without losing on effectiveness).

We have implemented PLPs by effectively and efficiently integrating e-learning tools that are available in LMS Moodle, like the Lesson module. LMSs like Moodle are widely used in the educational process to enhance the learning experience. We have selected Moodle since it is the basic system used for distance learning in our institution, the Hellenic Open University (HOU). To support our research, a pilot implementation of PLPs for certain didactic notions from an Informatics' course in HOU, has been conducted for the students and the tutors, along with self-evaluation exercises. In addition, short

online questionnaires have been delivered to the students and the tutors, for the pedagogical evaluation of PLPs and their added value in the educational process, especially in Distance and Adult Education. Finally, we present preliminary evaluation results and we demonstrate our thoughts for future work.

The structure of this paper is as follows. In Section 2, we present the key theoretical concept of Leaning Paths, the Learning theories that investing the learning activities and the basic technical of this approach. In Section 3, we present the general framework of the Predefined Learning Path along with the development of a case study Learning Path highlighting methodological aspects. In Section 4, we present the implementation framework for our case study and in Section 5, we give a preliminary evaluation of it. Finally, we give some conclusions and future directions.

2 THEORITICAL & TECHNICAL FRAMEWORK

It is commonly accepted that the process of student learning in a distance education setting is more demanding and at the same time more complex than in the traditional setting. Distance Learning (DL) is a challenging task that requires the coordination and the combination of several factors especially from the conductors of learning events (i.e. tutors and instructional designers). **Motivation, planning, organizing, content development, communication** are some of the most important components that a tutor should enhance by providing students with rich educational material.

Another demand of a successful distance learning model is to meet the instructional needs of students; an ultimate responsibility of every effective distance education program. Besides the educational context, the primary role of each Educational Program is to provide students with all the necessary means for an effective and efficient learning process. Hence, every effort for enhancing the learners' educational experience is more than vital.

Therefore, there are many challenges that the faculty confronts at a distance education in order to succeed and provide the students with solid foundations. Two of the most crucial challenges are (a) to develop a working understanding of delivery technology, while remaining focused on their teaching role and (b) to function effectively as a skilled facilitator as well as content provider. In short, tutors themselves need to be taught how to utilize the technology so that they can prepare the kinds of courses that work best through distance learning. This would seem like an obvious conclusion to reach, but far too often tutors/instructors have received insufficient training on the best way to do so. More specifically, when speaking about technology and education, the main concern that emerges is the adaptation and the support of an e-learning system.

Today many authors agree that the main goal of e-learning systems is the construction of a learning path tailored to student capabilities, previous knowledge, available time, etc.; representing the widely recognized alternative to the one size fits all approach. According to [1, 2], 3], learning takes place when students experience instruction at a level of difficulty that is appropriately challenging and attainable. Therefore, if the tutors skillfully integrate clusters of learning standards in engaging learning tasks into an e-learning environment, they can enable students to demonstrate understanding.

2.1 Theoretical background

In the following section we present and define the basic concept of the proposed Learning Path Approach. That is, the definition of a learning path, the role of the activities and the feedback in e-learning and the used learning theories.

2.1.1 Learning Path

Learning Path, a methodology developed by Jim Williams and Steve Rosenbaum [4], takes a practical approach to defining proficiency and then producing an effective sequence of training, practice, coaching and experience to accelerate the time it takes for a new employee to reach that defined proficiency. From an educational point of view, according to Wikipedia [5], a "Learning pathway is described as the chosen route, taken by a learner through a range of (commonly) e-learning activities, which allows them to build knowledge progressively. With learning pathways, the control of choice moves away from the tutor to the learner. Clement [6] argues that "The sequence of intermediate steps from preconceptions to target model form what Scott (1991) and Niedderer and Goldberg (1995) have called a learning pathway. For any particular topic, such a pathway would provide both a theory of instruction and a guideline for teachers and curriculum developers".

In our approach, the learning path is a specific procedure with pre-determined steps to be followed in an arbitrary order. More specifically, this procedure can be perceived as a form of interactive branching scenario applied in online education. The learner is allowed to choose the predefined learning paths according to her/his "current" needs. Although, the "freedom of choice" is not real, it remains as an activity that provides the personalized approach of the content that a learner should study.

