Measuring the Preferred Learning Style: Case Study

Robert Pintér, Sanja Maravić Čisar

M. Oreškovića 16, 24000 Subotica, Serbia, probi@, sanjam@vts.su.ac.rs

Abstract: This project presents some new problems facing the study process in the distant learning system (DLS), and also tries to answer the central question: "Why do we need personalized e-learning curricula?". The web application was developed in order to detect changes in learning styles and measure the level of satisfaction of the students with the presented e-curriculum for C++ programming language. This research would contribute to creating such a type of learning objects which will be preferred for each student with different learning style. Also, the data collected from the students can help educators in choosing type of learning activities or in the design of those activities which can suit all types of learner.

Keywords: Distance learning, e-learning, adaptive web, personalized curriculum

1 Introduction

The learning process in the distance learning system is substantially different compared to the frontal type of teaching. Today it is widely accepted that during the design and development stage of educational materials for DLS, attention must be focused on the learner's characteristics and requirements [1]. This means that, through adaptation to these characteristics and requirements, personalized courses and systems must be developed and implemented.

Using personalized e-learning curricula can result in successful and effective learning. One form of personalized e-curricula can be achieved through implementation of different learning styles [2][3][4]. A learning style is defined as the unique collection of individual skills and preferences that affect how a student perceives, and processes learning material [5]. Each student has a different set of goals and requirements for a given course. Moreover, the learning style of each student is also unique. When designing an e-learning curriculum these facts must also be considered. In order to achieve better results, the designers must integrate different teaching and pedagogical styles into the curriculum to suit the variety of students.

2 Problem Formulation

The lack of adaptation to the learner's characteristics and requirements results in learning environments in which the "one size fits all" approach is dominant. Those systems may cause a rise in the student's discomfort level up to a level which then it will hinder or prevent the learning process itself, or more to the point, hamper the further use of the learning system [6].

One of the main problems can be defined as the lack of guidelines on how to design, develop and manage pedagogically sound e-learning materials. On the one hand, the system developers claim that they only provide tools for e-learning, and they cannot tell educators how they should use it. On the other hand, the educator is often working alone in the e-learning curricula developing process, because applying other experts would involve additional costs. All these factors can lead to a total waste of time, energy and money invested so far in the development of system or e-curricula.

Another mistake the result of the fact that the most common approach when developing an e-learning curriculum is still defined by the assumption that the student in a distance learning system (DLS) is an ideal student. This student is always motivated, likes to learn via the PC, and is satisfied with the level of communication provided by the Internet and its services [7]. In fact, experience shows that this image is far from reality, and the wide-spread belief held by system developers that the advantages of DLS and using multimedia in the e-curricula will be enough to overcome the negative effects which are likely to result from studying in an isolated and stand-alone environment is proved to be wrong.

The main approach when designing our web-based learning environment was that we only want to adapt curriculum to the student's learning styles. We did not want to develop an adaptive hypermedia system (AHS), in which building student's complex profile is a goal. The idea was, when the student creates account in the system, he/she must fill a special questionnaire, which will determine his/her learning style. Once the profile is determined the students access the curriculum in whichever formats most suits their preferred learning style. We choose to implement Felder-Silverman Learning Style Model (FS) [8][9]. The Index of learning styles (ILS) is a 44 question instrument designed to assess preferences on the four dimensions of FS model:

- Active and reflexive learning style
- Sensitive and intuitive learning style
- Visual and verbal learning style
- Sequential and global learning style

At this stage, the authors reckon, new problems appear: How well does the determined profile really mirror the student's profile, and to what extent does the system's "preferred curriculum" really match the student's preferences?

The first question refers to the case when the student's answers are not true (reasons for this may be lack of honesty, lack of interest, momentary state of mind, etc) and because of his or her dishonest answers the student was given a different profile. The system always offers an ILS and profile determination, the student only has to initiate these options nonetheless, practice shows that students hardly ever use this option once they have filled in the questionnaire at the beginning.

The second question focuses on the phenomenon that the learning style is not an exact parameter; it may change with time and may also depend on the topic. Consequently, the use of adaptive techniques heavily depends on whether or not the student's profile was correctly detected throughout the entire learning process. This is also true for those systems which do not determine the student's behaviour using psychological tools, but based on the student's behaviour and the data collected by the AHS.

