Towards a Reference Model for ODL: a Case Study in the Tourism Undergraduate Course

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Abstract – **Open and Distance Learning (ODL) environments are defined as tools that aims at aiding learning practices since they use new technologies to free learners from constraints of time and place. A research target of this area is the use of new modeling techniques for this type of environment, taking into account not only aspects of data such as accounts, school infrastructures, but also educational profiles of the course and educational agents involved. In this paper we developed a modeling technique for ODL, which has practical application. Our modeling technique takes into account pedagogical observations and needs identified by actors (students, professors, and the staff involved in the development of the learning environment). Our approach was evaluated using a distance-learning environment in a pilot class of Software for Tourism Course. The class aims at teaching software for professionals in this area. The implementation of pilot class allowed developers to have an initial contact with a productive and dynamic learning environment. Furthermore, it was possible to generate a real product based on lessons learned.**

Keywords – Data Model, Open and Distance Learning, IT

I. INTRODUCTION

Open and Distance Learning (ODL) [1] can be defined as a new learning and teaching mode that is increasingly applied in industry and academy domains in Brazil. It can be also considered as a modern version of correspondence education widely used in the last century. It is considered as a quick form of teaching, training, and also as a means of self-development for the ones that use it [1]. This method is part of an educational process, which is systematic, organized, and requires a two-way communication channel or the effective use of multimedia technologies for use these educational interactions. One of these new technologies, *i.e.* information technology (or simply IT), is extensively applied in teaching practice, resulting in the presence of various new media development and communication in the learning process [2]. The use of ODL in the academic environment started increasing from 2001 [1], when it was enhanced by the explosive growth of the Internet and WWW. After that time several educational institutes started using this methodology to aid students in their courses. In Brazil, ODL was formalized in a 2005 (Decree number 5.622, 19th December 2005) presidential decree that states: "This decree characterizes distance education as educational modality, organized according to the methodology, management and peculiar evaluation".

Although IT has added a different perspective for ODL, defining how the computational environment is configured and modeled for supporting the learning process is still an open challenge. There are several existing pedagogical models that can be appropriate in this new area. This way, in ODL we cannot ignore all the pedagogical models developed for education over the last century even if they are not directly designed for ODL. All of them can provide subsidies to educators to discover something about the methods and media used in order to make distance education possible. This way, it is not the goal of this paper to propose new pedagogical models. Instead, in this paper we propose and describe a process for developing a modeling tool to be used in the construction and development of class and courses based on ODL using existing pedagogical models.

The goal is to obtain a reference model for process of class construction in ODL courses. Our model is designed in layers, where these layers address pedagogical aspects, content (*i.e.* course data itself) and finally an environmental organization layer. Part of the design of our model was inspired and based on data modeling techniques in Databases. Our reference model was applied in a pilot project, as a case study, which was the construction of a class of software for Tourism Course at the Federal Center of Technological Education of Rio de Janeiro (CEFET/RJ). A motivation to apply this model in this course was due to the fact that IT is part of the training needs for professionals in this area and there is a large demand of IT skills for the professionals during important events that will be held in Brazil such Olympics and the 2014 FIFA World Cup.

Besides this introduction, the paper is divided into seven sections. Section II presents related work. Section III presents an overview of ODL. Section IV presents an overview of the tourism course, which was the subject of the case study. Section V discusses general aspects of the data model. Section VI presents current initiatives for reference model. Section VII discusses our reference model. Section VIII presents methodological discussion of the application of the model in the class of software for tourism course. Section IX presents the results and finally, section X concludes the paper.

II. RELATED WORK

There is no approach that uses data models for representing the entire ODL process. Commonly, other approaches trends to model only the computational environment. In general, the existing methodologies for modeling data for ODL environments refer to two main

aspects: data modeling for ODL software development and authoring.

As for modeling data for ODL software development, there are previous initiatives, such as the project PGL (*i.e.* Partnership in Global Learning) which is an international consortium that aims at producing, through partnerships around the world, learning systems biased technological innovation and distribution capabilities and worldwide use. This model is used for construction of software but it is not focused on working with learning process, but only with their technical definitions [3].

Another approach that builds data models for ODL refers to authoring templates that are more associated with the definition of process for authoring in ODL courses. In this case, the model includes tasks related to the creation of the course itself, such as: design, planning, definition and implementation, serving as a guide to the author for this design [4].

