Chapter XXI

Supporting Learners’ Appropriation of a Web-Based Learning Curriculum

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ABSTRACT

This article presents an approach and tools that can help learners appropriate a Web-based learning curriculum and become active participants in their learning. The approach is based on a detailed modeling of the curriculum and intends to equip the learners with different computer-based tools facilitating a multiple point of view perception of the curriculum, while promoting self evaluation and self regulation of the learners’ curriculum performance. The proposed architecture is generic and can be used in the context of an already existing Web-based learning system. We define what we call “appropriation,” describe our approach, present different tools that have been implemented, and present the findings from the first experiments.
INTRODUCTION

Learners utilizing Web-based learning curricula, distance learners in particular, often face problems related to the curriculum (i.e., the components of the curriculum and how these components are related one to the other) and how the curriculum corresponds with their personal wills and objectives. This problem, that we will call the “appropriation problem,” is closely connected to autonomy and motivation issues.

It is well known, even from educational research that focuses on the early school years, that the student’s participation in his learning process in terms of motivation and independent learning (Wang & Han, 2001) is very important. Independent learning involves student’s meta-learning (meta-control) in a framework of goal driven learning (Ram & Leak, 1994). Meta-learning from an educational pragmatic point of view occurs with a student’s self-reflection and self-evaluation of his own performance in relation to his goals, to the other students’ performance, and to the tutor’s evaluation of his performance. Meta-learning also continues after reflection/evaluation and encompasses the regulation phase. In the regulation phase, self-regulatory mechanisms are set up to change behavior taking into consideration cognitive and affective factors as well as environmental factors, such as group dynamics, class structure and interaction with the tutor (Pajares, 2002).

The transition of the meta-control of the learning process from the tutor to the learner has been discussed for a long time. Some researchers have found that the transfer from traditional guided learning to an autonomous learning is not easy for teachers or students (Grow, 1991). A major difficulty for the learners to become autonomous is setting goals and making plans for their learning (Kelly, 2002). According to Sinista (2000), technologies are able to make it smoother by arranging intelligent support for learning-related activities. Examining the issue of technology integration into traditional education from the tutor’s and students’ perspectives, researchers Anand & Zaimi (2000) mention that being accustomed to extensive tutor guidance can make learners feel abused when they are thrown into a self-directed activity all of a sudden, and the tutors then become unable to fulfill their goal to create independent learners. The researchers tried to involve their learners into an evaluation of Web-based learning materials by asking them their opinions and suggestions. This involvement affected the attitude of the students, made them collaborative and opened the door of independent learning for many of them. In addition, Forcheri et al. (2000) identified three steps in the transition using technology: a need, identification of an objective, and a strategy for attaining the goal. Sinista (2000) mentions that during the learning process, apart from the typical learning activities that are necessary for the learner to acquire knowledge, he (the learner) also performs control, evaluation and monitoring functions. She calls these activities meta-learning activities and proceeds to elaborate on them in detail. For Fischer (Fischer et al., 1993; Sumner et al., 1997) such types of reflection are difficult and a human coach/teacher or a design critic can help the learner to identify the breakdown situation (these breakdowns can happen due to missing knowledge, misunderstandings about the consequences of actions, wrong self-efficacies or any reason that hinders the learner from attaining his goal) and prompt the learner to reflect. Fischer in his work chooses the computational critic to provide some of this support when humans are not present.

The objective of the exploratory research presented in this article is to study how a learner can be helped to appropriate a Web-based learning curriculum by proposing different computer-based tools dedicated to this issue. In order to explore this question we have constructed a model for appropriation based on three dimensions.
(perception, evaluation and regulation) and have designed different tools (the Saafir architecture) that address these dimensions: first, perception tools that allow learners to browse a detailed model of the curriculum from different points of views. Second, evaluation tools that allow learners to annotate the different items of the curriculum, to indicate a level of achievement and to propose syntheses of the annotations. Third, regulation tools that promote peer-to-peer help and allow us to introduce some control issues, such as deadline warnings. The preliminary experiments suggest that such functionalities do result in a better understanding by the learners of the curriculum and better motivation. These results pave the way towards further experiments, which will allow for more detailed analyses of the respective use and impact of these tools, a continued refining of the tools implemented thus far, and the designing of new ones.

This article is organized as follows: the second section presents the research questions that address this work and the methodology, the third section presents a conceptualization of the appropriation issue and the overall approach, the fourth section presents examples of tools that we have designed according to this conceptualization, the fifth section presents the implementation approach, the sixth section presents some findings from the experiments realized so far, and the seventh section summarizes the work and its perspectives.

As a general objective, in the context of in Web-based learning curricula, supporting learners’ transition to self-directed learning must be addressed by both technological means and human tutor means. In this article we address technological means. This does not mean we exclude human tutors, but that we explore, as a research question, the type of support that can be proposed by technological means. In the sixth section, when we present the experiments, we will describe the human tutor role in the learning context created by these tools. Considering technology, we have studied what tools could be proposed to learners in order to help them gain an understanding of the curriculum and their process within the curriculum, as opposed to approaches such as intelligent tutoring systems that fully direct the learning of the students (Fischer & Scharff, 1998).

**GENERAL ISSUE: SUPPORTING APPROPRIATION**

**Definition**

We define appropriation as the process of a learner to make a curriculum his own, giving it a sense of relevancy to him personally. The overall objective of this research is to study how a learner involved in a Web-based learning (WBL) systems context can be helped in reaching this desirable state by equipping him with dedicated computer-based tools that he can use to facilitate the appropriation of the curriculum. Appropriation is a notion that is not limited to the WBL context; however, we believe that when developing a WBL system it should be given particular attention as it is directly related to autonomy and motivation, two known major issues for WBL (Linard, 2000).

The appropriation notion is often referred to in WBL and distance learning contexts, as it is considered to be a prerequisite and/or desirable state to reach. However, this notion remains vague and is not associated with an operational definition. In this article we will refer to appropriation in the general sense used in the literature (Bourdages & Delmotte, 2001; Garland, 1994; Henri & Kaye, 1985; Karsenti, 1999; Paquette et al., 2002) and, in particular in Jouet (2000)), considering that a learner has appropriated a curriculum if he is aware of the curriculum structure and contents; and is aware of how he can best utilize the curriculum, its resources, and its activities according to his personal objectives. In other words, a learner that has appropriated a curriculum is not a passive consumer but an active participant of his learning.
Shifting from a structural and/or administrative conceptualization of the curriculum to a conceptualization in terms of addressing a personal objective is a key issue for appropriation. In the context of WBL, an active participant who has appropriated a curriculum should, for example, be capable of drawing relationships or possibly making connections between a given pedagogical resource such as an online document, his participation on an online forum, and the resources available to him for communication with other learners or a tutor, all as means to achieve his plan and address his personal objectives.

Research Questions

The definition we have proposed does not allow for a straightforward assessment of criteria to decide if a learner has appropriated a curriculum or not. In this research, we will not attempt to propose a more precise definition and a list of criteria with respect to this concept of appropriation. We think that this would be premature in the current understanding of the appropriation notion, in particular in a WBL context. Rather, we will consider this general definition as a direction to go towards and consider the following questions:

- What means can be proposed to a learner working with a WBL system to progress towards appropriation? This aspect of the work has been conducted in order to suggest tools that can help learners develop their appropriation of the curriculum.
- How do learners react and use such means? This aspect of the work has been conducted to identify some learners’ behaviors in respect to the proposed tools.

This article is therefore essentially oriented on engineering issues (proposing innovative tools related to appropriation issues). The model and tools that have been elaborated and the first analyses we made are a step forward in the direction of both (1) a better understanding of the appropriation notion and coming up with the notion’s formal definition that allows us to measure it and (2) an understanding of what types of tools can be proposed for this purpose and how they are used.

In this research we focus on supporting learners in order for them to appropriate the curriculum on their own. This does not mean that we think that tutors should not be active participants in the appropriation process. On the contrary, we believe that learners should construct a personal study plan and then discuss and negotiate it with human tutors, as well as evaluate and regulate their progress with those tutors, and this is what was achieved during the experiments. However, we believe that (1) in many cases, while it is not a desirable situation, there is lack of tutoring and therefore, developing an understanding of what can be achieved by proposing specific tools to the learners without involving tutors, is interesting and pertinent per se, and (2) this understanding is a necessary boot-strap step toward a later study on how the appropriation issue could be supported by coordinating the respective potentials and roles of tools and tutors. It should be noted that this is not an assumption that we should just “add” a human tutor to the system. The tools proposed to the students will have to be re-analyzed in respect to the role of the tutors. Addressing this coordination issue is, however, anticipated while what can be done to help students to appropriate the curriculum on their own has not been studied.

