BEYOND THE REGULAR UNIVERSITY EDUCATION IN COMPUTING: THE MOVE TOWARDS BLENDED LEARNING

Assoc.Prof.Juliana Peneva PhD, Assoc. Prof. Stanislav Inavov PhD
Dept. of Informatics, New Bulgarian University, 02/8110611
jpeneva@nbu.bg, sivanov@nbu.bg

Introduction

The speeded development and deployment of networking and computing technology has altered global market and commerce, and almost all aspects of the modern life. These technologies have a significant impact on education as universities manifest a continuous effort to implement them both at institutional level or participating in large projects [6]. The dynamics of the labor market and the economy as a whole, and the automation of most manufacturing activities require agility in education forms [7] as well as a continuous update of the learning content.

Investigations show that there is a lasting trend towards online and blended education. Coupling the Internet with various course management systems permits the universities to offer online coursework globally, nevertheless the distances. Assessments concerning why the move to online education take place as well as some crucial factors are summarized in [2]. Changes in educational practices imply on the applied teaching and learning paradigms[1].

The proper and immediate professional recognition of graduated students determines the trend towards a pragmatic education. Nowadays universities are available to anyone, anywhere at anytime and they compete for students, resources and faculty all over the world. Thus, creating e-learning courses in different subject areas represents a high priority activity. This activity makes for an increased quality and permits to diversify educational forms both in higher and professional education. Besides regular education, universities also differ in their strategies when develop and offer distance learning courses. In any case, covering a whole subject area with distance courses is regarded as a long-term process where the efficiency becomes a predominant factor. E-learning as a way to deliver courses is widely applied both in schools here and abroad, and for corporate training [5] as well.

At the same time investigations [3] show that many Bulgarian organizations (62%) are lacking in IT experts. Universities are forced to train skilled workers in order to bridge over these difficulties. Therefore delivering properly designed educational resources and offering online courseware is an important and economically motivated activity. To benefit from the advantages of e-learning, a self-contained trainees' work with the courseware is expected. Among the factors forming any IT specialist [3] those with the greatest influence are self-directed learning - 25% and higher education – 18%. In addition, according to the opinion of the experts from American Educational Research Association in 2010 two thirds of all possible educational courses will be delivered online. So, a proper adaptation of the courses in computer science curricula to conform online education is very important. The quality and hard skills of trained IT professionals strongly depend on the successful transition to e-learning.

In the context of the above, the main goal of this paper is to focus on some didactic issues that relate to the preparation of courses for bachelor and master programs in computing. Their partial or complete on-line delivery permits to experiment on various schemes for blended learning. We discuss how to adapt these courses for e-learning, their scope and the orderliness of learning content. We share our experience of delivering learning content in computing via LMS (Moodle).

Beyond the regular university education in computing

Nowadays a transition from teaching conventionally to online education is underway. In order to compete successfully, New Bulgarian Unuversity has formally adopted three types of delivery models for its courses: in-class, online and blended. Usually regular education is face-to-face while distance education is organized as blended learning (a combination of face-to-face sessions with self-paced online learning) and pure online learning. Certainly we take into account studies that evaluate the pedagogical characteristics on online and regular classes [5]. The final objective is to attain mutual exchange among regular, part-time and distance studies – for separate courses and for a whole program as well, i.e. to deploy blended learning over the whole education.

Full-time study in computing could benefit from different courses delivered as distant courses. On one hand various online

resources have been offered. The suitability of these resources for self-directed learning is important for the decision whether to deliver a given course distantly. On the other hand, the organization of the overall learning process tends to be network based. The communications of the teachers with the trainees remain somehow restricted by the number of posts in the discussion forum of the learning management system. It appears relevant permitting to a great extent a self-dependent work with the learning content. As a result, blended learning furthers student's mobility and appears feasible, thus giving advantages to organize bendable educational process.

The modular approach, where content is divided into units of instruction is widely applied. Depending on the trainee's learning style, current knowledge and attitude, the access to a single unit of the leaning content could result in different outcomes.

The fundamental courses are expected to build professional attitude and critical thinking, but their target knowledge usually is more abstract. Its successful acquirement depends on the close interaction between the lecturer and the students. Despite the possibilities of the modern communications and even in synchronous on-line mode, the resulting feedback to build-up new abstract knowledge effectively remains slight. Approaching this issue the instructor should rely on communication facilities ensuring verbal immediacy of the trainees. So, in this case face-to-face learning has an obvious priority and the e-based diversification of such courses is a real challenge.