Another common mistake must be mentioned when designing AHS: forming the curriculum, processing and presenting it, is strongly connected with the learning style of the assembling expert(s). The authors of this paper feel that it is important to state that a learning material created for a given profile can only be transformed into an e-learning material to the fullest effect by those teachers or instructors who themselves have a similar learning and teaching style. This would lead to the conclusion that the designer team working on project must be definition include experts with different learning and teaching styles to design the learning material according to their styles, as well. Yet it can safely be stated that such complex designer teams are highly unlikely to materialize due to the enormous costs it would involve.

3 Problem Solution

The arising problems have changed the structure and aim of the project. The authors started experimenting with such adaptive systems that were equally adaptable for all parties involved in the education process, teacher and students alike. Two main goals were defined. First, to examine if there is a change in the learning style if the subject to be learned is one of the programming languages, and second, to collect as much information about the presented preferred curriculum as possible. The goal is to use the attained information to determine some form of regularity which can be used to develop similar e-learning contents. The aim is to define some type of methodology for creating learning objects using adaptivity approach to the student's learning style.

For achieving the previously described goals, a web application was developed based on PHP, Apache, MySQL and Linux solutions. The application distributes

the e-learning contents and collects information from students. The lessons are pre-composed dynamic html pages. The lessons are created using the structure and presentation style following the guidelines described by the learning style model. Some pages contain somewhat more than the optimal amount of "stuff to be learned" because the lessons are designed to be follow able for all FS profiles. The application can manage the students' profiles, categorize students by their learning style, distribute the curricula prepared in advanced, track the students' knowledge progress (such as results of tests), and assure asynchronous type of communication (e.g. forum) with the other students. The information collecting part of the application collects data about student's activity in the system, as described in the following example:

1. Information is gathered regarding how satisfied the student is with the presentation and content processing of curriculum and available examples. The external contents are also evaluated. The point is that the student can give a mark to every part of the application. The marks range from 1 to 5 and there is also a possibility to evaluate by textual comments or notes. With this feedback one can measure to what extent the given lesson structure and presentation style is preferred, broken down according to each profile. This information can help to form aspects of how to create e-learning materials.

2. Information is also gathered about student's activity in the system and within the e-learning material. The following activities are tracked:

- Did the student leave a note, or open some other student's notes?
- Did the student follow the hyperlinks to the examples page and to the external links collection page?
- What is the pathway of visiting the lessons?
- Did the student play the multimedia file on the page (sound, video or flash animation)?
- Did the student ask for printer friendly versions of the lessons?
- What are the time spending statistics on lesson pages and on the example pages?
- Did the student select a bigger picture option on the page?
- How often did the student communicate via the forum?
- Did the student use a glossary?
- Did the student change the colour theme of the application?

Based on the marks and comments, the educator can change any part of the curricula. By taking into consideration the students' views of the curricula, two goals are achieved: firstly, the teacher is no longer the only one who develops the

curricula, and secondly, the needs for personalized curricula will be fulfilled. Unfortunately these changes will be used only by the next generation of students, and not every student's special need will be fulfilled. Critics may say that the general direction is that of the classical "one size fits all" approach. It is partially true. But, using the data from the learning style questionnaire, which is a mandatory part of using the DLS, and the data collected by the system about the student's behaviour, the educator can detect those students whose needs are more special than the average, and give them adequate attention.

This particular application was tested at Subotica Tech in the spring semester of 2009. The students had an obligatory course of C++ programming language consisting of 14 classes in a typical frontal-teaching style. The students were given the option to use the web application as an additional learning tool (with 5 e-lessons). Out of 100 first-year students of informatics, 56 of them had opened accounts in the system. At the end of the semester, a great amount of information was collected. Primarily, this information will be used to perform changes in the application, in a manner that the students indicated. Further, based on the collected information, changes will be applied in presentation styles, lesson structures, and types of examples of the existing as well as the new e-curricula.

Conclusions

This paper presents some problems which may appear in a DLS, when the students learn in an isolated and stand-alone environment, affecting the learning process negatively. The project implements the following thoughts: The students should benefit from all known learning theories and models as well as learning styles and strategies. We, as educators, should not be the determinant in fixing the recipe for the students as we do not absolutely know how, when and where students learn [10]. The current web application was developed in order to detect learning styles and measure the level of satisfaction, so that research would contribute to creating learning objects for teaching programming languages. Also, the data collected from the students can help educators in choosing the type of learning activities or in the design of those activities which may suit all types of learners. After all, if the next generation of students rate the curricula higher, and leave fewer comments with critics, the authors of the project will consider it a success. If apart from that, the students will even get better mark at the final exam, this approach can be alternative to the very costly system development which involves the time and energy of numerous experts.

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