Methodology

We analyzed literature related to the appropriation notion and to WBL, and we elaborated a general model for appropriation. Then, we designed and implemented an integrative architecture (the Saafir architecture) that proposes different tools based on this model. This architecture has been tested in two contexts at a university level: first, in an explanatory context where using the tools
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was made possible but not mandatory for learners; second, a context where using the tools was mandatory. We then analyzed how much the tools were used (by analyzing the logs) and how the learners felt about these tools (by administering questionnaires).

The two contexts we have used are very different and the analyses we made have the unique objective of providing empirical ideas for this exploratory research. Therefore, the analyses do not follow a controlled data comparison methodology. Here again, we believe that designing functionalities to support appropriation in the context of WBL is a domain in its infancy that requires a better understanding before allowing controlled experiments.

SUPPORTING APPROPRIATION: GENERAL APPROACH

Issues Related to the Appropriation Notion

The appropriation notion can be related to different characteristics that have been identified in the literature:

- **Motivation with respect to the curriculum:** A learner can involve himself in a Web-based curriculum with different kinds of personal objectives, such as acquiring a targeted competence, obtaining a degree or sharing knowledge with other learners (Carré, 1998). Making explicit one’s motivations is an important issue in order for a learner to appropriate a curriculum. This is a very personal issue, which can eventually be investigated by administering to the learners an attitudinal questionnaire or interview. Apart from that though, a WBL can help learners to address such an issue by providing the requested data, that is, a comprehensive view of the curriculum and its description at a detailed level. The fact that learners can be concerned with different objectives and that these objectives can evolve during a session can be tackled by: (1) presenting the learners with different descriptions of the curriculum according to predefined prototypical objectives or (2) presenting a structural view (i.e., in terms of modules, sub-modules, etc.) as almost all systems do, but, differently from these systems, also proposing means for learners to perceive the same information from different perspectives (addressed competence, etc.) according to their objectives. This second approach, which is more flexible, is the one we have adopted in this research.

- **Motivation with respect to the tasks:** Making explicit if and how a given pedagogical activity that is proposed to learners is useful in order to attain an instructional objective. Questions such as the following are addressing important issues related to the curriculum appropriation (Viau, 1994): What are the required capacities to address a task? What is the degree of control of the task or sequence to be achieved? What are the consequences of achieving, or not, a proposed pedagogical activity? Answers to these questions should be explicit and available to the learners.

- **Time management:** Making learners explicitly manage time issues is of crucial importance. Time management is a spiral process (Paquette et al., 2002): elaborating a learning plan (scheduling actions), acting in a process guided by the plan, adapting the plan to the effective actions and unexpected events. A plan is not a constraint, but a resource for action (Bardram, 1997). Time management can therefore be related to two different issues: (1) planning activities and (2) regulating activities, which includes, if necessary, a re-planning process.
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- **Autonomy:** An autonomous learner is a learner that is conscious of his strength, his objectives, his learning tasks (etc.) and also other surrounding persons (Deschênes, 1991). The autonomy concept comes in hand with different competences such as: adopting a learning strategy, establishing priorities, scheduling actions, selecting necessary resources (materials, numerical, or human) in order to achieve one’s learning objectives, examining and criticizing one’s actions, measuring one’s progress or diagnosing one’s difficulties (Paquette et al., 2002; Garland, 1994).

- **Self-regulation:** Self-regulation has been initially defined in Zimmerman (1986) and Zimmerman et al. (1996). Following Karoly (1993), “self-regulation appears to be the stable element attempting to guide behavior along a specific path to a directed aim or goal. However, apart from procedural, epistemic and conceptual divergences in various models of self-regulation, basic volitional factors, such as goal setting, self-monitoring, activation and use of goals, discrepancy detection and implementation, self-evaluation, self-con-sequation, self-efficacy, meta-skills, boundary conditions, and self-regulation failure, characterize the process of self-regulation.”

Towards Tools to Support Appropriation

The basic functionalities of a WBL system are to make available pedagogic documents and activities descriptions (downloadable documents, on-line quizzes, exercises, etc.), communication tools (forum, chat, white-boards, etc.), tutoring services and administrative interactions (registering learners, etc.). These basic ingredients can be mixed in different manners, from purely delivery mechanisms to more pedagogical approaches such as collaborative activities. Our point is not to be innovative at this level, but to work out how a given WBL system can be enhanced to support the appropriation issue.

The previously described analysis allows us to define general specifications. The system should not impose a unique point of view but allow learners to have different points-of-views on the curriculum. The different activities proposed by the WBL system should be described in detail making explicit issues that often remain implicit, such as the addressed competence of the different activities. The relationship between the activities and/or other learning objects (documents, forum, etc.) should be highlighted. Time management should be promoted and supported. Reflective activities such as analyzing and regulating one’s activities should be proposed and supported.

It can be supposed that a WBL system proposing such issues would help learners (as individuals) to appropriate the curriculum by supporting issues such as:

1. Understanding the structure and the content issues of a curriculum.
2. Developing an explicit understanding of the reasons why one does enter the curriculum (as a side effect of considering explicitly the details of the curriculum).
3. Identifying the learning objects that are related to one’s personal objectives or how to tackle activities in a way that matches one’s interests.
4. Planning one’s itinerary in the curriculum.
5. Evaluating and regulating one’s itinerary in the curriculum: examining and criticizing one’s actions and the way one’s personal plan is being performed, adapting one’s plan and actions to unexpected difficulties or emergent events.
6. Contacting useful persons (other learners, tutors).
Proposed Model: Perception, Evaluation and Regulation

On the basis of the previously proposed approach of appropriation we propose to conceptualize appropriation on the basis of three dimensions: perception, evaluation and regulation.

- Perception is related to the awareness and understanding of the structure and details of a curriculum. Supporting perception is a key issue that addresses points 1, 2, 3, 4 & 5. Perception can be supported by making explicit the different curriculum issues, both in terms of structural and organizational issues (modules, activities, precedence links, etc.), and in terms of content (pedagogical objectives of an activity, prerequisite competences, competences to be obtained, etc.).

- Evaluation is related to awareness of how curriculum activities are performed. Supporting perception is a key issue that addresses point 5. Evaluation can be supported by encouraging the learner to annotate his activities, for example, stating to what extent a task is achieved and/or typing free text as “meta-level” notes.

- Regulation is related to the fact that a learner manages (at a meta level) the way he performs the activities. Supporting regulation is a key issue that addresses points 4, 5 & 6. Regulation can be supported by facilitating awareness of the progression, by encouragements to consider at an explicit level planned and effective advancement or connecting learners that encounter similar problems.

It can be noted that this three-dimension model helps in conceptualizing the appropriation issue and specifying computer-based tools, but that these dimensions are of course not independent nor disconnected.

Some of the features proposed by classical WBL systems can be analyzed according to these three dimensions. For instance, WebCT (WebCT, 2005) proposes some perception issues, such as the « goal » item of a module, evaluation and regulation issues such as the curriculum calendar feature (time-management issues); the connection statistics; the personal events editor; or the annotation editor. A WBL system such as Explor@ (Explora, 2005) proposes advanced functionalities that can also be considered as supporting appropriation, such as highlighting a learner’s itinerary in respect to that of other members of the group or the personal feedback of the system. The appropriation issue is, however, not considered as an issue, per se, and if some of their functionalities can be useful for appropriation there is not any notion of appropriation involved in the pedagogical foundations of the system’s design.

If one comes back to the notion of self-regulation, we see that the model we propose is not dealing in detail with all the elements of self-regulation. Actually the model is proposing a perception of something very specific: an online course curriculum presented in a very detailed ontology, aiming for the student’s better understanding of what the specific course curriculum entails (knowing in depth what are the objectives, competences, activities and deadlines, as well as how all these components are related to each other) and helping him put together this understanding with his interests so that he can spend his labor on work that interests him and/or is going to prepare him for the field he wants to specialize in. If he accepts the curriculum, then the designing of a personal plan that will help him go through with the course, a plan that includes material and/or human resources and/or personal adjustments is necessary. Evaluation is related to how well the student has done within this plan and an editor that allows him to annotate his progress supports the evaluation. Regulation is related to fixing errors or failures of his performance and a tool that allows a learner to present his planning as rules and generates a warning according to these rules supports the regulation. With respect to the
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definition of self-regulation by Karoly (1993) we can see that the model (and the implemented tools) support the following aspects of self-regulation: goal setting (creation of one’s own study plan); self-monitoring and self-evaluation (annotations tools, advancement synthesis, specific tools for rules and discussions); self-efficacy (students have the feeling of contributing to their learning, cf. results of the experiments); self-regulation failure (revision of the plan, by oneself or with the tutor, cf. results of the experiments).