III. Background on ODL

There is no consensual definition about the ODL concept. Actually, there is a diversity of different definitions. For some authors [5]–[7], ODL is associated to a physical and temporal separation between the student and teacher and as teaching process is performed in this space-time dimension. Other definition [8] considers not only the space-time dimension, but also the technologies used to manage this dimension, the modeling of the course and instructional techniques performed.

The use of the Internet and its variations (intranet and extranet) as ways of transmitting knowledge is a powerful ally in the implementation of the concepts of ODL, because, through this technology, it is possible to promote the space-time dimension along with all kinds of resources for application of methods of teaching and learning of ODL, such as access to texts, films, databases and discussion forums, as well as the presentation of interactive exercises, among other features [1]. The internet has become a way to exchange knowledge and information in a collective manner, without pre-definitions, different from a live class in which the student must be present at a specific time and more resources to exchange information between students themselves and between students and professors [9].

Despite these features, there are views of the ODL that aim at increasing the diversity of learning, but not necessarily as a full replacement of the traditional class attendance in a classroom. This way, ODL should not be seen as unique teaching mechanism and should include mechanisms such as mentoring that meet the needs not covered by ODL technologies in long-term courses [10], [11].

ODL can be divided in two modes according to Prinsloo, Slade and Galpin [12]: virtual mode and semi-presence mode. In virtual mode, all access to the content is remotely granted via Internet. There is the figure of the tutor, to whom students report doubts in person or virtually. In person interaction is commonly used to perform evaluations. In the semi-presence mode, there are educational stations where students go to study and to meet tutors. In this mode there is also the figure of the online tutor, but the stations there is a present tutor with whom students can ask questions and participate in the activities requested in specific laboratories [10], [11].

It is well known in Brazil that, in the case of implementing one or more ODL-based class in an undergraduate course it cannot exceed 20% of the total amount of class of the course [13].

IV. Case Study: The Tourism Course

The Tourism Course (TC) that was chosen as the case study in this paper is offered at CEFET/RJ. It provides a comprehensive curriculum for Tourism students. TC is based on the importance of promoting concepts and techniques related to the world of tourism and entertainment as well as to understand the relationships that are part of the tourism phenomenon, emphasizing the humanistic education of the student.

The TC was structured based in the Brazilian law number 9.394 of December, 20th 1996 that defines guidelines and bases for national education (LDBEN). The TC curriculum consists of 20 classes in total. This course has a workload of 1,152 hours and lasts for 6 semesters. It offers classes include the main sectors that structure the Tourist System (Agency, Lodging, Transportation, Entertainment, Events) and qualifies students for medium and long-term job positions according the specific demands of tourism market sector of Rio de Janeiro. None of these classes is currently provided using ODL environments. In special, one of the classes of the course is named "software for tourism". Currently, there is a lack of software professors to teach this class. Thus, the decision to offer this class in ODL follows the aforementioned reasons and justifies our choice for this case study.

V. Data Modeling Process Background

Almost all areas of knowledge, such as arts, social sciences, and software, make extensive use of models for representing relevant aspects of their environment. In an IT environment, these models can be used to explicitly represent characteristics of the real world that can be translated into methods and data that describe the operation and behavior of software components. Data modeling process creates elements (*i.e.* models) that ease the comprehension and design of an information system.

The data modeling process consists of three phases: Conceptual, Logical and Physical Modeling. The first one is used as a high-level representation and mainly considers perspective of users as creators. Some authors believe that perspective, to be effective, dispenses a pre-phase, called requirements analysis on which the key concepts associated with the problem domain are obtained. This information is used to design data models in the following phases. The second phase introduce some logical details that can be used to support the implementation, whereas the third phase works with the physical aspects of the data that goes into the model, as they are physically stored in a database, for example.

The objective of this modeling process is to analyze the environment in a data-centric perspective, with emphasis on modeling: (i) entities and relationships between them, (ii) logical data groups; and (iii) the life cycle of entities.

When it comes to notation, the conceptual model is a graphical representation that presents the components and concepts of the system that can be represented as entities

and relationships between them. The logical model expands the concepts of the conceptual model, providing information in the form of tables, files, and also how they can be accessed, for example through mechanisms of primary keys, commonly used in database. Finally, the physical model includes the analysis of the characteristics and resources required for storage and manipulation of data structures identified, contemplating their storage structures, addressing, access and physical allocation.

