Designing E-portfolio module for open source LMS

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Abstract: - Selecting LMS (Learning Management System) for education is not an easy task. But once it is chosen it is hard to switch to another LMS. In some cases market available LSM are not suitable for specific tasks. Designing entirely new LMS is often too expensive. Designing software module for existing LMS is much more favorable though. Luckily open source LMS provide good insight for software module development. But designing an extension module is not an easy task because we are not to change the LMS. None of open source LMS covers a highly important topic in teachers' education - teacher training. Teacher training consist of observation, analysis and lecture training. It involves students, didactics specialists and training mentors. We have solved them with students' trainings' e-portfolio module. Pilot project to develop and test the idea in practice is coming to the end and in the article we present requirement analysis, software solution, users' comments and operational analysis. The process of development was discussed with our computer science students who need to study software development. We were able to show them all steps in the software development from requirement analysis to the implementation up to the final analysis. Feedback in their increased knowledge and clarity of the software development process is fantastic. All the "broken peaces of knowledge" come together at last they say.

Key words: LMS, software development, teacher training, education, UML

1 Introduction

Performance evaluation is important task in all levels of our society. Companies wants to know who are their best employees, schools wants to know who are their best students, people chose the best restaurants etc. Rapid developments in the information and communication technology introduce information systems at all levels of our society. Large market companies are now developing e-portfolios for their employees to detect the seller of the month. Banks use them to detect knowledge shortages and schedule education. Educational institutions grade their students.

Teachers' education requires teachers' training. The theory is not enough for students to become teachers. An elaborate system of training was developed in the past though. The main principles are practicaly the same all around the World. Recent changes in the EU require development of new educational systems according to the Bologna declaration [1]. Our hope is that changes will bring good results and boost students' mobility [8].

For teacher training we need a support system [7] that performs tasks of student assignment, information office, data gathering, cataloging, and final analysis. Each student has portfolio and this portfolio is filled with the documents until the training is complete. Traditionally this was done all on paper and sometimes might happens that during the transportation some papers get lost and need to be resend. But most annoying thing is that papers are delayed on route and deadlines are missed. This was just one reason that we started the pilot project to develop the web application for teacher training support system. Another reason was the project Partnership of Faculties and Schools where one of the modules is also "Teaching practice in education". The aim of this module is to prepare the support system, organizational and normative changes in the teaching practice according to application of this module in the practice. Therefore the development of the web application was also a part of the project. At the beginning we want to design it as stand alone application but we later decide that application should be incorporated into LMS (Learning Management System) as module [2]. This enables us broader functionality and better incorporation into other type of TSL (Teaching Study Learning) processes.

In our case we use open source LMS Moodle. It enables us to use previously developed learning material and incorporate our previous findings [5]. The policy to use the open source software wherever it is suitable saves a lot of money and enables us to share Open Learning Objects [3]. Since Moodle is in the constant development we need to assure that we could use the new versions. Therefore we use Moodle's user authentication and add some tables in Moodle's database. Program code is also physically separated from the Moodle's code to minimize the impact.

In the teacher's training we have three different types of participants: students, mentors and special didactics. Students are future teacher which will teach in the primary and secondary schools when they graduate. Mentors are teachers in schools which have at least three years of practice in teaching and gain sufficient amount of points. Mentors are tutors for students when they attend teaching practice in schools. One mentor can have up to five (5) students but in practice they rarely have more than two (2). Special didactics are university lecturers who are responsible for methodology of teaching of their studying discipline and teachers' training of their discipline.

Enabling mentors access to the learning materials we this builds a horizontal virtual community and strengthen the bond between different levels of education [4].

2 Requirement specification

Everyone who participate in the software development know that preparing requirement specification is most important task. With the team of didactics specialist from different scientific areas we manage to prepare the consensus and unify the procedures for teachers training. The tasks require many meetings and two months. In this small scale test we unified three different types of teachers training. We cover computer science, geography, German language and we also have observation practice work for general pedagogy. In the beginning we find out that our work has some differences but we could manage to make a common ground in our training procedures.

