Abstract

The ability to support students’ learning processes efficiently during web-tutored programming project course is a key factor to success. In order to enrich the supportive efforts we need to build specific environments to fulfill this requirement. One of the most interesting methods to be used in such environment are various problem-solving tools which help the student to solve relevant problems in a creative way. The environment equipped with such tools could both support students in various situations and ease the workload of the instructors in the tutoring task.

1. Introduction

During the distance education project called Virtual Approbatur at the Department of Computer Science, University of Joensuu, it has been discovered that there is a need for tools to manage and tutor students’ programming projects in web. Current methods for managing and supporting the students are not enough.

We are currently using WebCT as a technical platform for all of our courses. However it is also discovered that existing learning environments are mainly designed to manage a traditional or common formats of courses. They typically do not support specialized forms of delivering the education such as computer science courses that rely heavily on programming or similar kinds of assignments rather than traditional written assignments [2].

Naturally, there are several environments available that can be used to manage the programming projects. However, these systems are seldom designed from the student’s point of view. The goal of many of such environments is just to ease the management of the students’ projects. Our vision differs significantly form this perspective. We argue that the development of these kinds of tools must arise from the needs of the students, not from the needs of the institution or administration. Hence, our environment is designed from the viewpoints of supporting, managing and tutoring the whole process of a programming project. On the other hand our design differs a lot from the viewpoint of counseling the student.

In order to enhance both the students’ ability to solve occurring problems during the programming project and instructors workload we have begun the development of environment to be used in the web-tutored programming project. One of the key features of the environment is the adaptation of various PMA (Project Management Assistant) tools at different stages of the project [4]. Students receive adaptive guidance and support according to their user profile and earlier performance.

2. Web-Tutored Programming Project Environment

2.1 Student Model

The user profile holds all the necessary information about the students. The user profile information can be gathered from three different sources; a general student model, students’ performance at programming courses and students’ behavior when using the environment.

- **The General student model** holds background information about the students. The possible elements for students are: age, hobbies, programming experience prior to the Virtual Approbatur, possible weak subjects in programming. The general student model is gathered directly from the student, and he can update the model at any time during her studies. In this way the student can make her own contribution to the information that will be used by the environment [5].

- **Students performance during the previous programming courses** is stored as detailed as possible. In the current situation the information received from courses consist of data about students’ performance in programming exercises and exams in the courses. Hence, we get information about possible weaknesses that have occurred during the two programming courses [3].

- **Students’ behavior** in the environment is monitored and stored continuously. Hence, we can monitor students progress during the project.
2.2 Adaptation of PMA Tools for Different Steps of Project

The Project Management Assistant (PMA) consists of several tools which provide the user with various accessories for problem solving. In the context of web-tutored programming projects we will not necessarily use all the PMA tools. Rather, to manage the project the web-tutored programming project environment can individually help to choose the appropriate tools for each step of the process.

We can define several tools as columns in a matrix, like DTM, T2, T3 in Figure 1. Furthermore we can define several steps or stages as a rows of the matrix. The adaptation and personalization of the tools operates in such a way that we can choose the tools to be used at the different steps of the project, marked as X in Figure 1. Also the tools can have personalized parameters which direct the usage of the tool in some ways. In Figure 1 for example the T2 has got one parameter \( m \) which can hold personalized information stored in the students profile.

![Figure 1: Personalizing and adapting the tools](image)

<table>
<thead>
<tr>
<th>STEP1</th>
<th>DTM</th>
<th>T2</th>
<th>T3</th>
<th>T4 (k)</th>
<th>T5</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEP3</td>
<td></td>
<td></td>
<td>T2 (m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEP4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>STEP5</td>
<td></td>
<td></td>
<td></td>
<td>T4 (k)</td>
<td></td>
</tr>
</tbody>
</table>

2.3 Code Bank

The code bank is based on the idea of Linux and Open Source Development [1]. The students can distribute solutions, tips and ideas among each other. Every code found at the Code Bank is freely available to be used at the programming projects. Students could share their codes and make voluntary improvements to the existing programs. Furthermore, the distributed effort could offer some students extra support and guidance. Naturally the quality of the programs could also enhance.

As we get more courses finished there will emerge a repository of codes to be utilized in different contexts and settings. Furthermore the students can leave their completed projects as seeds for topics in upcoming courses. This enables a new dimension to the implementation of the course, as the emphasis of the projects moves towards updating and enhancing extensive software rather than starting the whole project always at the zero level.

2.4 Programming Project Portfolio

Electronic portfolios bring new approaches to several aspects of the course. Portfolios can be used when the instructors assess the products of the students. The portfolio can be seen as a “travel journey” of the programming project, binding together the most crucial aspects of the learning process of the student. After and during the project the students can use the portfolio as a mirror of their own skills and knowledge [6].

The project has got a distinguishable starting point and there is also clearly ending for the journey. Our goal is to map the most essential events and feelings during the trip. Hence, we want the students to include descriptions about their positive and negative attitudes during the project. In this way we can also get valuable information for the development of course.

3. Concluding Remarks

Web-tutored programming project management system emerges from the needs of actual circumstances. Both the students and instructors require more support and guidance than we are capable of offering them at the current state of course. However the implementation of the first PMA tools is still underway. Furthermore the student at the programming project course in this year will have an opportunity to exploit the capabilities of the programming project portfolio in a format of paper poster. We believe already these non-electronic portfolios will give us valuable information about how to the evolve the use of technology to develop them into a direction which involves a student towards a more creative and inspiring learning process than with traditional tools.

References