Modeling the Curriculum

In order to allow learners to perceive and understand the curriculum notions in detail and to allow some actions related to these notions (e.g., associating an annotation to a given activity) it is necessary to define a fine-grained modeling of the curriculum. This model must denote the structural features of the curriculum (e.g., the fact the curriculum is hierarchically structured in modules or the different activities and sub-activities) and the content features (e.g., pedagogical objectives, prerequisites or addressed competences of an activity).

We believe that such a modeling requires a two-step process: (1) defining a meta-model (i.e., the means that will allow constructing a model of the curriculum under study or, in other terms, an ontology: the notions that can be used to describe the curriculum, the links, etc.) and then (2) constructing with the teachers a model of the studied curriculum by utilizing the meta-model notions. This consists of presenting each teacher (in the generic sense of: each responsible authority of the top-level objects of the modeling, e.g., a module or an activity) with a description form (structured following the ontology concepts) to be completed.

It is important to note that such a two-step process requires an effective cooperation of the pedagogical staff. Although the description of a module or the ontology itself can be modified at any time, such changes are time consuming and cognitive consuming tasks. The modeling can be defined by some hierarchical manager (for a curriculum or a set of curricula) and imposed on everyone, but we advocate to some extent, at least, a collaborative elaboration of the modeling by a group consisting of different curriculum managers and teachers or tutors. The experiences we processed demonstrated very clearly that the curriculum modeling is a key stage of the process and that it required time and cooperation.

Considering the notions used to model the curriculum, the IMS-Learning Design (IMS–LD)

Figure 1. Learning Design conceptual model (IMS project, 2003)
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proposal is an interesting basis. LD is based on work by the Open University of Netherlands on EML (Koper, 2001) and different other standards as the pedagogic resources meta-data standard LOM (LOM, 2005). The LD objective is to allow the description of different kinds of learning approaches in a formalized way that facilitates abstraction, reuse, and interoperability.

Considering the appropriation issue, the interesting part of LD is the A level (see Figure 1). This level proposes a set of notions that can be used for conceptualizing and describing curriculum notions. We believe that a particular interest of LD is that it proposes an activity centered point of view. Activities link the roles and the environment notions, the environment being composed of learning objects and services. Activities can be separated as learning activities (oriented by the learning objective) and support activities (performed by staff members to support learners). Activities can be structured in an activity structure, that is, a structure corresponding to a group or a sequence of activities. An activity can be associated with a maximal duration. LD also allows describing the learning objectives to be addressed and the prerequisites.

Figure 2. An LD model of a module (simplified)

Informal description of the module

The Module « Journalism vs. Literature » addresses one pedagogical objective: understanding the similarities and the differences between journalism and literature. The prerequisites are: (1) Ability to detect and explain a journalism work and (2) Ability to detect and explain a literary work. The activity « Journalism vs. Literature Activity » is composed of two sub-activities « Read URLs referring to the differences and similarities of literature and journalism writing » and « Given two different works, decide which is a novel and which is journalism ».

LD modelisation:

```
<imsld:learning-design identifier="JvsL" level="A">
    <imsld:title>Journalism vs. Literature</imsld:title>
    <imsld:learning-objectives>
        <imsld:item>
            <imsld:title>Understanding the similarities and the differences between journalism and literature</imsld:title>
        </imsld:item>
    </imsld:learning-objectives>
    <imsld:prerequisites>
        <imsld:item>
            <imsld:title>Ability to detect and explain a journalism work</imsld:title>
        </imsld:item>
        <imsld:item>
            <imsld:title>Ability to detect and explain a literary work</imsld:title>
        </imsld:item>
    </imsld:prerequisites>
    <imsld:components>
        <imsld:roles>
            <imsld:learner identifier="learner"/>
        </imsld:roles>
    </imsld:components>
</imsld:learning-design>
```

continued on following page
Figure 2 presents an example of a module LD modeling (taken from our second experiment).

An LD modeling proposes a comprehensive view of a curriculum and its different activities. When using LD to model the curricula however, we encountered three minor problems. Firstly, interactions with the teachers highlighted that it was useful to model a « competence » notion (capacities in relation to some content) and an « objective » notion (objective in respect to a situation or an activity), notions that LD does not distinguish. Secondly, objectives, prerequisites and competences are not categorized very precisely in LD. This limits the accuracy of the information that can be proposed. In particular, it is interesting for a learner to understand what type of issue an objective is about, for example, to dissociate theoretical and pragmatic issues or
discovery oriented and investigation oriented activities. Thirdly, activities and modules are not associated with beginning and ending dates in LD (which is information that differs from total duration). This lack of precision for describing temporal aspects limits the capacity to support time management issues (e.g., being warned that time is running short for a given activity), which is central for learners not only to achieve the tasks they are supposed to, but also to construct and maintain a global control of their progression.

In order to respect the issues that the teachers wanted to model we had to extend LD basic model. A detailed description of this can be found in Rasseneur et al. (2004). We do not claim that this extension of LD solves all problems. We have elaborated this model in the context of our experiments, and we believe that this model has to be further analyzed in the context of different experiments before reaching certain stability. Note that the tools we propose are linked to this modeling but can easily be modified if the modeling evolves.

EXAMPLES OF TOOLS TO SUPPORT APPROPRIATION

In this section we present different examples of tools that can support appropriation:

- Perception support: tools that support learners in their awareness and understanding of the curriculum structure and contents.
- Evaluation support: tools that support learners in evaluating their itinerary by annotating their actions and offering synthesis of their advancement.
- Regulation support: tools that support learners in regulating their itinerary by offering some feedback on their itinerary.

These tools are but a possible operationalization of the general approach previously described here. They have been implemented in the so-called Saafir architecture but could be integrated in any WBL system. Therefore, we dissociate: (1) the description of these tools and exemplifying

Figure 3. Meta-model for describing a curriculum currently used in Saafir
snapshots that illustrate how they are implemented in the Saafir architecture (this section) and (2) the description of the Saafir architecture itself and the process for using it (the fifth section). The usability of the tools will be discussed in the sixth section.

Example of Tools to Support Perception

Although the contents of a curriculum are generally identical for all the learners, each of these learners has his/her own history, interests and background knowledge. Each of these learners probably already has mastered some of the addressed competences and can therefore, focus on some others. Thus, it appears interesting to allow every individual learner to construct an individualized perception of the curriculum content and how he/she intends to proceed.

Following Deschênes (1991), we dissociate three aspects of a module that can be sources for learners’ autonomy and appropriation: (1) structure, (2) content and (3) interaction aspects:

- **Structure-based appropriation**: A curriculum is based on a set of structures (e.g., modules, activities and exercises) regulated by features such as agendas or assessment procedures. Providing structure-based views allows learners to define/structure their objectives and plan their work. While some of them organize their work according to the curriculum structure, others organize their work differently (e.g., by competences), but use the structure view to deal with the curriculum planning or its assessments procedures.

- **Content-based appropriation**: A module generally addresses a set of domains and sub-domains and/or competences. It therefore, it appears interesting to propose different views of the curriculum (e.g., add to the view by modules a view by addressed competences, this competence view being accessible through the module structure and more transversally at the curriculum level) that will allow every individual learner to construct an individualized perception of the curriculum content.

- **Interaction-based appropriation**: WBL implies different types of interactions between different participants (learners, groups of learners, tutors, curriculum manager, etc.). These interactions are, in particular for distance-learners, of key importance, and it is therefore necessary to provide learners with a comprehensive understanding of the interactions that could/will take place. As an example, distance learners usually look forward to exchange with other learners through collective activities, but are also very worried about the fact they can appear as incompetent (or not at peer level). This prompts some of them to organize their work in order to appear at their best within these activities.

These different points of view are complementary and not exclusive. Learners usually adopt a predominant point of view (that can be one of the prototypical views described here above or an idiosyncratic view), but in all cases a single view is insufficient; it must be complemented by other points of view.

The perception functionalities implemented in Saafir allow different views according to the different ontology notions. The different ontology notions correspond to the way a curriculum is usually described. As an example, the view by module allows browsing the curriculum descriptions as a set of modules (see Figure 4). However, using the ontology notions, it becomes possible to make this view much more detailed than usual presentations, as every module is further described by different items such as the pedagogical objectives to be reached, the prerequisite competences, the different courses or the proposed pedagogical
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Figure 4. View by module

![Figure 4: View by module]

Figure 5. Detailed description of a module

![Figure 5: Detailed description of a module]

activities (see left part of Figure 4 enlarged in Figure 5). The view by objectives (see Figure 6) lists and structures the different objectives of the curriculum and links them to the concerned modules (there is usually a 1-n relation between a module and a set of objectives related to the module topic, but very often a same objective is addressed by different activities that can eventually be related to different modules; in such cases this view is particularly pertinent). The views by competences or by activities propose alternative perceptions. Using a different ontology, other views could be proposed.

