Software Engineering Studies – a Step to Virtual University

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ABSTRACT. Our Department has been participated in two European projects with main aim to improve educational processes. Based on experiences gained during projects realization about software engineering education we decided to create the virtual classroom that would support the classical lessons and also initialise discussions on assignments and other problems of the course between students and teachers across different countries. Virtual classroom is a first step in support of the joint studies. Furthermore, the implementation of studies will impose even more needs for additional support, i.e., elements of virtual university.

1 Introduction

Together with a number of other institutions, Department of Mathematics and Informatics, Faculty of Science, University of Novi Sad participates in two important international projects related to studies of software engineering:

- Project supported by DAAD under auspices of “Stability pact for South Eastern Europe” (2001-2003). The project later continued (2004-2006) under support by “Stability pact for South Eastern Europe sponsored by Germany”.
- Project supported by Tempus started in September 2004 and will continue until September 2007.

Fig. 1 Logos of two projects
Both projects deal with software engineering education. Software engineering is the field of informatics (computing) that is general enough, independent on the regions, and with universal significance. Moreover, software engineering is not very well developed in this region – both in education and in practice.

2 Stability Pact Project

The aim of the sub-project dealing with software engineering is to define a common curriculum for the undergraduate course on software engineering that would be accepted in all participating institutions or used as a pool of teaching materials available to all. So far around 30 topics of the course are covered either by reusing (after translating and/or adapting) existing teaching materials or by developing the new ones.

The amount of produced materials is huge and generally belongs in two groups: the proper course materials and the meta-material (related to project management) – fig. 2 and 3. The material for teachers is centrally located at the site of the Humboldt University in Berlin [3], while the material for students is distributed over several institutions.

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Fig. 2 Materials produced by the project

Recently the project started with the development of teaching materials for more courses, including Management of software projects that also belongs to the field of software engineering.
3 Tempus project

The objective of the project is to create a joint graduate curriculum in software engineering leading to the M.Sc. degree according to Bologna declaration and to provide an environment for teachers' and students' mobility. We also hope that the curriculum will be common for all beneficiary partners and partly even for partners from EU.

The start of the studies is scheduled for summer semester 2007. At the current state of the project, the curriculum has been adopted by the project consortium [5]. The adopted curriculum is in fact curriculum template that can be instantiated in several different ways according to the needs, background, expertise, … of individual institution. At the same time curriculum template contains firm principles and procedures such that resulting studies can be called the joint ones.

4 Towards the virtual classroom

Currently the joint course in software engineering is most intensively used in Humboldt University in Berlin, University of Novi Sad (Faculty of Science), and University of Belgrade (Electro-technical faculty). Berlin and Novi Sad use fully compatible courses, while the Belgrade uses around half of existing teaching materials.

The experience from the previous year of teaching the same course in Novi Sad and in Berlin [2] shows that students in Germany and in Serbia reacted similarly to the same assignments and gain similar number of points in every assignment. That proved again that problems of software engineering are universal.

Based on the facts:
- that the course (or at least the teaching material) is the joint one,
that the problems that software engineering tries to solve are universal and border-free, and
that the students in different countries and with different backgrounds react similarly to the same parts of the lecture and to the same assignments.

we decided to create the virtual classroom that would support the classical lessons and also initialise discussions on assignments and other problems of the course between students and teachers across countries.

The virtual classroom is currently supported by Moodle (www.moodle.org) and Skype (www.skype.com) that are still not integrated into a single environment. The virtual classroom contains:

- the repository of slides (pdf versions) used during the lectures in 6 different formats,
- the chat room available always and specially scheduled on Mondays at 10 pm (for students to contact teachers) and during the lectures (for teachers to contact other teachers),
- calendar of events (fig. 5)
- news and announcements
- personal messages
- general discussion forums
- and specialized and restricted forums devoted to assignments (fig 6)
- assignments with deadlines (fig. 7)
- periodical reports to students with current number of points
- electronic lessons (fig. 8)
- quizzes (self-evaluation and evaluation)
- anonymous surveys (occasional and the final).
Fig. 5 Calendar of events (here: scheduled chat and the deadline for assignment)

Fig. 6 The specialised forum on the first assignment
Currently the virtual classroom is in its initial phase and is regularly visited by 50 students from Novi Sad and 5 teachers from Novi Sad, Belgrade, and Berlin. We expect that the students from Berlin could join the classroom in the summer semester, when their course in software engineering is scheduled.
5 Towards the virtual university

Virtual classroom (even in its current state) may be enough for a joint course in software engineering, but is only a first step in support of the joint studies. Much stronger support is needed during the development of the studies as well as during the implementation of studies. We shall illustrate this claim with excerpts from the definition of the joint curriculum [5].

5.1 Declaration of project consortium: what do we mean under “joint”

- “Goals, structure, and the module list of the curriculum
- The firm principles for instantiation (adopting) of the curriculum,
- The firm joint quality assurance and control mechanism
- The pool of implemented modules (study packs) fully developed according to:
  - Module templates and
  - Principles for the development of modules.”

5.2 Roles and responsibilities during the development of courses

5.3 One of the principles for instantiation (i.e. implementing the studies)

“Core modules. Every institution can choose 4 modules from the list of core modules (given above) that will be obligatory for the students in the 1st semester. The institution can change its decision every year and have to direct students to the core modules of other institutions belonging to the joint MSc studies in software engineering.”
5.4 One of the principles (i.e. implementing the studies)

“An External Examiner (EE) is appointed to ensure that the quality of the assessed work is of a national and Joint studies standards. The EE should be experienced academic or industrialist. “

5.5 Joint and/or coordinated students’ selection

” As the general guidelines for those who wish to attend the Joint M.Sc. Programme, we provide the following competencies that are expected from every student. These guidelines can be also used by the institution to decide whether or not an induction is necessary.

- fundamental knowledge in basic fields of mathematics
- ability of logical thinking, formulation of prerequisites, and deriving conclusions in a formal or formalized way
- ability to understand and formulate problem, and it modelling to enable its analysis and solving
- programming skills in at least procedural and object-oriented programming paradigm
- understanding of all phases in the software development cycle: requirements, analysis, design, implementation, testing, maintenance.
- practical skills in using of programming environments, DBMS, and CASE tools
- understanding of current trends in the development of informatics
- ability to adapt to new circumstances, i.e., ability to learn new models, techniques and technologies as they emerge and appreciate the necessity of such continuing professional development
- appreciation of basic ethical and social responsibilities of IT “.

5.6 The need for virtual university

To implement and monitor the ‘jointness’ of the studies, to achieve quality assurance and joint development of courses, etc., the support (virtual community) can be of great importance. Furthermore, the implementation of studies will impose even more needs for additional support, i.e., elements of virtual university. It will be certainly needed:

- the joint list of offered courses, assembled (syndicated) automatically,
- the harmonized criteria for students’ enrolment (see 5.5 above)
- the joint list of enrolled students, assembled automatically
- partly joint administration of studies (grades, advancements, projects)
- joint implementation of exams (see external examiners in 5.4 above)
- shared courses with virtual lessons from other institutions (video links or stored lectures in video format),…
6 Conclusion

Although none of the mentioned projects promised to create the virtual classrooms and elements of virtual universities these two possibilities started to emerge during the course of projects. They emerged almost spontaneously as the mean to enrich the contents of both projects and to make their implementation easier. That is the reason why we believe that we could really have implemented virtual studies, if not the whole university.

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