Among the elements identified and generated through the phases, we can cite: (i) tangible elements: elements that have concrete existence, which take place in the problem domain; (ii) functions: identification of objects through their performed function (such as role, assignment, and classification); (iii) events: identification of actions that are related to objects identified in the domain of problems that can be either simple, such as insertions and changes; or complex, such as identification of relationships between them; (iv) Interactions: resulting associations between objects in terms of a process performed, in which each participating object interaction preserves its characteristics, not being impacted by the materialization of the interaction and (v) specifications: elements that define characteristics of other objects.

VI. Reference Models for ODL

There are several approaches to model IT environments, but a few is focused on modeling ODL environments. Andrade *et al.* [14] proposes a modeling and implementation process for ODL environment that is based on six phases. The phases one to three have direct correspondence to the data modeling technique of IT environment [15]. Phase 1 refers to the conceptual design; Phase 2 is related to the computational modeling and phase 3 to the environment implementation. The other phases (four to six) deal with environmental assessment under the pedagogical point of view, taking into account characteristics such as ergonomics and usability, which is outside of the scope for our proposed model. To this extend, only the first three phases are presented here.

The first phase corresponds the process of modeling ODL classes. It is focused on instructional design, as well as the definition of the architecture of the environment. As the emphasis of this phase is to obtain data that is associated with relevant items for learning, some data structures mapped are: audience data, containing the definition of students and professors, such as name, registration, and other class information identification; data from the field of knowledge and its area; definition of content (data menu), policy definitions for teaching/learning, among other structural elements that help in defining the course.

The second phase targets the computational modeling of the environment following a structure similar to requirements elicitation of a traditional software life cycle. It encompasses a preliminary study of the design of the learning environment and the technical conditions for its implementation. It starts with the educational proposal identified in first phase and models the product based on the computer that may come to integrate various media, services and Internet tools. The requirements obtained in this phase take into account the type of media being used (*e.g.* printed or electronic media), operating system basics, application and access mode, and the preparation of materials (*e.g.* text editing, sound). Finally, the third phase consists on defining the environmental elements identified in the second phase, with emphasis on mapping platform: ODL application and operating system used.

VII. Our Reference Model for ODL

Our proposed reference data model for ODL applications is composed of three layers. The first layer defines educational and pedagogical standards, the second layer defines the aspects of the course content and the third layer defines the application environment where the course is instantiated.

It is worth to mention that our reference model is neither a methodology to build a new ODL tool, nor a methodology to develop a new type of application. Instead, our reference model is conceived as an element that enables the construction of class development within an ODL environment. To this extend, at the pedagogical perspective, it is not intended to establish a new approach for teaching, but benefit from existing models applied in the context of ODL [16].

The first layer, named as pedagogical layer, is a layer that contains texts, documentation in narrative form, and elements of requirements analysis and conceptual model. The goal is to elicitate aspects related to the ODL courses, considering pedagogical requirements identified by the professors. This layer establishes the problem domain, the people involved (students, professors), the object of the course, the motivation for using ODL, the learning methodology to be used and its supporting elements. As aforementioned, it is a narrative specification, whose information is derived from questionnaires and group interviews used to obtain data from the main actors (professors, students, academic managers, program coordinators, staff). It is important to identify, using any of these methods, the following information: (i) Which are the goals to be achieved by the course; (ii) Who are the users and components of this course; (iii) What are the goals of providing the course (complementary goals); (iv) How well are pedagogical components organized; (v) How well are the contents of the course presented; (vi) What are the tools for teaching to be used (if identified). The output of this layer composes the information that aids the assembly of the elements of the content layer.

In the content layer, we use a visual model, based on the Unified Modeling Language (UML) [17] that is commonly used in software development. The purpose of this layer is to present the two main relationships mapped from the pedagogical layer: between the main actors and between the organization and pedagogical content itself. In the first part of the content layer we deal with the relationships between main actors. It has the objective to present a hierarchy of access to a specific content, representing the organization's vision of access, to specify the main functions of each ODL user and also aids in identifying security aspects.

In the pedagogical and content relationships, the emphasis is to show the content tree of the course, its pedagogical structure, prerequisites and relationships with support tools (forums, chats etc.). It is important that this part of the model is able to show the type of content, so their view form, their way of update, relationships with

other content, relationships with supporting tools and pedagogical vision of how that content should be covered.