2.1.2 Activities and Feedback: their vital role in e-learning

Activities are an essential part of the learning procedure and more particular in distance and higher level of education. As it is well known from cognitive and constructive theories of learning, activities and every kind of completion of tasks within a specific framework, plays an important role in successful learning. According to Lockwood [7] research in self-instructional texts, learners seem to consider that they benefit from activities such as in-text questions, self-assessment activities etc. To maximize activity completion, the creator should make sure that activities are not more demanding than they should needed [8]. To this direction, providing learners with feedback and any kind of help results to a more likely completion than when the same task is not based on reasoning answers.

Therefore, the most important function of activities is to give feedback to the learners. This scenario is more likely to be successful in computer-based courses. The importance of feedback depends of its nature [8]. Obviously, a rich feedback is more precious than a poor feedback. By the characterization rich feedback, we mean a feedback that is explained (when the answer is wrong/what the logic behind the correct answer), continuous, immediate (prevent errors becoming embedded) and full (not just "right" or "wrong") [9].

2.1.3 Learning Theories: Constructivist or behavioristic approach?

Three are the main learning theories of instructional design that we encountered during the years. the first was the behavioral approach, next were the cognitive approaches, and more recently has been the constructivist approach. Although the majority of writers today espouse the constructivist approach as the most appropriate for Distance Learning, many instructional designers argue that the use of all three approaches is the best way to develop a sound educational material.

According to [8], "the devices that the designers built into their learning materials help identify which approach they are using". By the definition "devices" refer to the description of the learning outcome through the learning material. For instance, a learning package that prescribes what is to be learnt is a learning device associated with the behavioral theory.

The technique that we adapt in the current work is the chaining technique (or, multiply-path technique). According to this technique, the learner performs on specific procedures with pre-determined steps to be followed. Like a chain, one step leads learners to the next. In essence, in the current work, we develop a behavioristic activity focusing on guiding the learners to reach pre-established learning outcomes. Learning is considered to take place when learners manage to reach these expected outcomes designed to meet the learning objectives of the eLearning course. Therefore, the aim of a behavioristic-oriented instructional design for eLearning must be provide learners with the appropriate motivations that are with opportunities that help them demonstrate that they are able to express desired behaviors that prove that learning has actually taken place [10].

2.2 Technical background

Due to the widespread use of Learning Management Systems (LMSs) by the educational institutes (e.g. Moodle) the need of hosting and reproducing learning designs by such platforms has emerged. A new group of tools has been introduced bearing these characteristics and allowing the learning designs to be extracted in a format, which can be imported and reproduced from different LMSs. The best-known tool in this category is the LAMS (Learning Activity Management System) [11] which is an authoring tool for the creation and management of learning designs. The basic idea behind the LAMS is the creation of sequences of learning activities according to the IMS LD specification, which are pluggable in any LMS (Moodle, Sakai, Blackboard etc.). One step further in this direction is CADMOS LD [12, 13], which has been introduced as a learning design authoring tool that is IMS LD level A and B compatible. Furthermore this tool can output a learning design as a Moodle package which can be incorporated in Moodle platform and automatically create a Moodle course. The basic difference with LAMS is that CADMOS creates Moodle courses while LAMS creates learning designs that LMSs' like Moodle can reproduce as LD players.

2.2.1 Learning Designs for Adult Distance Learning Education- The HOU Case

The Hellenic Open University provides adult distance learning education to approximately 30,000 students, coached by 1,700 tutors per year. The digital era implies the adaptation of HOU's curricula to the new digital standards concerning the supporting learning material and the interaction of students with their tutors. The main system supporting HOU students' for the interaction with their tutors is the Moodle platform. Thus, this platform was chosen as a hosting engine of learning designs that are offered to students of HOU in the case study presented in this paper. The implementation of the lds' is running on a module of Moodle called "Moodle Lesson" and not in one of the aforementioned tools (LAMS, CADMOS etc.). Although this module is not IMS LD compatible and does not support interoperability between LMSs, as it is Moodle built in tool, it supports the creation and reproduction of learning designs as Moodle courses in webpages format. Throughout the process of creating and deploying a learning sequence, the creator can implement it and deploy it on the same platform. This feature reduces the complexity of creation, transferring and deployment of learning designs between systems. At the same time this module was chosen over other alternatives in order to investigate its features with regard to other existing systems, which have already been researched and there is a thorough literature on them (e.g. LAMS). The aim is to highlight possible features of this tool that are not covered by the preceding LD tools.