Teacher training in our country begins in third year of study. This is done in special didactics subject who present the students' study discipline. Despite the differences in the preparation of the training and amount of ICT used in the training the general idea is the same. Students work under supervision of special didactics in schools where they start with the observation of the mentor. Mentor prepares the lecture for his pupils and our students observe how mentor perform the lecture. Later students prepare their lectures and have to present their work in the classroom in front of pupils. Other students observe their schoolmates and in the end special didactics conduct a didactical analysis of the students' performance. Didactical analysis is done in tree steps:

1. The first is the student who performs the lecture. He presents his observation of his work. What he thinks was good, what was not good and what he would do different if he is to do the same lecture again.
2. The second is the student who was assigned to log the lecture and present his view about the performance of the teaching student and also present what he would do if he would be in the same situation.
3. The last one is the didactics specialist that makes the final assessment of student's performance and highlight the attending students what they might miss during the observation. He also encourages students to make creative solution about unforeseen situation that occurs in the classroom during the lecture.

Each student needs to be present on three (3) observations and prepare one (1) lecture.

Students can insert data about the observation of the lectures performed by mentor or his fellow student. But when student present the lecture special didactics specialist is the one who enters data to the web application because he is the one which assess the student's performance.

The second stage in student training program is practical work for two week per year. Students are assigned to different schools and they work with the mentors. Because students have two studying disciplines they have two week practice. One week for each studying discipline.

During the second stage didactics specialist's role is to observing the process of training. Only students and mentors are active in the second stage. Mentor assigns different tasks to students and student needs to perform these tasks if he wants to get positive training assessment. Student therefore needs to perform observations, lectures and other educational activities. At the end mentor prepare the final assessment of student's performance in the practical training.

Training is concluded when didactics specialist provide the combined assessment of student. The report of the training is signed by mentor and didactics specialist and deposit in the student's portfolio.

This was a short description of the procedures that needs to be followed in the teachers training. In the third year students have practice in primary schools and in the fourth year they have practice in secondary schools. Description of these procedures

was the basics for our software development. But the real aim of the software development was the ease of communication between students, mentors and didactics specialist. At the present all things are done in paper form. Forms are sending by the Post or students carried them in their portfolios. Sometimes (even not rarely) some documents can get lost and additional resending is needed.

Because we have students of computer science and they have problem to understand object software development we got an idea to prepare for them real life software development project. As we continue through the phases we show them progress and results of development steps. In the discussion with them we find out that they participate much more eagerly than in fictions projects. The discussion of solutions also proved to be good validation and verification process because they discovered some possible scenarios we have not foreseen.

3 Software analysis

Requirement analysis was good starting point for conducting real software system analysis. Armed with the knowledge we gained developing technical information system for industries we chose object oriented approach [6]. We could identify all involving classes in the system. There are three classes of users involved in the process: didactics specialists, mentors and students. We have identified the attributes we need for each of them and then prepare the object diagram in UML notations (Fig. 1).

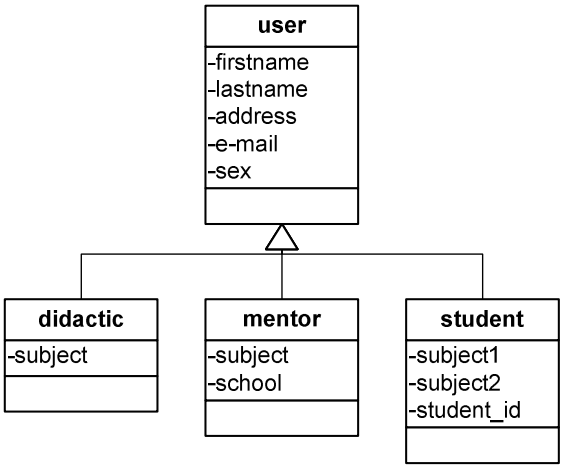

Fig 1: Object diagram - participants

As we can see in the Fig. 1 there are some reasonable constraints. The didactics specialists can cover only one studying subject. The same applies to the mentor but students can have two different studying subjects. How to deal with the exceptions? If a didactics specialist is for two studying subject then he will be treated as two different didactics specialists with one studying subject. This principle can be applied also for mentor. Despite the fact that this occurs rarely we have one didactic specialist that covers computer science and physics and he was the project member.

Student training consist of two stages. The first stage is general observation under supervision of the didactics specialist and the second is practical training in schools (Fig. 2).