The leaders of software industry launch products and technologies that have significant impact on the software process in smaller companies. The labor-market exhibits a constant deficiency for qualified Java or .NET developers and forces the universities to build at least initial competences. The first move is to use directly the original documentation. It is true that companies like these offer high quality learning content for self-dependent study. However company's materials, e.g. tutorials, handbooks, etc. concern a specific technological solution (the ultimate goal is to master the product!) and usually no associations with theoretical knowledge in computing are made. The strict use of company's materials exhibits didactical discrepancies consisting in low cognitive levels (reproduction and application). As a consequence, limited

possibilities to attain higher levels (analysis and synthesis) exist. These learning resources are convincing for the effectiveness of example- and task- based self-dependent learning, but academia instructors cannot use them directly. The need for academically tailored courses on specific software technologies emerges.

The move towards blended learning – our experience

As it concerns e-learning, numerous platforms can be applied. These platforms facilitate significantly the development and management of proper learning content. The choice of a specific platform, commercial or open source is of secondary importance. The emphasis is on the selection and the get-up of the learning content for every course supposed to be delivered distantly. The learning content can be organized and offered in different ways and via various learning environments. Finally courses are implemented via those e-learning environments that are implemented at the university.

To administer e-learning at New Bulgarian University, the open source learning management system Moodle has been implemented. This platform offers localized interface and allows further customization. Close interoperability with the integrated information system of university has been established thus ensuring a strict control over the course enrolling. Moodle allows various didactical and pedagogical features to be implemented such as: modular course design; in-class and distant assignments and assessments; online and blended course delivery models; task-based learning; collaborative learning, etc [4].

The department of Informatics offers three bachelors' and two masters' programs – all of them are taught conventionally face-to-face. The implementation of Moodle has provided the proper framework for the design of distance courses.

We started our experiments with delivering some hybrid courses where Moodle courseware supports face-to-face classes. However the most important learning activities are done in-class. In our masters' program some distance courses have been launched. Students have access to the learning content in advance and during the face-to-face classes some tutored practical assignments are carried out. Usually company's materials and extra readings (tutorials, handouts) are recommended for self directed studies. The individual search for supplemental resources is encouraged. In the

bachelors' programs Moodle is mainly used for publishing of proper learning content.

Following the modular approach we observe the principle of encapsulation, i.e. minimum references to other courses and facts outside the content, thus reducing the dependency of a momentary missing knowledge. In this way we try to achieve a maximal independence among the different courses and to make easy different configurations of curricula. The main didactical issue is to retain the unit volume in admissible size when the complexity grows. Competences have been defined explicitly to facilitate learners' navigation within the coursework and their choice of the learning path.

We placed different type of resources at students' disposal and practiced almost all learning activities but testing. We find especially useful the feature of Moodle to track the individual students' activity. Examining the registers we have a reliable feedback about the students' actions. In addition the uploaded students' assignments can be easily tested against plagiarism and other forms of scholastic dishonesty. Many students transfer to the university the common school practice of copying others' homework or helping a friend on an individual project. Instructors have to spend a lot of time preventing this practice. In addition, for each course topic the possibility for weekly online activity: discussion, group project, peer feedback etc. is highly productive. We ask students to make posts and to participate in different forums. The electronic evaluation of assignments permits the instructor to send personal comments to each student for better understanding.

Common teaching techniques are applied with regard to the specificity of e-learning. For example, "exposition" can be varied with interactive exercises. The "active method", i.e. non-guided learning can be implemented as performing different tasks working in groups or individually. When "demonstration" is implemented, the learners repeat the demonstrated activity, supported via instructions transmitted by communication devices.

Conclusion

In this paper we shared our experience trying initially to comply with the University's policy for student-centered and diversified education. Our efforts led us to the blended learning as a natural solution.

The next steps are to re-configure the curricula distributing target competences and learning content in a new disposition for all course delivery modes. Despite the reusability of course material, it turns to be a huge task. Moreover, the subject area is computing and we have to consider the very rapid development in technologies. So, we should relay on all accessible learning resources and habituate our students to work with them.

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ABSTRACT

Nowadays enlarging competences in computer science and improving their conformance with the needs of software industry is an activity of great importance. The university education needs to diversify and intensify its forms in order to achieve this goal. This paper focuses on some didactic issues that relate the development and delivery of courses in the area of computer science so that they can be used in different forms.

KEYWORDS

Student-centered learning, computing