2.3 Moodle Module: Lesson Activity

Moodle Lesson module [14, 15] allows the content to be structured in HTML5 format for creating self-directed lessons. It provides a plethora of content presentation (content pages) and student assessment (question pages) tools. A lesson is made up of html pages consisting of educational content and questions where the creator provides beforehand if the student will follow a predetermined path of visiting the pages (linear pathway) or whether he is free to navigate between pages (non-linear pathway). The two most important modules of lesson are: the content pages and the question pages.

2.3.1 Content Pages

The content pages include educational material for presentation to the students where the teacher can cite a teaching concept, and navigation buttons for navigating among the pages. Each navigation button has its own jump, which determines what the next page will be. When the student clicks a description button he is transferred to the page that has been preset in the corresponding jump.

2.3.2 Question Pages

There is a variety of different types of questions in the Lesson module. We describe them in the sequel.

- Multiple choice – single answer, where the student can choose an answer from a list of possible options
- Multiple choice – multiple answer, where the student can choose more than one possible answers.
- True – False type, where the student has to choose between two possible options.
- Matching questions, enabling the teacher to set up lists which must be matched against other lists, for instance, words, pictures, numbers etc.
- Short answer, in which the student can complete a word or a phrase from a list of possible options.
- Numeric answer, where the student is asked to fill in the result of a calculation is also supported.
- The Essay type, which enables students to answer a question in a few sentences. The instructor must manually evaluate the answer as it cannot be evaluated automatically by the system.

2.3.3 Lesson Activity: Main benefits

One of the most powerful features of Moodle lesson is the student's activity progress bar in conjunction with the grading option. This feature allows the student to check his progress at any time, to check how many activities are left to complete the learning trail and his grades at that point of time.

Timed activities option is supported too where the instructor can time limit the access of the student to an activity. Another feature of Moodle Lesson is the prerequisite chain courses where a lesson can be made available after the successful completion of another prerequisite lesson. The number of times a student can attend either an entire lesson or repeat an activity is fully configurable too. Through the navigational pages (branching and clustering) the instructor can create random quiz slides. Very important feature also, is the capability of creating predefined learning paths where students, depending on their answers may be guided through different learning paths (personalized learning). Lesson supports CSS styling to configure pages and dynamic content which means that material from external resources (e.g. YouTube) can be integrated. Finally, a powerful feature is the Template lessons that enable the instructor to create a Master Lesson Template and to import it for the creation of other lessons [14].

From a pedagogical point of view, Lesson Module promotes a personalized approach of learning due to the fact that each learner can follow different routes based on his/her individual knowledge. More specifically, the use of a system of branches and paths provides the learner with a road map of learning where different routes/paths are achieved based on the individuals skills and knowledge. Furthermore, Lesson Module helps differentiate the delivery of content within Moodle.as teaching staff engage with ideas and creatively design reflective learning in Moodle. Since learners enter an online course with different prior knowledge and life experiences, is more than necessary to provide learners with different avenues of learning, processing and demonstrating knowledge [16].

3 PREDEFINED LEARNING PATHS

In this section we describe the general framework the proposed learning activity, called *Predefined Learning Path* (PLP), along with a case study where a PLP for certain didactic notions from a specific course of Informatics in HOU was implemented and evaluated.

3.1 The General Framework of Predefined Learning Paths

A *learning path* is learning activity that aims on personalized and self-learning of students. The student is asked to follow a directed graph of learning nodes, where each node deals with some didactic notion. A learning node is characterized either as a “theoretical” node or a “question” node. The idea is the learner to answer a question, but he may previously study the theoretical issues that are compulsory for the question to be answered. It’s up to the learner to decide whether to visit a theoretical node, or a sequence of them, or to immediately reach a question node and try to answer the question, or even to skip it and move to the next question. At any step, the learner has the possibility to go backwards and study the notions that are appropriate for him to answer the question.

The general framework of a learning path is depicted in Figure 1. Starting from the most left-sided red node, a potential learner may visit a theoretical node first, next s/he may try to answer a question, and then s/he moves to the next theoretical node, and so on, until s/he reaches the most right-sided red node and finish her/his activity. The white nodes are the theoretical ones and the colored nodes are these that represent certain questions. It’s upon the designer of the learning path to skip a theoretical node and to design more than one question nodes to follow after a theoretical one. Moreover, backward arrows (from the right to the left) connect a question node with theoretical ones, in case where the learner wants to study the corresponding theory more than once.