In the environment layer we describe the place in which all the physical elements specified in the content layer are going to be used. This layer not only defines IT platforms, but also all physical definition that might be required for the operation of educational activities defined in the first and second layer. This means that beyond the technical definitions, such as ODL software applications, machines and operating systems, sets up any physical instrument necessary for the learning activities. To achieve this goal, we should include a description of elements such as classroom to support local access to computers that are not platform for installation of ODL environment, other supporting tools, such as data projector, and whiteboards.

VIII. APPLYING THE MODEL IN A TOURISM COURSE

To demonstrate the effective use of the reference model proposed in this paper, we present the implementation of the class of "Software for Tourism" in an ODL environment for TC course.

A. *Pedagogical Layer*

The construction of the pedagogical layer for the class of Software for Tourism of TC began with eliciting the learning needs. For this, we initially identified the main actors involved, including staff, target students, professors, coordinator of the TC, and coordinator of the research project. Once identified, each group was classified according to their importance in the teaching process. Professors received the highest value, followed by the coordinator of the TC, students, project coordinator of the research project, and finally staff. This ranking indicates a greater degree of pedagogical responsibility in relationship with the course, and the higher the value the greater the responsibility to define the pedagogical and didactic.

Following, we applied the methodology for obtaining information about the course. The requirements were gathered using interviews with two professors of the tourism course, to address perspectives and pedagogical advantages of the implementation of ODL. We also interviewed some students, in order to obtain the students' feedback regarding this new approach and which requirements that would be relevant from their perspective. At last, we have conducted a final meeting with group of those surveyed students to consolidate the prospects of learning with this new technology, focusing on their opinions.

This information was then consolidated and evaluated with the TC coordinator, the coordinator of the project and the staff. In the meeting with the two professors, we presented the benefits of ODL technology and its features. This meeting aimed at defining what would be the best strategy for building an ODL environment for teaching Software for Tourism from the point of view of those who would administrate the class. At this meeting it was possible to obtain the professors that could be addressed to the class of "software for tourism", and other items such as: strengthening the approach of a course containing practical information, enhancing the "how to", the description of the most used software in tourism area. One result of this meeting was a list of possible applications of being taught by ODL and should be related to the needs of a professional tour, *i.e.*, market vision. Another result achieved was that the development of the class in an ODL environment, which was an entirely new experience for the TC and was started very carefully, on a trial basis.

Following the script previously drafted, the staff conducted a survey with students of the course, following the guidance of the TC coordinator, and checked what needs would be met immediately on learning of this class. It was provided a questionnaire for 32 students from several different stages of the tourism course. The purpose of this questionnaire was to obtain students' items of class that would be relevant to their academic life, thus identifying the expected didactic perspective and identifying some previous experience of using ODL. In this questionnaire, it was inserted a set of six applications, nominated by professors at the previous meeting, and within these options would be chosen the 3 most voted, that would be those that would be implemented immediately. Table I presents the results obtained in the questionnaires.

It is important to emphasize that this questionnaire was also used to obtain the expectation didactic-pedagogic from the students. This is also motivated by the fact that the novelty of the use of ODL. One result of the survey was that students chose learning more conventional IT tools such as MS-Excel™, MS-Word™ and MS-PowerPoint™, also known as MS-Office package™, instead of database software, specific software for tourism or electronic mail software. It was observed in offline conversation after applying the questionnaire, the reason students choose this package was due to the fact that this tool is so dominant in the market for tourism, is to build spreadsheets accounting, scheduling travel, construction documents or memoranda and presentations to build. The choice of software is not specific for tourism, since there is no standard software in the market, which would make the student, who is learning particular software, a specialist in a non-standard application.

TABLE I: RESULTS OBTAINED IN THE QUESTIONNAIRES

Application Options	% of students
Excel	77%
Word	58%
PowerPoint	58%
Access	15%
Tourism Management Software	15%
Outlook	9%
Do you know ODL?	23% yes, 77% no
Have you ever learned from ODL?	13% yes, 87% no
What is the best didactic form for you?	25% expositive classes, 20% debates, 20% technical visits, and 35% do not know
What is your stage in the course?	90% between fourth and sixth semester

Another important item that was obtained in this layer was the preference of student for lectures and teaching that added value to interactivity, *i.e.*, there was a choice

by exposing content with books, coupled with a need to have dynamism in the learning process. This is important information, since the ODL contains both facilities desired.