These different views are accessible as sheets (see upper part of Figure 4) and the learner can shift from one to the other. This allows scenarios such as:

*browse the curriculum as a set of modules; focus on a given competence related to this module and...*
select this competence; shift to the competence-view in order to understand how this competence takes place in the set of competences to be acquired and if it is related to some other module or activities or to prerequisite; discover that it is related to a particular activity and then shift to the activity view to analyze (etc.).

Example of Tools to Support Evaluation

Within this research project we are concerned by self evaluation, that is, how a learner can manage the way he achieves the different actions he is supposed to achieve (according to his individual plan and/or the teacher prescriptions), which will eventually lead him to a regulation phase (Deschênes, 1991). Evaluation here is therefore subjective and addresses the objective of helping the learner to perceive and manage his actions (which is different and does not replace an assessment by a teacher who intends to give marks). Evaluation is probably a phase that could be a mixed initiative by the learners and the tutors. However, coherent with our methodology, we study here what can be done to support a learner who is taking charge of his learning process.

The approach we propose to support evaluation is based on annotations and synthesis of annotations.

The Annotation Tool

An annotation is a piece of text that can be attached to an object and is separated from that object (Baldonado et al., 2000). Following Azouaou & Desmoulins (2005), we have defined an annotation as being composed of (1) episodic slots (e.g., name of the author or date of creation or modification) and (2) semantic slots that can be used to describe issues related to the object. This semantic slots can be pre-structured (e.g., proposing a slot denoting to what extent an activity has been accomplished) or unstructured (open text). An annotation tool is composed of a module for creating or modifying annotations, a module for browsing annotations, and a module to store annotations (Denoue & Vignollet, 2000). Within Saafir we propose tools that allow a learner to attach an annotation to any of the items corresponding to instances of the ontology notions (modules, activities, etc.).

We have adopted a semi-structured format. An annotation is composed of:

- Episodic slots (date, author) that are created by the system.
- An assessment slot that allows a learner to indicate, using a progress bar, to what extent he feels he has completed the corresponding task.
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Figure 7. Edition of an annotation

Figure 8. Visualization of an annotation

Figure 9. Visualization of the annotation history
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- An open-text slot allowing a learner to indicate any pertinent information.

Figure 7 presents the annotation editing tool and Figure 8 how a learner can browse the curriculum and, by selecting an item, visualize the attached annotation.

An important point is that annotations are cumulative: modifying an annotation does not destroy the preceding data and the learner can visualize the history of the annotation (see Figure 9).

The annotation structure we have used so far is minimally structured. We believe that, given a particular context, it can be advantageous for teachers to elaborate an annotation structure that will make learners question themselves in a way that is particularly pertinent, given the context or the curriculum. In other words, we do not think that it is pertinent to implement a fixed generic set of predefined slots, but rather that these slots should be contextually defined by the teachers and/or the learners themselves. Note that this is already possible in our system as the learner can structure the annotation by defining slots that can help him to denote some specific information (e.g., “To do list,” “Relation to the A project,” or “To be confirmed by John the tutor”). However, this has not been tested yet.

The Evaluation Tool

The evaluation tool proposes syntheses of the annotations. As with the perception tool, the learner can browse the curriculum through the different ontology notions (modules, activities, etc.). When the learner selects an item, the tool presents the data that is attached to this item (see Figure 10 and details in Figure 11):

- Personal information: last assessment links to the last annotation and the different previous ones (history of the annotation).
- Group information: lower, upper and average progression of the other learners (anonymously).

Providing information on the other learners of the group is known as being an important issue in WBL (Dufresne & Paquette, 2000). Note that this information is, however, pertinent only if all learners “play the game” and record their progression on a regular basis.
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Example of Tools to Support Regulation

Regulation consists of identifying difficulties in one’s progression and, eventually, reconsidering and/or repairing one’s plan (Deschênes, 1991). This is certainly one of the most difficult issues to be tackled by learners on their own. However, different types of support can be proposed, from non-intrusive to more pro-active means.

The evaluation tools, previously presented, can be considered as a first implicit support for regulation.

Another strategy to support regulation is to promote peer-to-peer interactions. As an example, it can be helpful for a learner to know about learners who share similar situations. In Saafir we have implemented a light strategy that provides learners with means to contact learners who are at a similar level of advancement (e-mail) and/or the entire group (forum; see Figure 12). More sophisticated (and semantic-based) strategies could be imagined, as analyzing the learners’ production and linking learners with similar difficulties, but this requires domain-dependent analysis tools, which is not within the scope of our approach.

We have also elaborated a pro-active strategy based on automatic warnings. This strategy originates from the learners themselves, who explained that one of their major difficulties was the time management issue, most commonly, awareness of the deadlines for delivering their different works. We conceptualized this requirement as the fact that learners wanted to make explicit and externalize some regulation issues (in this case, time management issues). We generalized this requirement and implemented a tool that allows learners to define rules that must be respected (e.g., delivering an exercise before a particular date).

The Saafir warning tool allows learners to create rules following a premises and conclusions.
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format. The premises allow denoting predefined constraints related to the ontology notions (module, activity etc.) such as, comparison of the beginning or ending date of an item with the current date, or comparison of the level of achievement of an item with a given value or the lowest/best/average level of the group. The conclusion is a text (typically a reminder) that can be composed from the dates, associated progressions (etc.) related to an item. Rules are also associated with a level of importance (green/orange/red). This allows definition rules such as: “If the activity A ending date is in less then 3 days and the level of advancement is less that 50%, then Print ‘Urgent: A must be finished;'” or “If the average level of advancement for Activity A is more than 20% above mine, then …” or “If my level of advancement for Activity A is within the lowest 10%, then …”.

The editor allows a drag-and-drop construction of the rules (see Figure 13).

When the premises are respected, the text is presented to the learner when he connects himself to the system (see Figure 14).

Example of an Integrative Tool: Project Management Tool

The distance-learning literature highlights the importance for distance learners to adopt a formative project (Carré, 2001), that is, make explicit one or several high-level objectives that the learners identify as goals. Within such a framework, learners

Figure 13. Rule editor

![Rule editor](image)

Figure 14. Warnings

![Warnings](image)
identify the curriculum elements that are related to these objectives and can help them achieve it, and learners recognize how these elements are related to one another. Identifying such projects denotes a form of appropriation of the curriculum and helps in regulating one’s itinerary within the curriculum.

Such a project is a prospective point of view, that is, is similar to a plan. The fact that a learner identifies such a project does not mean he will necessarily work out the corresponding features following this plan. A misunderstanding would be that we want the learners to bury their activity in a predefined intangible plan. A project is a means for a learner to understand what the curriculum suggests and thereby, to organize his work and a resource to carry it out, nothing else [for a similar use of plans as resources, see Bardram (1997). However, although not mandatory, such projects are key issues in helping learners in their appropriation of a curriculum.

As an example, the master’s degree curriculum in computer science that has been used as a first experimental field to test Saaﬁr proposes theoretical modules, individual works and activities. These different modules, works and activities are interrelated. For instance, the M1 module addresses the domain “knowledge based systems and knowledge engineering” from a theoretical point of view. This corresponds, in the distance-learning Web site, to a set of PDF files to be downloaded and worked out. Learners are also supposed to prepare, as an individual work, an oral presentation on some subject related to the course, a subject they can propose themselves. One of the curriculum activities is also related to this domain (the “Web Clips activity”), in which learners must develop a toy knowledge-base system, here again on a subject they can propose themselves. These different features can be further related to different other modules such as the human-computer interfaces course and activities. We have learned from the successive promotions of this curriculum that distance learners have great difficulties in managing all these heterogeneous features and often give up, unable to face this apparent complexity. One of the staff pedagogical objectives is therefore to help learners to articulate the different curriculum features, and to perceive how the different items (and their underlying domain notions, competences, and constraints) can be interrelated in different ways. This can be obtained by encouraging learners to construct individual projects such as:

I know that there are at present many job opportunities in the knowledge management area; in order to develop my competence for this domain I will focus my M1 (Knowledge Engineering) presentation on this domain. Within the bibliography collected for this presentation different examples of ontologies are provided, and I could attempt to use one of these for the knowledge-based system I have to develop in the Web Clips activity. This will make me address competences X and Y from the M1 course (and competence A from the M2 - human-computer interfaces - course), and therefore for this M1 course the remaining competences to be addressed separately will be W and Z. As M1 course agenda is [...], I will organize things as follows: [...].