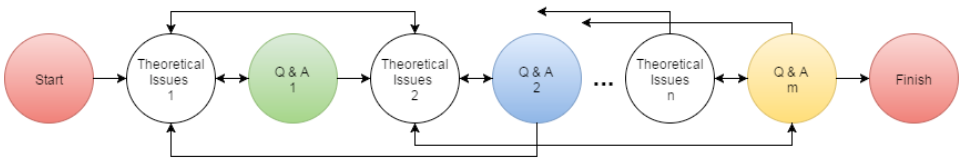

Figure 1: A general pattern for predefined learning paths

Each of these nodes is actually a subgraph containing a set of smaller nodes. A theoretical node (see Figure 2) may be a collection of simpler nodes containing smaller pieces of theory for the learner to study, examples, propositions, or even self-evaluating exercises. A colored node is composed by the statement of a question (a proposition or a theorem, or even an exercise or a problem, along with an attempt of the learner to answer the question and the correct answer for the question (the colored ones). More specifically, a certain pattern for the question nodes is proposed: starting with the

question, the learner makes her/his try trial to answer it. Next s/he reads a sort answer of the question and decides whether her/his answer was correct or not. If it was, s/he may move to the next component of the path, otherwise a hint is given to her/him and s/he is encouraged for a second try. Next, an extended answer for the question is given and the learner moves forward to the next component (see Figure 3).

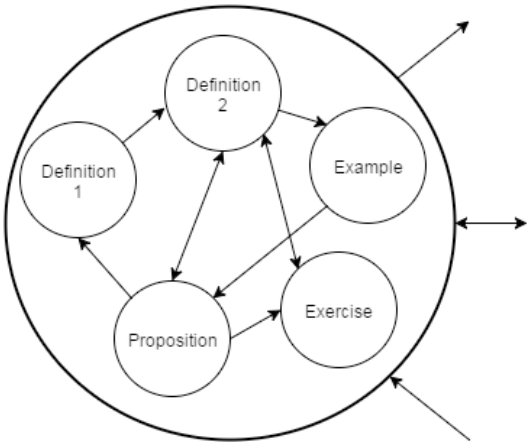

Figure 2: Internally to a theoretical node of the learning path

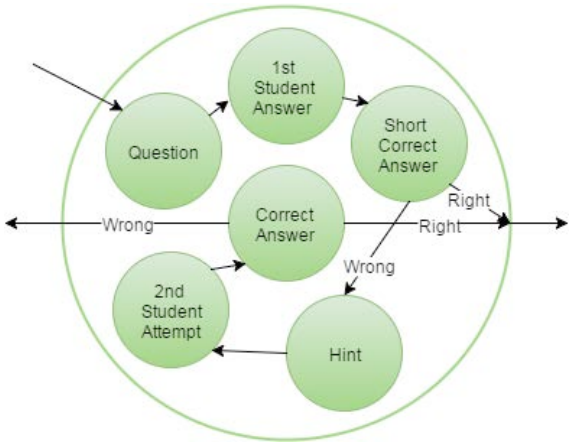

Figure 3: A predefined pattern for a question node of the learning path

An individual make some decisions and traverses the learning graph according her/his needs and her/his interests. However, the designer of the activity can design certain nodes that are proprietary for the learners to be visited. Thus, the learner visits a *predefined learning path* while s/he has the opportunity to make decisions the node to visit nest, according her/his needs and interests. Thus, the proposed activity allows the individualized support of the students promotes the decision-making process and enhances the Differentiated and Personalized learning within the learners' environment. We next describe a pilot implementation of a Predefined Learning Path in Moodle, using the "lesson" module, for certain didactic notions.