After this questionnaire, there was another round of data collection, in which interviews were conducted with 15 students, chosen from the group of 32 who answered the questionnaire in order to identify how lessons should be submitted in the ODL environment and how students could choose the format of classes, in videos, slides or handouts.

As the result of the interviews, it was observed that 60% of these students found it easier that classes were presented as handouts and 40% preferred video lessons. Students also indicated a preference for the inclusion of an environment such as a forum or chat.

The summarization of this information helped us to define the course to encompass the teaching of the 3 top rated applications, MS-Excel™, MS-Word™ and MS-PowerPoint™. It was also possible to identify the preferred class model, which was focused on the use of textbooks that are easily accessible. The staff and coordinator of TC produced the handouts using Portable Document Format (PDF).

Another result focused on pedagogical content for that layer, i.e., the way in which the course should be presented. The class was divided into three modules, one for each selected tool. Each module contains at least two and at most four topics. Also, each module can be accessed independently, that is, there would be a prerequisite among the modules. The topics within the module should be successively attended, that is, a topic can only be considered open when the previous access was completed.

Students connect to the ODL environment using passwords and were granted access to the pilot course. Students' access in the course can be queried by professors and administrators, which allowed them to check students' attendance. Finally, another tool defined for the ODL that was also based on the interviews comprehends the inclusion of a forum to allow students to solve their doubts.

B. Content Layer

In this layer we use a data-modeling tool to present the relationship between the actors involved and the content identified in the pedagogical layer. When assembling the visions of these relationships, we built the model with flexibility, focusing on objects that compose the design. The identified objects are those that have been obtained from the analysis of the pedagogical layer. The content layer was modeled through class diagrams in UML; which is a modeling language that facilitates the presentation of these types of relationships, helping in understanding their association and hierarchy. The model for the case study is shown in Figure 1.

In this model we identified the key actors in the pedagogical relationship, according to the necessary functions for manipulating the non-ODL and ODL environments, which would be: students, professors, administrators and coordinators. Students are those who would be entitled to registration functions (with insertion, modification, query and deletion) and the access function containing restrictions on handling the pedagogical environment. But the professor has no restrictions and can act as administrator, which allows a super user to control the environment. A professor is the one that actually runs the course. This administrator role is associated with ODL environment, that is, those who work directly in the environment, the entire building security mechanism and restriction of the tool, since the coordinator's role would be beyond the ODL tool. The pedagogical relations can be seen in Figure 2.

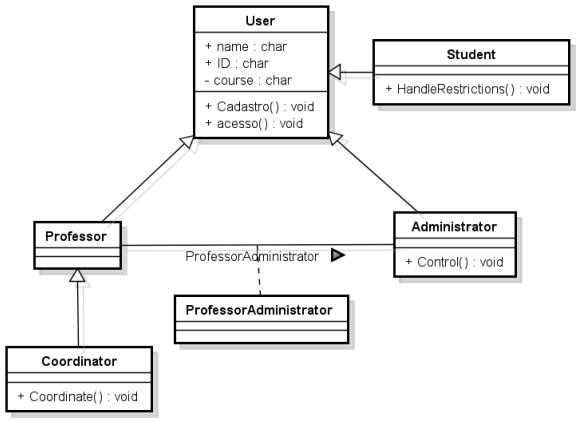

Figure 1 Relationship between the classes

The identified objects, and their relationships, for this case study were "course" (with their identifying attributes). It corresponds to four main components: the "class" (in our study, only one was implemented) and the "room" (or ambient). The class has modules (minimum 2 and maximum 4), which in turn are formed by topics. The topics have a self-relationship based on conditions prerequisites, so that they only grant access to a topic when it prerequisites are fully complied with. The mechanism for indicating the end of all topics is the end of the last topic, which is a test for the student. This support environment is formed by all material that might be required. In the present study we did not identify the need for tutors.

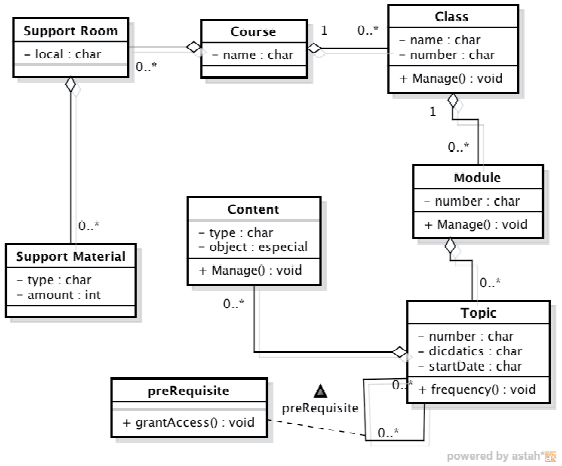

Figure 2 Pedagogical relationships

C. Environment Layer

The environment layer is the place in which the

components are described physically to allow the operation of logic elements identified in the content layer. Besides containing these components (ODL software, network, machines), in this layer we also describe the procedures for the development of the general ODL environment. Even when we identify the need for physical components that do not pertain directly to the ODL, from the point of view of IT technology, they are also described.