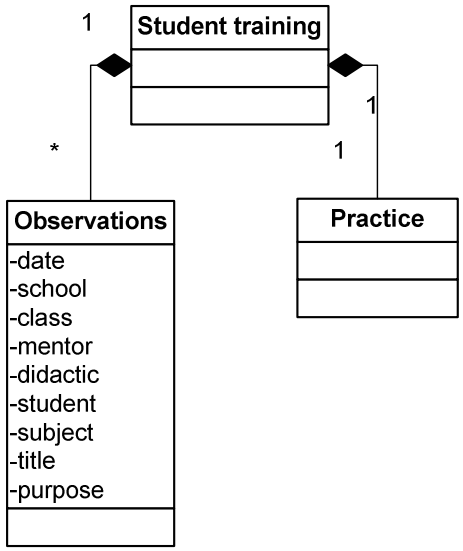

Fig 2: Student's training

As we can see in the Fig. 2 student need more than one observation and only one practice training during one year. The required attributes in the observation are date when the observation was performed, school, and class in which the observation was performed. Mentor, didactics specialist and student are needed for restricting data access. Didactics specialist can see data of all his students and mentors. Mentor can see only students who are assigned to him and student can see only his data. The title of the observation is prescribed in the curriculums for primary or secondary schools. The purpose of the observation is different depending on type of observation and can be: new knowledge acquirement or development of new skills; knowledge consolidation or exercise; knowledge verification; knowledge assessment; and other.

In the Fig. 3 we can see two types of observations. Observing the diagram we can see that the observations consist of observations and lectures. Why are the lectures included into observation? This was something that was very confusing in the first place for us to. But when didactics specialist explains us that student observe lectures either performed by mentor or by their fellow students this seems reasonable enough. Confirmation in the object "Observation" means didactics specialist's confirmation that students actually participate in

observation. When student perform the lecture he is also graded (using three grade levels: insufficient; good; and very good).

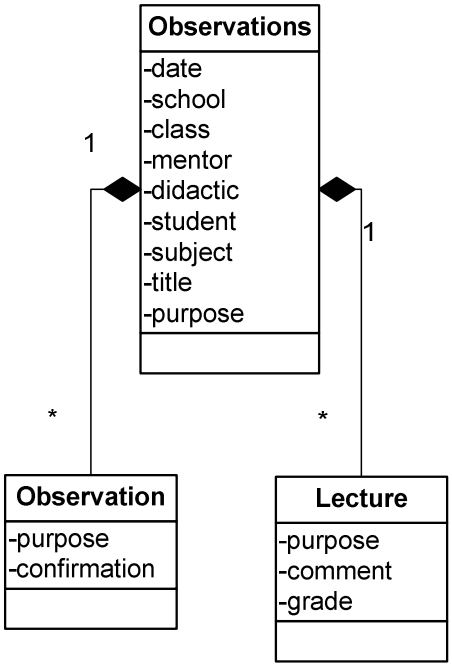

Fig 3: General observations

Students need to perform different tasks during the practical training in the schools under supervision of mentors (Fig 5). With the interviews we reach the agreement that practical training starts with the initial meeting where mentor prepare the plan for student. From our perspective we need only the date. Didactics specialists suggested that they do not need additional information. Mentors only task is therefore to select a student and confirm that he did have meeting with the student (see Fig. 4). Student's training is completed on the date when he has the final meeting with the mentor. At that time the mentor confirms the event and prepares the analysis.

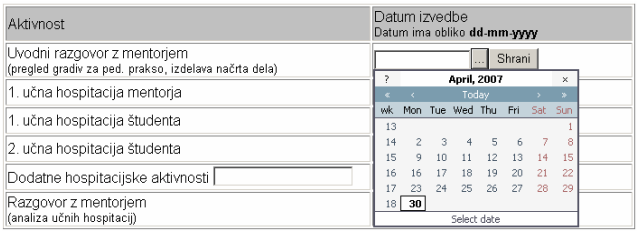

Fig 4: Mentor's view of Hospitations (see Fig. 5)