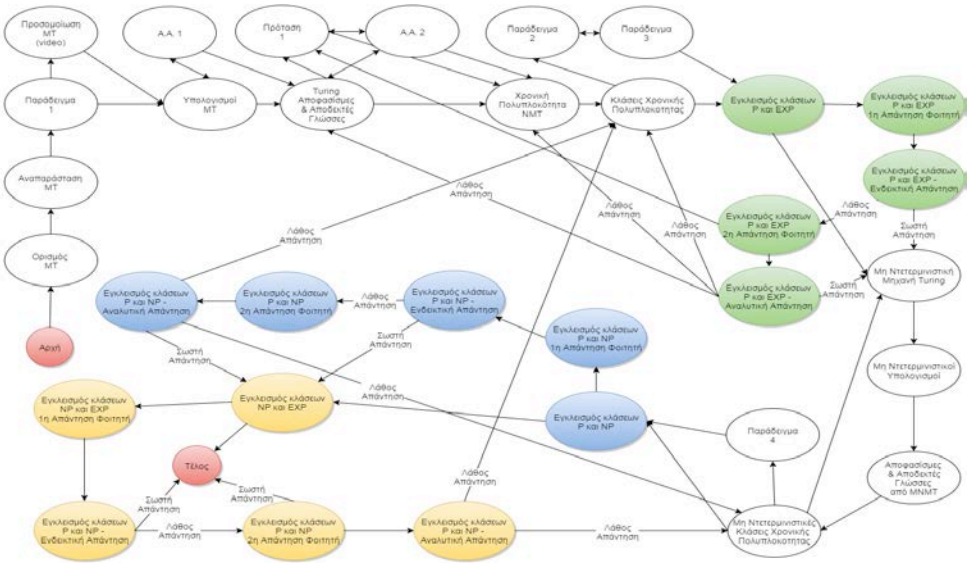

Figure 4: A predefined learning path covering didactic notions from an Informatics course

3.2 Developing a Predefined Learning Path: a case study

Based on the general framework described above, we have designed a PLP for a certain course of the Informatics undergraduate program of our Institution. More specifically, we aimed on exploiting the good properties of PLPs on didactic notions borrowed from Theoretical Computer Science, and especially from Computational Complexity Theory. Notions like "Turing Machine", "non-Determinism",

Computational Classes". "P, "NP" and "EXP" are rather inconvenient for the most of the students to be understood, and for some tutors to be taught. Thus, we have designed a learning path that provides a theoretical background for the above notions (definitions, examples, propositions, etc.) and asks for certain inclusion properties among the time complexity classes P, NP, and EXP. The full path is depicted in Figure 4. Courses in HOU are available in Greek, so the labels of the nodes of the path are in Greek language, too. However, one can easily see the theoretical (white) nodes and the question and answer (colored) nodes, and the interconnection between them. The learner can traverse the path, visiting some proprietary nodes and other ones according his knowledge. He may immediately try to prove certain propositions or, in case of luck of knowledge, to learn, by visiting some theoretical nodes.

4 PILOT IMPLEMENTATION

In order to gain a deeper and more diverse understanding of the PLPs, we present the creation phases of the implementation of a PLS followed by pilot application/flowchart as well as the individual stages of each phase. The main PLP has been developed by the Research Team with the contribution of an expert-tutor in the specific theoretical field. More specifically, the expert-tutor is a tutor at the HOU in the thematic unit from which the PLP concept/learning unit was developed.

4.1 Implementation using Moodle's Lesson Module

As it has already been mentioned in the Section 2.3, the selected web-based environment to integrate the PLPs is the MOODLE LMS System. In this environment, the potential users will be able to access the learning activity and run the activity in order to provide feedback to the creators. In the following section we present the basic creation phases and the main project framework.

4.1.1 Creation Phases

As mentioned in the Section 3.1, PLP is essentially a structured flowchart of intermediate steps of actions, which serve as paths for the design and development of a learning unit. Fig.5 below, lays out the basic framework on which the development of PLPs is based on and presents the main stages that characterize them. In order to gain a more diverse understanding of the PLPs design, we present the sequence of the specific phases of development/creation.

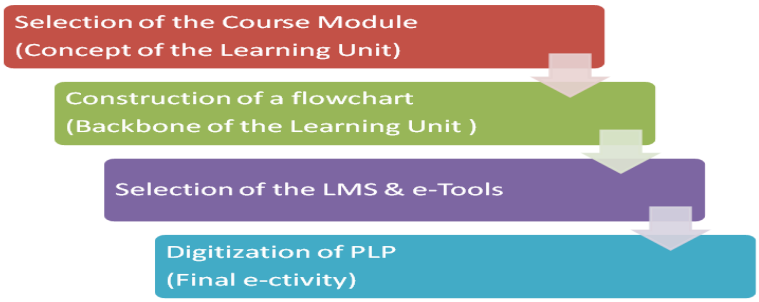

Figure 5: PLPs' Creation Phases

The first step includes the selection of the course module of HOU and more specifically, the identification of a particular/fundamental concept to be developed based on PLP. According to the PLP idea, a flowchart should be constructed and constitute the backbone of the learning unit.