This example highlights that a module generally addresses different competences (domain competences, transversal competences such as analysis or synthesis) and proposes different activities (resources, exercises, etc.). This introduces complexity and although a module is generally presented with many explanations about what the learners are supposed to do, learners generally develop misconceptions. However, it also introduces flexibility in the way learners can work out the modules, and this is recognized as a key advantage of distance learning, that must be emphasized. Highlighting this flexibility helps learners in constructing individual projects that
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articulate the different modules and items, whilst taking also into consideration their own objectives and motivations.

Managing formative projects is an example of a high-level task that can be supported by combining some of the tools we have presented: perception tools help in understanding the different elements of the curriculum and their links, annotation tools help in managing complex tasks, and so forth.

We believe that asking learners to design formative projects is a powerful means to help them in appropriating the curriculum. However, such an abstract task is far too difficult for most learners. This task is more likely feasible if supported by tools. In this case, it could be proposed to learners to edit (through a graph tool) a model of their project, this task being further supported by the perception and then evaluation tools. Figure 15 presents a snapshot of a possible interface for a formative project editor. How much are learners capable of building formative projects on their own and/or with the help of tutors and how should this be implemented (asking each learner to define a project from scratch, proposing different prototypical projects to be used and/or customized) is however still to be studied.

**SAAFIR: IMPLEMENTATION ARCHITECTURE**

As said before, our work does not aim to implement yet another WBL platform but to extend the capacities of current platforms. Therefore, the approach we have adopted in the Saafir project consists of the development of an epiphyte system, that is, a system that is associated to another (the host system, in our case the WBL Web site) without modifying or parasiting it (Paquette et al., 1996).

The Saafir architecture is a generic system that analyzes and manipulates an ontology-based model of the curriculum and not the Web site data directly (see Figure 16). This approach is known as “knowledge level reflection” (Reinders et al., 1991). The idea is that it is difficult to grasp the WBL data (the modules and their descriptions, etc.)
from the implementation of the curriculum within the WBL, as some issues of the curriculum might be lost or denoted at a too low-level of abstraction. Rather, building or re-engineering a model dedicated to the appropriation issue enlarges and facilitates what can be done at a meta-level. Another advantage of this approach is that it can be used to apply our approach to already existing WBL curricula/platforms without the necessity to modify them. In such a case, it is only necessary to build an abstract model by a retro-engineering process. Note that this approach is not specific to the educational objectives addressed in Saafir: it can be used in different contexts that require enhancing an existing Web site with dedicated tools (Richard & Tchounikine, 2004).

Using Saafir tools thus requires modeling the curriculum according to the used ontology (see the third section). This additional work is the price to pay for (1) having the capacity to make learners understand the details of the curriculum and (2) constructing tools that are independent from the WBL platform and can thus be used on the top of existing commercial platforms.

Within the context of this research study, we have used an ontology dedicated to the appropriation issue and, with feedback from teachers, have constructed the curricula models “by hand” from the curricula original descriptions. This is manageable for a research project but is probably too expensive for ordinary settings. This issue is to be addressed by model transformation techniques, taking advantage of the fact that second-generation WBL platforms are now more often based on the use of explicit models of the platform and the curricula using (for instance) UML or XML dialects. This allows the consideration of the creation of “bindings” that can fill part of the appropriation-focused ontology from the platform-focused and/or the curriculum-focused ontologies and meta-data, while teachers have only to complete features that are specific to the appropriation issue and are not present in (or can not be automatically retrieved from) the already available data, if any. From a technical point of view, the necessary techniques already exist, for example UML transformation (via MOF) or XML binding techniques.

**USABILITY AND USAGE: FIRST FINDINGS**

As explained in the introduction, the first objective of this exploratory research was to work out the means that can be proposed to a learner working with a WBL system to progress towards appropriation. We have presented in the fourth
section different tools that appear pertinent to this issue. The second objective was to understand how learners react to and use such means. We present in this section the first findings on this issue.

We have tested the approach and part of the tools proposed in the fourth section in two different settings. The first experience aimed at providing input for our iterative development. We have tested the Saafir tools for two consecutive years in a context local to the system designers, using the feedback from the learners to guide the creation of new tools and/or the refinement of the existing ones. The second experience took place in a completely independent setting and was piloted by a person who had no connection with the Saafir team and was just interested in the potential impact of Saafir on a learners’ given curriculum.

In the sixth section we propose a summary of what was learned from these two settings, emphasizing the second one. Let us recall that these experiences were aimed at providing empirical ideas for this exploratory research and therefore that the analysis does not follow a controlled data comparison methodology. Here again, we believe that designing functionalities to support appropriation in the context of WBL is a domain in its infancy that requires a better understanding before allowing controlled experiments.

Case 1: Exploratory Open Use

The context is a master’s degree in computer science of the University of Le Mans in France. This curriculum was followed by 16 learners the first year and 19 learners the second year, half of them being distance learners (in France and abroad). The learners were informed that they could use Saafir in order to have a better understanding of their curriculum (open use and not mandatory use). The tools offered were: perception tool, annotation tool, and evaluation tool. The WBL that was used was an ad-hoc Web site proposing different resources such as HTML or PDF files.

The data was collected by questionnaires and debriefing sessions.

This setting did not test our system in its targeted general context of use as (1) learners were computer science students and therefore had no difficulties in using the environment (from a computer science point of view) and (2) the curricula was related to technology-enhanced learning and learners therefore had a specific interest for such tools. This experience, related to the designers’ proximity, was therefore limited to a first understanding of the tools of perception and usage in order to iteratively improve them (ergonomic issues, residual bugs, etc.). These two years of experience allowed us to draw the following list of conclusions:

- Modeling the curriculum according to the adopted ontology was a non-trivial and engaging task for the educational team. As a side effect, this modeling helped teachers (as individuals) and the pedagogic team (as a group) to develop a better understanding of the curriculum (implicit links or constraints between modules, etc).
- All the learners used the tool, at least by way of curiosity. All face-to-face learners spent a few hours browsing with the perception tool, testing the other tools, and then did not use them anymore, while distant learners used it on a regular basis. This suggests that such a tool does play a specific role for distance learners, which is fulfilled in some other way for face-to-face learners. The debriefing sessions suggested that face-to-face learners do not feel that they need such a support because they are unconsciously confident in the fact they will be aware of what they need to be aware of by interacting with their teachers and peers, which is the implicit usual tropism. It would be interesting in follow-up research to study this point.
- The perception tool is by far the tool that is the most used (80% of the total amount of
time). The capacity to shift from one view to another was extensively used. A negative side effect of the perception tool was that some learners felt they had too much information at once (all the details of all the courses and activities of the curriculum).

- The annotation tool was mainly used to indicate the level of advancement; few advanced comments were defined.
- The assessment tool, and in particular the fact that it allows one to compare one’s advancement with that of the others, was of great interest to the distance learners. However, the learners were disappointed to discover that the tool appeared to be unusable because only few learners did use it. At the debriefing it appeared that the learners who wanted to use the tool formed a coherent group and shared a certain type of implications in the curriculum. This suggests that group-based tools such as the ones that compare the learners’ advancement with that of the others’ must be used in coherent groups, that is, groups that may have the same willingness and motivation in the curriculum and to use the tools.
- The warning tool was developed after the first year of debriefing, and the first prototype was proposed in the second year. The system was initialized with a set of predefined rules implementing the curriculum deadlines. Some learners defined additional rules in order to be informed that an event (e.g., document to be sent to a teacher) was coming soon. This suggests that this “externalization” of the regulation seems interesting, although, here again, if not for all students at least for some of them. We, however, do not have enough data to draw some conclusions. Moreover, it must be remembered that the learners were computer science specialists. Analyzing these types of advanced tools (warning tool, project tool) requires some specific research actions.

Finally, it can be highlighted that the learners proposed numerous ideas for improving the proposed tools or adding new ones. For instance, a large consensus of learners suggested the addition of a chronological view that would help them to deal with time management issues. As another example, they proposed that the assessment tool should calculate the level of advancement of an item by the level of advancement of its sub-items, using “some kind of formula,” this principle is used in Després & Coffinet (2004). They also suggested that a “learning companion” could mediate some information. Although this was a particular context, this makes us optimistic about the acceptability and the interest of learners in terms of using tools that make them reflect on the curriculum and their itinerary at an abstract level. This also suggests a tool-kit approach (proposing a set of tools that learners can use or not; or, eventually, adapt to their interest and practice) rather than an integrated all-in-one approach.

Case 2: Using Saafir to Increase Learners’ Motivation

This section reports on the findings related to the use of Saafir for intermediate English learners at the University of Puerto Rico Mayaguez (UPRM) campus. This setting corresponded to our targeted general context of use: basic users in a basic domain (nothing to do with computers), already existing curricula, and students encountering appropriation problems. We describe the research and its outcomes in detail below.