This layer can be described using a narrative, visual or using a specific tool. In this layer we define all components and installation procedures for setting up the ODL environment and supportive environment for the course. The first step to be described in this layer is related to the choice of ODL tool to define thereafter where all necessary components for its operation (operating system, engine, etc.) are associated.

In the case study proposed in this paper we used Moodle as a platform for ODL, since it is a learning management system (LMS) most used nowadays, and it is open source [18], [19],. All data in the Moodle is stored in MySQL databases [20].

The Moodle system began to be conceived in the early 90s at Curtin University of Technology in Australia and responsible for administering the LMS used by the University at that time. It is not only used by universities, but in high schools, primary schools, organizations, private companies, and by independent professors. The development of Moodle environment was guided by a the theory of philosophy of learning - social constructivist [21], [22].

Moodle allows you to create three formats of courses: social, weekly and modular. The social course is based on social interaction capabilities between participants and non-structured content. The last two courses are structured and modular and can be weekly. These courses are focused on content availability and definition of activities [23]. In the weekly structure we report the period in which the course are taught and the system divides the reporting period, automatically, in weeks. In the modular structure we inform the amount of modules. It also has all the main features of a virtual learning environment [10]. Moodle provides communication tools, assessment, management and organization. They are accessed by the tutor separately in two types of entries in the course page. On one side, add the material (contents) and other activities, and activities can be added to communication tools, assessment tools and other additional content. The administration tools used by the tutor allow for controlling participants; to perform backups and restore of courses, access to log files, logs the last minute, file management courses; release notes.

The Moodle platform used in the case study of this paper was installed in an operational environment MS-Windows Server 2003 SP2™. This software is a network operating system that runs as a network server for medium and large size and runs on Intel, AMD or similar. It was released in 2003 [24] and is still available in the market, although there are already new versions released by Microsoft™. MS-Windows Server is a robust, multitasking system, supports processing with 32 or 64 bits, which makes it very efficient in solving the tasks. Security environment has a well-established solution, based on the architecture called Active Directory. Moreover, it also has an easy and intuitive visual interface. [24]. This system supports all auxiliary elements for the operation of Moodle: the MySQL database, the Apache Tomcat Web server, which is needed to allow for Web access of subjects and courses administered by Moodle. This allows the network configuration in order to make possible access Moodle remotely, within the safety aspects expected by the machines of the institution's network.

We installed the entire platform in a Dell OptiPlex, 780, with 4GB RAM, 320GB HD with two NICs Ethernet 10/100/1000 bps. Domain space has been created within this machine, allowing it to be accessed by anywhere in the institutional network. In parallel, we installed a Web page server, the Apache Tomcat, Windows version, and MySQL database, according to the guidelines of the manual installation of Moodle.

Once completed all installation procedures we performed platform settings to adjust the access to the course, including: adjustment for inclusion of course, setting student access, setting the permissions of students, environment configuration forum adjustments and configuration via Web server to allow external access, such as ICMP settings and access to port 8080, so the Moodle page could be accesses by all machines in the network.

After setting up the environment, and the forms of access, we proceeded to test network access. Tests were performed by creating users with varying degrees of security, including providing access to the forum area. Once we set the ODL operating environment part we started customizing the entire environment according to the educational support that was requested.

IX. Results Achieved

The implementation of the course and lessons on the environment was assembled from the mapping of the proposed model and started with the settings of the course. Such configurations were performed using the administrator privileges [18]. We started by creating the course and the classes, considering the full name in case: “Software for Tourism”, containing an abbreviation, which appears as a caption on the menu of "Meus Cursos", as can be seen in Figure 3.