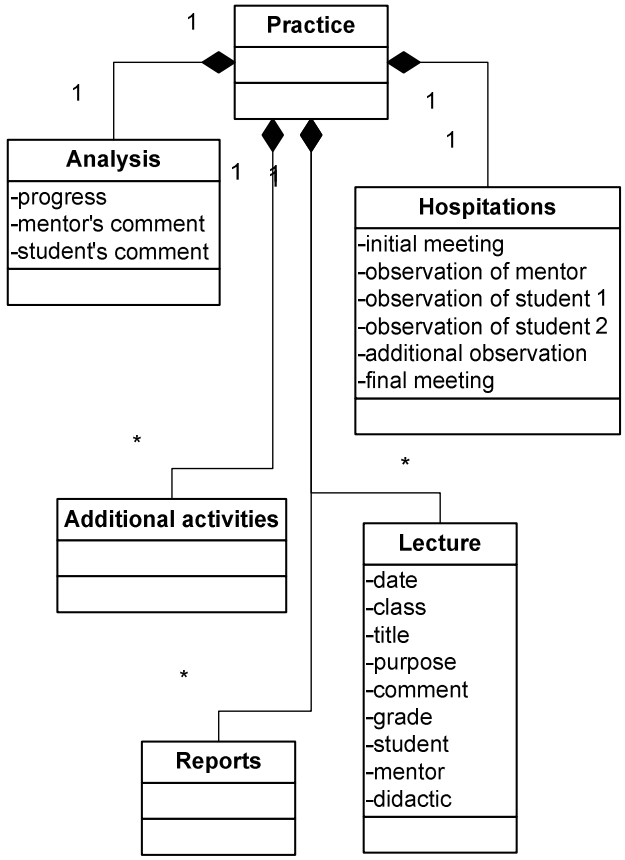

Fig 5: Pedagogical practice

Student needs three (3) observations during his training in the school and up to six (6) lectures. The lecture resembles the structure of the lectures in the first stage of the teacher training. The difference is that mentor grades the student. In the analysis the mentor assess student's progress with values (yes, partially or no). In the comment field the mentor prepare short commentary text about the overall student performance and gives some guidelines to the future student's work. Student has the possibility to comment his performance. The "additional activities" are grouped into different segments where student need to fulfill at least five (5) of additional activities. There are three types of report: (Fig 6)

- Mentor's report
- Didactics specialist's report and
- Final report

Despite the number of attributes we have in the final report all these data are already present in the system. Only the comments need to be written in the report.

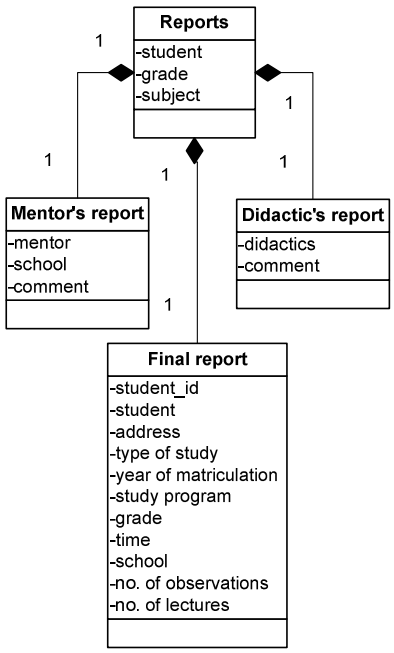

Fig. 6: Reports

The dynamic of the application can be best shown with the sequence diagram. For the purpose of this article we will not prepare sequence diagrams for all application but only for those that are in the mainstream of the application. We will omit in our diagrams actors which can only review data. In the Fig. 7 a sequence diagram for observation is presented. Scenario shows that didactics specialist assign student to the mentor, student then fulfill data about the observation and didactics specialist at the end confirm the student's entered data

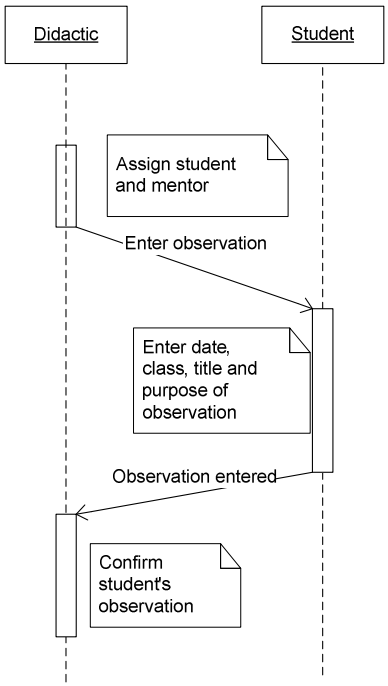

Fig. 7: Sequence diagram for student observation

In the second stage - practice training in school we see that all parties are involved but most work is done by the mentor. To reduce the load from the mentor only necessary data are to be entered. Studying the sequence diagram for lecture (Fig. 8) we see that mentor should enter data for each of the students lecture. But student is to enter the comment after the mentor grade him. This proves to be a bit of a problem for some mentors since they did not want to write comments before the students make their own comments. In the web application usually we do not permit reentering data. A scenario could be devastating if mentor would grade student and give comment. Later student would comment that the mentor did not do his part of the job resulting changes in the mentors comments and grade of the student.