General Context

Professors’ experience teaching English in Puerto Rico for more than 11 years has shown that learners in college did not fulfill the requirements of the Puerto Rico Department of Education, which wants them by the end of their schooling to be bilingual. Learners’ motivation to learn English is of the functional kind (e.g., to gain job advancement),
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rather than the integrative kind (e.g., to become members of the North American society) (Vargas Batista, 2005; Caratini-Soto, 1997). Despite that, a survey administered to the English composition learners showed that when learners have to deal with the courses of their own fields of study even functional motivation fades away.

Although the learning of a foreign language can be considered as being easy to self-direct and self-monitor, the UPRM team that works on the English composition issues faces problems, some of which are quite general, such as (Sully, 1995) low motivation and interest of students, no clear or realistic idea as to what is expected of them (Cooke, 1991), students’ poor mechanical skills (in this case: spelling, punctuation, creating paragraphs, using references and organizational skills such as how to organize ideas and paragraphs together, how to use transitional devices, how to do prewriting, writing and revisions) and also, more specifically, students’ inability to choose a topic (in this case, something to write about that gives enough material to develop an essay), students’ poor style and reasoning ability (giving a personal color to their essay and creating arguments) and a lack of good language skills that relate to writing (reading, listening, vocabulary).

In terms of low motivation mentioned above, different reasons have been identified from the same survey, such as the concentration courses have priority and English becomes another subject not as “real” and “urgent” as the concentration courses; learners feel English is politically imposed on the educational system of Puerto Rico; poorly thought-out planning and teaching methods are used in schools before they entered college; a lack of daily use of English is taking place in Puerto Rico since Spanish is the primary language that covers the everyday needs of the speakers. Two other issues can be highlighted. First, the official course catalogue is succinct and brief, and cannot include the exact content, competencies, requirements, and deadlines of each course. The result is that professors have learners who choose English core courses (in our case composition, intermediate level) for a particular semester without knowing the curriculum. The way most used by students to gather more insight about the curriculum is by talking to students who have already taken the course about their experiences. This type of information, of course, is usually very subjective. Thus, when they enter the courses their expectations may not match what they encounter. The conflict between what was expected and what is actually given creates a decline in their motivation to learn. Second, course materials are pre-determined by the professors. This top down method does not leave enough freedom for the learners to choose chapters of the curriculum based on their interests or to bring new chapters to it, thus having a voice in the curriculum building. Curriculum building actually could be an incentive to increase students’ motivation and thus the learners can direct their own learning (Lamy & Goodfellow, 1999; Brandl, 2002; Stepp-Greany, 2002; Strambi & Bouvet, 2003; Martens et al., 2004). This being what they would prefer to do as it is obvious from the high scores they gave to the questions assessing their attitudes in relation to being able to choose which chapters of the curriculum they would like to work on and bringing their own materials to the curriculum building.

The survey, including the above variables, was administered to incoming intermediate English students in the UPRM in 2002 and it was also given at the end of the semester without any significant results between the two groups. It seems that students’ motivation was as low exiting the course, as it was when they entered it. The following patterns specifically were scored equally high at the beginning and the end of the course:

• Students’ willingness to spend a small amount of time studying for the course (90%)
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- Priority is given by the students to courses of their field and the grade in English is only important to them
- Students’ attitude toward English as being politically imposed on them (due to Puerto Rico’s association with the U.S.) was turning them off (85% of the learners). The 85% of the learners also mentioned that if they had to choose a foreign language, it would not be English as they were familiar with it since pre-K. (Despite that, the English of many learners in Puerto Rico is not good.)

Integration of Saafir

In 2003 it was decided to integrate Saafir experimentally in the curriculum. The objective was to make learners have detailed information about what was taught to them and to make learners become participants of the curriculum building by constructing a module they wanted to be taught and by having the freedom to bring in materials that interested them.

Professors liked the fact that learners would have the opportunity through Saafir to evaluate themselves and the course, and they wanted to compare the students’ evaluations with their own. Professors thought that students participating in what they were being taught would result in an increase of their motivation. By having an electronic curriculum instantly available to them, learners could decide if the course matched their workload for the current semester or not, and also they could know down to the last detail what the course was about, since the curriculum was described with as much detail as possible in terms of objectives, competences, modules, activities and dates. The professors’ motivation to work on the project was high at the beginning, but due to the amount of work involved, from the twelve (including those who taught Intermediate English the particular semester during which Saafir was used, and those who had taught in the past but did not teach when we were experimenting with Saafir, as well as those who were interested in Intermediate English but usually do not teach it), three continued.

The profile of the Puerto Rican students who participated in the experiment consists of the following demographics: they are 17-18 years old; first year undergraduate students; the majority of being interested in the science curriculum of the University, particularly engineering, biology, chemistry, and pre-medicine; and they come from high schools with teacher centered environments.

In addition, in our program, we have found that students can do well in their e-learning in the sense that students are able to follow instructions independently, the turnover of the assignments is higher when submitted online and student participation in discussions is higher in online sessions than in class.

In general, students do not have extensive knowledge of the English course curriculum (in this case, composition), nor is it extensively provided for them online before registration. All students utilize office hours for one-to-one counseling and guidance, and they seem to value this face-to-face discussion with the tutor more than an online interaction, particularly if their grade is in trouble.

From a technical point of view, the courses within the Intermediate English Curriculum were delivered using WebCT©. A link in WebCT homepage connected with the Saafir (see Figure 17), while one more link connected with a virtual trip presentation regarding how to use Saafir. Due to the fact that students had come up with additional questions, apart from those explained in the virtual trip, a manual was also written up and linked in WebCT.

As explained previously, the role of the tutor was not left to a tutor-less teaching machine. As put forth in the research questions of this article, we believe that a student’s study program, along with the evaluation and regulation of his/her progress, should be developed and discussed with
human tutors. In the case of the UPRM experiment, Saafir was projecting the curriculum model, but the course modules, the work groups, and the synchronous and asynchronous communication was done in WebCT with meetings of students and instructor [instructors, professors, teaching assistants (TAs) are all considered tutors]. Thus, the curriculum was not a passive database; the tutor was monitoring questions and giving prompts while the students could exchange work and give feedback on each other’s work in the discussion forum. Students’ progress was monitored continuously by observing interactions (student to student and student to teacher) and assignments. Also, the tutor wrote and published in WebCT platform the manual “How to Use Saafir;” prepared the students to use Saafir; gave the students hands-on training in how to actually use it; guided the students in how to write their own course modules and objectives in the curriculum that would match their interests; monitored students’ use of Saafir with online observation of students’ interactions and assignments, and with face-to-face interviews, (see section six), which included fielding questions about the use of its tools and communicating them to the Saafir team, monitoring students’ attitudes about using Saafir, monitoring the effect of its use on students’ motivation to learn and improve their composition skills and offering counseling in terms of students’ evaluations of their achievement compared to the achievement of other students and the tutor’s evaluation of the students.

First Experience, General Findings

This section presents how Saafir was used in a one-year pilot study and the lessons that were learned.

Students are not motivated to learn English and they stayed with the course mostly for the credits. For the pilot study, two sections of Intermediate English learners were randomly chosen, for a total of 20 learners. When Saafir was introduced to the students and during the sessions familiarizing the students with the tool, through discussions we found: first, that the perception tool was helpful in
the sense that learners could have all the information of not only the general course, but also of the specific sections, even before registering for the course with a specific professor. To that extent, it was more detailed than the course catalogues. Secondly, we found that the annotation/assessment editor was considered useful because it allowed learners to use simple text for the evaluation of the modules, the particular professor, the curriculum, and their progress. Contrary to the University server, which had the course information posted as a continuous text, a format which tended to tire the students who tried to read it, causing them to give up, Saafir did not lose the students because of its navigability by clicks on the links to different parts of the curriculum (objectives, activities, and competences). Thus with Saafir, there was more of a chance that the student would actually read the curriculum. The same goes for WebCT. In WebCT the curriculum was given also as a database, making the learners who tried to read it as tired as the University server did, leading them to quit reading. With Saafir the curriculum was posted and linked in the system automatically.

Questions at the beginning and end of each module regarding the activities, competences, and objectives of the module as described by Saafir helped learners have an idea of what was happening in terms of class content, and how to evaluate the module and the class in Saafir. Also, the learners evaluated their progress while they had the chance to be warned about upcoming deadlines of the curriculum in terms of activities (assignments due). At the end we invited the learners to tell us what modules they wanted to see in the curriculum that were not there and how they would integrate them in the current curriculum, even if they had to modify or to take out any current ones. We also asked them to state those modules in the same detail that we had stated the course modules in Saafir’s ontology. This would give them the opportunity to participate in curriculum building by going through the experience of writing curriculum modules with material they would be interested in, and viewing them in the broader picture of the whole curriculum. We were hoping that in this way the motivation to learn would increase. The modules had to be checked and discussed with their professors.