Once the flowchart of the intermediate steps is completed, the next step is to integrate it in a web-based environment so that (a) the potential designer (i.e. tutor) to be able to easily edit and manage the created PLS and (b) the end user (i.e. student) to be able to involved in the educational procedure. Therefore, at this stage, we went forward to the digitization of the PLS in the web-based environment of the current LMS, Moodle. More precisely, we adapt the use of a well-known module of Moodle, called LESSON. This phase is the timeliest demanding procedure especially when the complexity of the flowchart is rising (i.e. the learning unit is an advanced concept). In particular, the stage of the Digitization contains the following three basic sub-stages.

(a) **The development of the educational content**: this requires (i) the development and processing of the suitably formed of the text and (ii) the gather of the necessary resources to be integrated

(b) **The designing and creation of the efficient transitions**: the transitions essentially form the different paths followed by the user according to her need (i.e. unless she is satisfied with the information she being looking for)

(c) **The control of the different transitions** to see that the reactions occurring leading to proper transition/learning path.

Last but not least, the final stage is the demonstration and the placing of the produced learning unit to the community and to the end users. The main scope of this stage is the use and finally the evaluation of this approach of a learning unit through well-structured questionnaires as a feedback from the users/learners.

It is worth noting that the above stages and the procedure of specifying a pre-defined learning path will provide the main specification for the development of the total learning Units.

4.1.2 Project Framework

The laboratory ECOMET-Lab is responsible for carrying out the research of new and innovative methods in distance learning in HOU. One of the major priorities of ECOMETLab is to increase the awareness of the tutors of the educational material and provide them with effective and efficient tools enhancing their teaching skills. For this reason, at this stage, we work with tutors as they are the cornerstones of the Institutional community. The initial intent of the current work is to provide advice in order to help them develop their students study skills using/reforming the available material. Therefore, a pilot phase carried out by notifying the community about the object and purpose of the research. It is a preparatory stage before the stage of acceptance and implementation of the new proposals proposed by our research team. To the acceptance/evaluation phase, a number of stakeholders from the institution (ex. tutors) actively participate to obtain the relevant feedback.

As mentioned above, the structure that we adapt is a learning path that can combine several format tasks. More specifically, various formats of tasks are being used to enhance engagement by providing richer learning environment and scaffolding support. The task set for the learning path is: a short answer tasks, a true-false-task, a fill-in task, reading and comprehension task. The final learning activity harmoniously combines many different tasks that we have to evaluate.

5 PRELIMINARY EVALUATION OF PREDEFINED LEARNING PATHS

To support our research, we implemented the PLP described in subsection 3.2, using the Moodle platform and the lesson module, according to the creation phases, as depicted in Figure 5. In addition, short online questionnaires were also implemented in Moodle, and were delivered to the tutors and the students, for the pedagogical evaluation of PLPs and their added value in the educational process. Our aim was to see if the PLPs are engaging and usable by tutors and students in Distance and Adult Education.

Participants in our pilot research were tutors and students enrolled in the Information Systems MSc Postgraduate Program of the Hellenic Open University. This means that all individuals in our research had advanced computer skills. A sample of 14 tutors had participated, i.e. about 35% of the number of tutors of the course, while the number of students was rather small. Our PLP was based on didactic notions borrowed from Computational Complexity Theory, notions that are taught in the Postgraduate Program.

Firstly, the participants had to visit the PLP and next to fill out a short questionnaire, having different questions for students and tutors. Concerning the tutors, there were 4 questions that characherized as “importance questions” with 5 possible answers (1 – 5) to each question, related to the level of enhancement of the learning process (very high; high; satisfactory; low; and very low). Also, there were 4 “Open Format” questions which gave to our participants the opportunity to express their opinions in a free-flowing manner. As for the students, there were 4 questions of type “Importance Questions” with the same range of possible answers with the tutors, 2 “Open Format” questions and 1 "Dichotomous" type question.

To start with the “importance questions”, tutors were asked to express their opinion about the impact of PLPs in the studying process of the students. 75% of them believe that the PLPs could be a good guide for the students to study basic didactic notions, along with the educational material offered to them by the HOU. Also, 78% of them claimed that PLPs could extend the way of self-evaluating for the students and 93% of them agreed that PLPs may offer a quick and easy way for the students to

revise the basic concepts for the final examinations. Concerning the revision of basic concepts while the students are preparing their written assignments, 65% of the tutors believe that PLPs can form an alternative way of students' preparation.