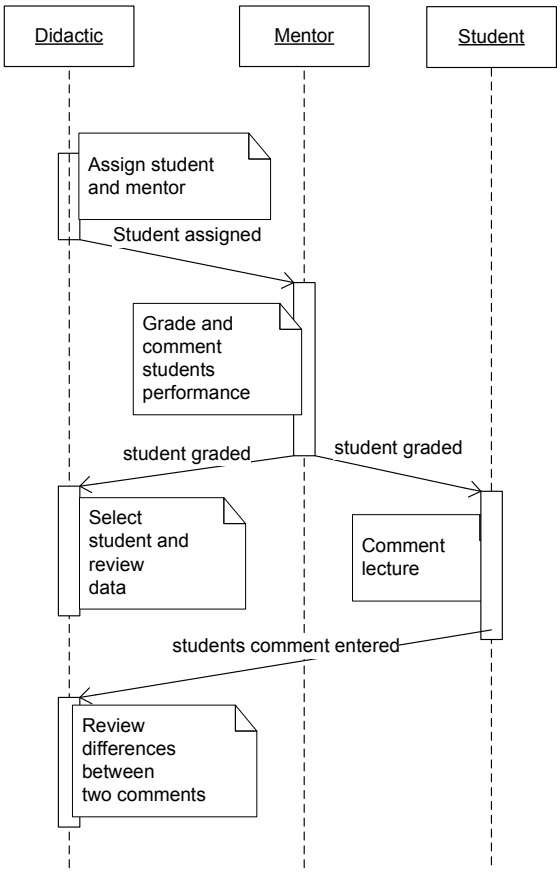

Fig. 8: Sequence diagram for lecture (Class Hospitations Fig. 5)

4 Verification

Despite it is fairly simple application we have quite some problems of understanding among involving parties. What were the reasons that such application makes so many problems? We were misled of the involving parties' knowledge about "driving" a computer. The project manager was the didactics

specialist who admits that have insufficient knowledge in computer usage and absolutely no knowledge about software development. The committee members who should make the evaluation were practically the same. When we tried to get them to verify the logical sequence of events they always focus to the minor grammatical inconsistencies. They always want to discuss about the programs function on paper despite the fact that web application was operational. When we tried to make the presentation of the application itself they get lost in the sequence of events when we switch between users.

Despite these obstacles we finish the job and make the application up to their demands. When the application becomes functional and successfully passed series of tests we prepare workshop for involved mentors and students. In one day workshop all grasp the concept of the application and acquire knowledge to work with it. In the pilot project 6 university lectures and assistants were involved, 13 mentors in primary and secondary schools, and 24 students from 3rd and 4th year of study.

When we finish the pilot project and make final assessment we find that most problems were caused by the fact that users were allowed to enter the data only once. But they could always report mistake and administrator would enable them to reenter data. We also have problems with some mentors who did not want to enter comments and grade students fearing that students may disagree with their comments. But in one single case we have mentor who said that she won't participate any more. This seems to her as huge additional work and she did not have time for such work. We did not expect this but it happens. We have also gain good lecture from this example and could be summarized in one sentence: "Never use 'old' teachers in pilot project". But from other participants we got only good response and some also want this application to expand and abandon traditional way which was carried in parallel with this pilot project.

Students of computer science also gain from this project. All of them have got thorough inside to the software development and they better understand UML models and techniques.

5 CONCLUSION

Development of software modules for open source LMS is sometimes needed if LMS does not support educational needs. Teachers training E-portfolio module was very useful in many ways:

- It provides better understanding between involved parties.
- It verifies and standardizes the procedures which previously existed just as letters on paper.
- It speeds up the communication.
- It provides a good example for computer science teachers.

At the end of pilot test project we find out that it was very good accepted between ICT aware teachers - mentors and in all participating students. Even those mentors who were not participating in the project want but have seen its effectiveness express their desire to use it the next year.

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