What we observed in this phase was that learners evaluated the modules using the annotation editor in the modules but not in the other windows, such as competences, objectives and activities, as they found that they could do it all in the modules editor. It may have also been because the teachers did not insist on different windows’ assessment and they used the modules editor as a catchall.

Teachers thought that the same happened with the e-mailing of the learners. The assessment window gives the possibility for the learners to e-mail other learners of different or same levels of assessment in a particular module, activity objective, or competence. The learners did not do it because teachers did not insist, since the focus was to use the annotation tool, and also because the Saafir learners knew that they were participating in an experiment and they would be graded in terms of evaluation and curriculum building, not in terms of cooperation with the other learners. Thus cooperation did not happen inside Saafir. The WebCT chat or threads in WebCT forum were the meeting places used by the learners.

In terms of cooperation, there was a reservation on the part of the teachers to use the e-mail. The learners could compare assessments anonymously, thus the learner would not know with whom he/she was communicating while he/she would be able to send them e-mails. Teachers felt that for a constructivist approach to learning, knowing each other virtually and having the feeling of membership would be very important. Though information could be exchanged anonymously it would be hard to create a community of learning (virtual classroom group). The other option would be not to use anonymity, but by law in the UPRM one learner’s grades/levels cannot be reported to
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another, even if they are self-evaluations. Since in the Saafir the self-evaluations take place in each student’s personal account, which is password protected, the issue of privacy creeps in if the content of the account is revealed to another account holder.

During this phase of our investigation, which lasted a semester (a total of 32 times online teaching/learning), we used action research, the nature of which is qualitative (Dick, 1999). The ways to collect data under this kind of research, in order to examine students’ opinions/attitudes about Saafir and the level of their motivation with and without using Saafir, involved students-tutor interviews, students’ evaluations in the Saafir, and a discussion blog period (Kern et al., 2004). The interviews and the blog period were run at the middle and end of the semester.

The blog showed how the learners felt about Saafir and if they were ready to proceed with the curriculum-building phase. It indicated that students would have preferred Saafir to be used as a study program tool (choosing the chapters they wanted to concentrate on and entering their own materials in the curriculum) rather than an evaluative tool, though they mentioned that they felt good that some of their own opinions about the course and themselves were heard and considered.

Regarding the interviews (Warschauer, 2000) that took place at the end of the semester, they showed that learners believed that the evaluations and the freedom to use their own modules had made them to want to participate more in the course because their needs and preferences could be heard (Oldfather, 2000). Also that the curriculum was not departmental wisdom thrown at them but a negotiation of institutional goals, learners’ preferences, and instructor’s ability to manage and counsel the learners’ objectives and such preferences. The fact that they saw how a curriculum was divided in detail made them informed course consumers, instead of course consumers based on instinct and/or the experiences of other learners who had taken the course. In order to get the evaluations from Saafir annotations, we used an administrator’s site that brought up all the evaluations from the different students’ accounts.

Second Experience: Questionnaire-Based Analysis

This section presents the lessons learned from the second year experience.

Procedure

Forty-two learners (two sections) were selected randomly to use Saafir. Another forty-two learners of similar demographics made up the control group where Saafir was not used and it was a traditional face-to-face interaction class. Six learners from the Saafir group and four from the control group dropped the course for health, family and transportation reasons.

Regarding the class, it was taught partially online through WebCT. In general, the composition courses are traditional face-to-face classes or hybrid classes [in which case, the majority (75%) of the work is done online] using WebCT. From past experiments we had come to the conclusion that WebCT itself is not a self-motivating/meta-control tool (Smyrniou, 2004) but rather a communication tool and the role of the teacher, even when WebCT is used, is important. This is the reason the Saafir was examined in comparison with a face-to-face control group to check motivation and not another hybrid section without Saafir. The class ran for a semester and the time that the students spent on learning varied from minimum of 1 hour to a maximum of 5 hours per week with the majority of the students falling between 1-2 and a half. The hours moved to three and five as they started writing the course modules (see results).

Regarding Saafir’s functionalities, all the elements of Saafir were used, with the exception of three: deadline warnings for the activities of
the modules, learners’ e-mail, and projects in the form that Saafir defines them. The reason for not using the deadline warnings was that WebCT was flashing the corresponding info even before the learners would enter the course and as soon as they would just log in. The “flashes” were links that learners had to click for the info to pop up. Thus, Saafir would duplicate the work. The projects option was not used because they were literature essays, not long individual or group projects that the engineering departments usually require from the learners. Thus, Saafir’s concept of projects did not pertain to the nature of the course. The learners received six extra points for their work in Saafir. Regarding the e-mail, it has been already discussed in the pilot study (see above). In addition, the WebCT e-mail was sufficient for the students to communicate without the danger of any rating of students’ performance to be given out either anonymously or namely. There was not any special need for the functionalities to be tested one at a time, as students, after some initial explanations, were able to use the tools quite well.

In terms of instruments for data collection, we continued as in the pilot study before to use a qualitative approach (Madison, 2001), this time involving questionnaires and Saafir evaluations. Learners had to keep notes on their progress in Saafir and evaluate themselves and the course modules, as well as the course in general. These learners’ evaluations were compared with the professor’s evaluations of the students. One week (called counseling week) before the deadline to drop the course, the learners would come to the professor’s office to discuss the similarities and the differences between the two evaluations.

The learners also had to write modules that they would like to be included in the course. The learners’ virtual groups in WebCT would decide with forum meetings which ones should be included in the curriculum and those were taught during the semester. The modules had to be written in detail and based on Saafir’s ontology.

In addition, similar surveys were given to learners using Saafir and those in the control group upon entering and exiting the course. The survey for the entering students of the control and experimental group, as well as the exiting students of the control group, called for students’ personal opinions on how their motivation to learn English (particularly composition) was affected in general, by course expectations; by the quality of information given to the students by the counselors and the course catalogue, or by teaching methods they encountered in the past; by their own beliefs regarding how useful English is in their jobs, citizenry and field of study; by the political imposition of the English; as well as by the ability to choose materials from the curriculum according to their interests or by the opportunity to bring materials to the curriculum (this is the survey that we always give to the students and it has helped us form an idea through the semesters about the students’ attitudes). Also, for the exiting students of the control group questions specifically about their course expectations, and their levels of motivation were asked, as well as an invitation was extended to them to suggest any changes they would like to make to the course so that their motivation could be raised.

The survey of the exiting students of the experimental group gave information on the above variables and additionally on: students’ opinions on the use of Saafir and its functionalities (perception and evaluation and general ease of use); students’ opinions on the course using Saafir and if it motivated them to learn; students’ opinions about building their own course modules based on Saafir’s ontology.

We analyzed the data by looking for themes, patterns, and big ideas. Then we coded the data according to the themes found. This procedure was followed for all those questions that invited students’ open-ended comments. Special attention was paid to those items with the highest frequency. We also paid attention to the high frequencies of the multiple-choice items. Last but not least, we
watched for any unusual comments or behaviors that might be connected with the tools, motivation, and course attitudes of the students. The analysis of the data followed the qualitative pattern we had established since the pilot study, with the exemption of only one inferential test (which was run to confirm and triangulate the pattern we had established in our qualitative analysis of the data), between the results of the entering and exiting students of the control group and the entering and exiting students of the experimental group. This inferential test was a test of significance applied on the same variables of the entering versus exiting group of students, in one case within the control group and in another within the Saafir group. Then the results—qualitative and inferential—were compared.

**Results**

From the survey given to the entering students of both groups (experimental and control) we found that in terms of motivation, the results were exactly the ones reported in the sixth section under “context.” The survey results from the entering students (control or experimental group) did not show any significant differences. Also, none of the students of either group had ever been part of any curriculum building in any UPRM courses. Regarding what they would like to see changing in the course; they mentioned more participation, fewer assignments and more discussions of topics they were interested in. The majority of students’ expectations about the course did not match with what the course was all about. Regarding the time they were spending to learn and study, they mentioned they would not dedicate more than one to two hours maximum, as the course was not part of their field area only being taken to help their GPA (Grade point average. See also the sixth section above). These results were compared with a similar survey given to the learners at the end of the semester (see below).