Next, tutors were asked to express their views about the usability of PLPs. One of the main issues that concerns a Teacher-Advisor of the Hellenic Open University is the organization of the agenda of the Contact Session with the students, in order to solve a problem, to resolve misunderstandings, improve student understanding and performance, and promote tutor-student and student-student communication. When they were asked whether the PLPs can be used as a method for feedback to set up the agenda of a Contact Session, 50% of the tutors responded positive. When they were asked if the PLPs can be used as an alternative way of feedback for the written examination and the final revision, 36% of them stated that this could have a remarkable contribution.

Also, tutors have been asked whether the usage of PLPs could improve the learning process. According to their responses, the majority of the tutors believe that PLPs can enhance the learning process greatly. Finally, the last question had pointed out the interest of tutors in using PLPs. Nearly 80% of participants were interested not only in participating in the creation of learning paths, but also in applying PLPs in the educational process.

Through a set of "open type questions", the tutors were asked to express their opinion about the way the students can benefit from the use of PLPs; the majority of them said that the students could become capable of not only understanding basic didactic notions of the syllabus, but also revising their knowledge. In addition, it was stated that, under certain circumstances, PLPs might be a more efficient way to access the educational material regarding the conventional printed course book due to the better presentation format of the structure of the content. The participants made useful comments in the next open-type question concerning whether PLPs could benefit a tutor. Many of them agreed that PLPs could be used to record statistical data, and the analysis of them in turn would help the improvement of the educational material. Some tutors said that they could create PLPs which can be used as introductory teaching material. The majority of the tutors stated that they had never met a similar approach like PLPs before. However, they noted that PLPs must involve students more, so that they are enriched with more examples and self-assessment exercises. This opinion, which was expressed several times, however, has to do with the content of the paths but not with the structure of the path advocated by the specific paper. The main point that the majority of tutors concerned were the way the learning path is being accessed and the lack of access directory for the content. A view recorded as important for its pedagogical value is related to multiple choice questions. Specifically, it is proposed that when a student's answer is wrong the best approach is the system to identify it and propose the study of the relevant module again. Many views were expressed on issues about the interface usability, but this is not furtherly analysed in this work. Finally, one of the major views expressed is the improvement of PLPs in order not to burden the study time and study load of students.

The small number of the student, who participated in the pilot phase, led us to consider the sample unreliable for generalizing any conclusions. We just mention that the 80% of them believe that PLPs are a great study guide and they can be used for learning new notions. Moreover, it seemed that PLPs weren't so helpful for their revision aiming at their preparation for the written assignments since more than the halves of them were negative. However, several of them were positive regarding the assistance offered by PLPs for their revision for the final examinations. All students answered positively to the usage of PLPs in their study. Similarly, the PLP appears to be easy-to-access and well-structured for the students since almost 100% of them responded positively on the understanding of guide paths. Moreover, in a question about the feedback that the students received from PLPs, they also responded positively. Finally, by their responses in an open-type question about any possible improvements, the conclusion is that the paths should incorporate more exercises and examples rather than theoretical definitions.

6 CONCLUDING REMARKS & FUTURE WORK

In this paper we propose a framework that provides a more effective and motivating learning experience to the adult learners. Our research underlines the value of available tools of the current LMS system MOODLE in HOU and more generally shows that the incorporation of ICT in the teaching and learning process leads to the development of more pedagogically sound practices. The preliminary feedback received from the teaching staff of HOU has shown that the approach of PLPs is

quite interesting and promising. Although the original framework used in our study can be significantly improved, the scientific community of the University responses positively.

It is worth noting that, even though the total number of tutors who were actively involved in our research was satisfactory, nevertheless, our sample is not large enough to provide general conclusions with sufficient confidence. Therefore, since the ultimate goal of our research will eventually affect a University level program, we intend to conduct a large-scale pilot for the PLP approach, taking into account comments and recommendations for improvement along the way.

Our future work involves the improvement of activities structures and tools in the context of instructional design and the development of alternative formats of content and activities in HOU Courses. Furthermore, we intend to develop additional material that supports and guides students in various scientific fields

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