Figure 3 Inserting a course and class in the environment

After the course has been created with its characteristics, we performed insertion classes, and each class was associated with a tool of MS-Office™ chosen in pedagogical layer. For each of these classes were inserted associated modules, and for the MS-Word™ class were inserted 4 modules (three textbooks and a test - *i.e.* Moodle Lesson), for the class of MS Excel™ we inserted 3 modules and for MS-PowerPoint™ class we inserted 2 modules, remembering that the last module is always the test and have to be completed so that you can access the next. It is worth noticing that the most important factor for each module was the content, and it was represented in PDF format. This can be seen in Figure 4. Once the class has been created, the administrator can then associate with the same content, which in this case study was the inclusion of PDF handouts. An example of such inclusion can be seen in Figure 5.

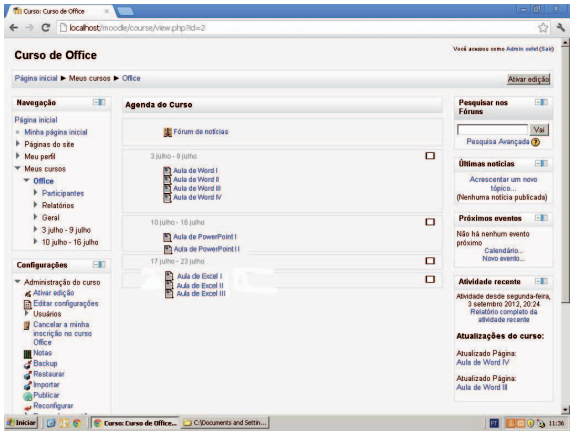

Figure 4 Inserting modules in the environment

After these steps were performed, the environment is ready for students to use. In order to access the Moodle, students have to sign a form and send it to the staff. This step was useful to prevent access from undesired users. The teacher who enrolls students will also select the option to assign roles, associating them as "student" of this specific course. This description may be by name, social security number (*i.e.* CPF in Brazil) or e-mail. After these procedures the student will be able to access classes.

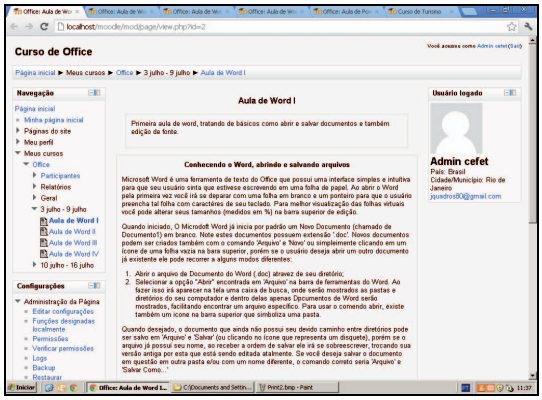

Figure 5 Inserting content in the environment

In addition to the classroom environment, we configured, as defined in the pedagogic layer, a forum, as seen in Figure 6.

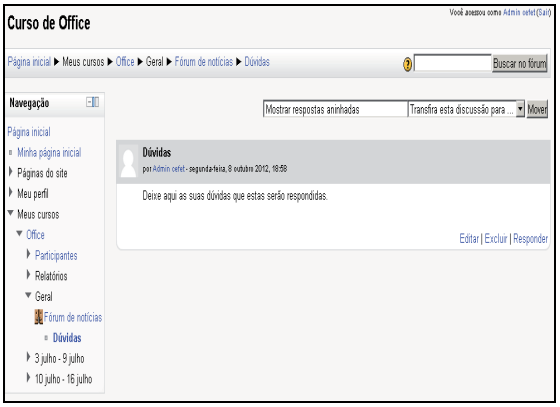

Figure 6 Forum of the environment

X. Conclusions and Final Remarks

The proposed model enabled a systematic way to prepare the course containing the class of Software for Tourism in an ODL environment. Based on the results produced by the pedagogical layer, content layer and environment layer, the task of building the ODL class for TC was very productive. This way, the proposed model eases the work of the staff and professors, since the products developed were target directly in agreement with students desires, leading in very little demands for changes and adjustments. The tourism course was built to address the software considered relevant by the interviewees, focusing on the standard software of the tourism market, and has been formatted as a set of handouts in PDF, containing exercises and tests. All of these items were obtained from the applied modeling process.

Our option to adopt a simple course structure, with modules and classes, was due to the fact that the vast majority of students showed that they had no prior knowledge or training in the ODL domain. Yet the application of this learning method, constructed according to the pedagogical criteria, increased the productivity of the students in this course. Such fact will be investigated in a future work.

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