From the survey given to all learners at the end of the semester we found the following:

- **While the counselors’ ability to orient students right in the course curriculum, along with the quality of the information provided by the course catalogue and the decrease in students’ motivation due to previous school methods that tried to teach them composition were scored very unfavorably by the exiting students of both groups, 98% of these learners liked the fact that they could write their own modules of interest and give them to their group members in WebCT for review; that each group voted which one would be taught in class; that they would then submit them to teachers for inclusion in the curriculum, and that at the end of the semester these modules were taught as part of it. But they mentioned that while the Saafir electronic curriculum had helped them to build the modules, they found it hardly an easy task. One learner mentioned that it was as difficult as the computer graphics course he was taking. From the same learners 85% noted that while their respect for the course increased through the difficulty they experienced in writing the modules, the grades they received in their concentration courses were still more important to them. Also, contrary to the entry survey where the majority of the students wanted to do the minimum, in this (exit) survey 96% of learners mentioned that the time they had to put into finding materials and contributing to the class had increased, but it was a “creative time” and because of that, the motivation to participate offset the usual complaints between credit versus required work. The students did not perceive the six extra points we gave them as an incentive for using Saafir as an extreme reward for the work involved. Despite that, they were not belligerent about it.**

- **In addition, 98% mentioned that they would enjoy contributing materials to the cur-**
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The same amount of learners mentioned that they could understand better through the Saafir curriculum what the professors intended to do in each module, and that they would like to see other courses being provided electronically, since it is an easy way (a “click away” as they mentioned) to understand what was going on in the course. In addition, they mentioned that it is preparing the students well for what is expected in the course and in a way it taught them how to write curriculum modules. Looking at the control group, we found that learners did not have as firm a grasp on the details of where the course was headed as the Saafir group did.

The questions referring to attitudes toward English regarding its use in PR, its contribution to the students’ field of study, or job or citizenry and its image as a politically imposed language scored in both exiting groups as being unfavorably associated with their learning of English, though a few students in the Saafir group mentioned that it makes sense to learn it if you go to work in the United States or study (42%).

Regarding what they would like to see changed in the course, the non-Saafir exiting group mentioned more interaction in the groups and fewer assignments. The Saafir group, by introducing their own modules, gave us a pretty good idea as to how the curriculum, in terms of topics, has to be revised. They clearly asked to continue the students’ involvement in the curriculum.

For the questions or part of the questions of the survey that lent themselves (they were not open ended) to a test of significance, we discovered that there was not a significant difference between the two groups. The differences in terms of students’ motivation seem to come in when new variables, such as construction of modules or a detailed electronic curriculum comes on stage (see above) or self-evaluations/regulation, are introduced (see below).

As far as the Saafir’s functionalities are concerned, the following results were gathered: it was very easy to use Saafir (87%) and as the open ended comments mentioned, it became almost intuitive; they found it very easy to evaluate themselves in any of the four parts of the Perception function (modules, objectives, activities, competences); they liked the tracking of the progress, as 96% of the learners mentioned that they liked having their Saafir evaluations being compared with the professors’ evaluations (as was found in the first survey, too) and then being given counseling time at the professor’s office. This kept them informed throughout the semester and helped them to make a decision when the administration’s deadline came up regarding dropping or going along with the course. In terms of what they would like to see changing in Saafir, they mentioned the following:

First, some students mentioned that it would be a good idea if after every evaluation is done a check mark could be put as a reminder where the student left off the time before. It would be easier for the student to track his evaluations if he had only one part of the perception to work with, for example, modules. But since there are four (modules, objectives, competences, activities) it can be confusing where he stopped.

Second, for some students putting all buttons in one language—English or French—would be an idea and make the program become faster and shorter (-Kbytes).

Third, that the program stores only one evaluation by event and that it have many colorful icons to associate things (sometimes the evaluations were saved more than once).
Fourth, for security reasons some students would like to implement an option that helps them change the passwords.

Fifth, coming from three students was the thought: “I think that not everyone has the facilities of accessing a computer with Internet and downloading the program Saafir because the program has certain specifications. I personally tried to download it into my laptop but I don’t know why it didn’t allow me to do it” and “Maybe if it can come with an online manual of trouble shooting it would help.”

Regarding learning, the final exam showed that the grades were distributed equally between the control and the Saafir group. If somebody defines learning based on grades and final exams, then we did not have any difference between the groups (control and experimental). The difference is in the quality of learning and the understanding of the structure of the course between the two groups, along with the creativity of the learners that went into actual curriculum building, which helped them to learn. This creativity was obvious in the Saafir group but not in the control group. Summarizing, if learning is defined along the lines of motivation, experience with the course structure, and use of creativity, then the Saafir group had an advantage.

In terms of Saafir and faculty we found that the use of Saafir helped the professors to see where our curriculum needs revision based on learners’ evaluations in Saafir and on the learners’ writing of modules. It also helped to discover how learners’ needs, starting with learners’ learning disabilities that were never reported, up to learners’ personal issues that came up through the counseling week interviews, changed the way it was decided to evaluate learners (particular deadlines for emergencies were established as well as a definition of what is an emergency in the course; also instructions were given in the course syllabus as to how the American Disability Act protects the learners who suffer from learning disabilities and how and where on campus they have to report them). On the other hand, we did encounter the issue of how to change the dates of the activities if something should go wrong and either some modules had to be skipped or the deadlines to be changed (as happened due to an all campus strike). Due to a regrouping of materials to adjust them to time that had been left, the students would see different dates and modules from the ones taught during the face-to-face interaction. This issue was resolved by gaining access to the particular site from where we could change those dates. Some professors mentioned that it would be nice if in the future, instructors could have control also in order to change some of the activities as the course proceeds if better materials came up that are more relevant than the ones that have already been entered in the Saafir.

Two major features can be outlined concerning the functions of the developed tools. First, students have an opinion on the tools, not only in terms of “it is useful or not,” but in terms of how the tools could be adapted to fit their needs. This means that students learn that appropriation tools can be useful to them and actively reflect on the utility of the tools and propose ideas pertinent to their own usage. This is an interesting side effect. Second, students have different proposals, which at times are contradictory. This is coherent with our theoretical premises: appropriation of a WBL curricula concerns both appropriation of the curriculum and of the technological issues, and it is coherent in that students who are appropriating the WBL curricula are required to adapt the tool to their own individual needs. The conclusion that can be drawn from this is that an architecture that proposes appropriation tools should not be one-in-all but composed of building blocks that students can use or not, and that these blocks should be customizable by each student.
CONCLUSION

In this article we have suggested that appropriation is an important issue to be considered in the context of Web-based learning. We have proposed a general definition of the concept of appropriation and explored how it is possible to design computer-based tools that manipulate an explicit model of the curriculum in order to help learners to perceive the curriculum from different points of view, to annotate, to evaluate, and to regulate their itinerary.

The experiments conducted thus far demonstrate that such tools do provide an added value service. In particular, the second experiment in Puerto Rico suggests that Saafir helped with learners’ motivation and curriculum participation. In addition, as a consequence of using Saafir with the English learners, the pedagogic team of the course was challenged to refine its curriculum description.

We have proposed in the fourth section, examples of tools that can be useful to support appropriation. At this point, further research must take place: the basic tools (perception, annotation) must be further tested in different learning environments; the complex tools (project editor, warning editor) must be evaluated in terms of usability and then be tested in real learning contexts; and many other tools could be designed and implemented. It is also necessary to work out if it is possible to propose an ontology (the one we have used so far or a variant) that is both sufficiently generic and precise enough to be used in any setting or if a preferable strategy is the construction of an ontology that is context-dependent (customized according to the curriculum, the public, or the objectives). This latter case would then require addressing issues (such as an automatic customization of the tools to accommodate the ontology of different curricula). In both cases, it would be interesting to study how the ontology based modeling of the curriculum (which is a task that is difficult for teachers to address) can be supported, including potential bindings with standards such as IMS-LD.

From a more general point of view, this exploratory research opens different questions to be examined, in particular:

• Can/how can the appropriation of a curriculum by a learner be measured?
• Can the effect of using/not using tools such as the one presented in this article be measured?
• Can using such tools be interesting enough to learners and to such a degree that they use them on a volunteer basis, or is making this usage mandatory a better strategy?
• How can the support proposed by such tools and the support proposed by human tutors be articulated?
• Can we propose an architecture that students can adapt to their needs, selecting the tools they want to use and then customizing these tools?

We believe that the research presented in this article and the different researches that we suggest above can contribute in enhancing WBL platforms with tools that can avoid some of the appropriation, autonomy and motivation problems that learners face and that contribute to the pedagogical and learning difficulties currently associated with Web-based learning.

REFERENCES


Paquette, G., Pachet, F., Giroux, S., & Girard, J. (1996). Epitalk, generating advisor agents for ex-
isting information systems. Artificial Intelligence in Education Society, 7(3-4), 349-379.


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