CHALLENGES OF BLENDED LEARNING

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Abstract: *The nature of blended learning is expressed through dynamic educational process streaming towards perfect match of teaching and technology. That alone represents a blended learning strength for both, academic and business world. In higher education blended learning has been not a new term, but has intensively attached the importance owing to rapid development of available digital and social media that have been utilised for adequate learning environments. This paper identifies core issues and points to the challenges of this delivery mechanism in higher educational context. Some experience in the development of engineering graphics blended course is presented along with few directions for future course redesign and research.*

Keywords: BLENDED LEARNING, ENGINEERING GRAPHICS BLENDED COURSE

1. Introduction

Blended, hybrid, mixed or interactive learning are all terms for the trend that has been widespread but always new owing to its permanent modification. The definition of blended learning has been not unique and has varied widely outgoing from the holistic approach to the subject that is not limited to academic area.

The definition according to [1] is worth to be citied first, owing to its approach generally applicable and not time limited. "Blended learning is defined as structured opportunities to learn, which use more than one learning or training method, inside or outside the classroom". This definition embraces the factors essential for the recognition, distinction and valuation of blended learning: different learning or instructional methods (lecture, discussion, guided practice, reading, games, case study, simulation), different delivery methods (live classroom or computer mediated), different scheduling (synchronous, or asynchronous), and different levels of guidance (individual, instructor or expert led, or group/social learning).

Blended learning introduces and utilises new information and communication technologies for the development of innovative learning environment to transform and improve learning. The benefits of traditional and distributed environment have been combined and re-evaluated again and again to achieve optimal learning results. The information and communication technologies are not just a supplement, they don't simply replace traditional learning system; they become an active part of novel one [2, 3, 4].

The way the technology and teaching are conducted and combined to transform, improve and maximize the learning process, is explicitly included into numerous definitions of blended learning.

Fig. 1 *Development of blended learning systems by convergence of traditional and distributed environments [5].*

In [2], blended learning is defined as integrated online and traditional face-to face activities in a planed pedagogically valuable manner.

The effort was made to reduce three commonly used definitions to one essential [5]. This definition embraces two separate models that have been historically combined as the foundation of blended learning system: "Blended learning system combines face–to-face instruction with computer mediated instruction". Two definitions that were omitted are related to the combination of instrumental modalities or delivery media and to the combination of instructional methods, which is in authors' opinion laid too broadly and can involve virtually all learning systems. Furthermore, the author emphases the central role of computer-based technologies outgoing from the definitions of blended learning. Heik states [6] that "it was only a matter of time before learning become "blended" by necessity", hinting to the emerging role of digital and social media.

The trends coming from the past, taking place in the present state and predicting the future, are depicted on Fig.1 [5]. The approaching tendency of traditional face-to-face environment and permanently growing distributed one has been obvious thus keeping the continuous change of blended learning always actual.

The concepts embedded in the definition of blended learning can be found in [7] that give the emphasis to learning outcomes instead of the combining and matching different learning technologies and personal learning styles in order to maximize learning.

According to [8], the redesign of instructional model is characterised by the shift towards the student-centred instruction, increased interaction between all subjects, and integrated assessment mechanisms for instructor and student.

The following learning elements are respected when considering pedagogical decisions during the development of blended learning: "content, reflection, social/emotional, collaboration and student-generated content, dialectic/questioning, and synthesis/evaluation" [9].

In [10] blended learning is referred to four different concepts for the accomplishment of specific aim:
-to accomplish an educational goal → the combination or mixing of web-based technology modes
-to produce an optimal learning outcome with or without instructional technology → the combination of various pedagogical approaches
-the combination of any form of instructional technology with face-to face instructor led training
-to create a harmonious effect of learning and working → the mixing and combination of instructional technology with actual job tasks.

Fig. 2 represents the matrix with constitution of blended learning that enables to distinguish what is and what is not its part [11].
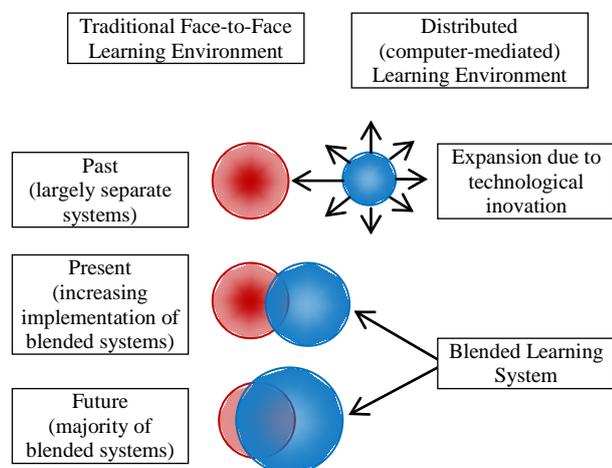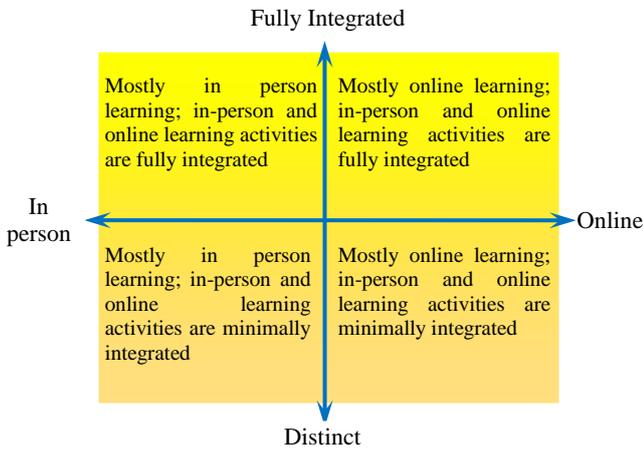
Fig. 2 *Variations of blended learning [11].*

In order to accomplish the balance between online and face-to-face components of blended learning, important issue is how to blend. The challenge is to include the strengths and exclude the weaknesses of each learning environment (Fig. 3). The desirable amount of face-to-face and online learning varies for every course. The decision about the ratio of blending components depends on the nature of instructional goals, student characteristics, instructor background, and online resources [3].

The report about experimental comparisons of learning by means of meta-analysis was performed by U. S. Department of Education [12]. It was concluded that blended instruction is more effective than conventional face-to-face one. Furthermore, "when used by itself, online learning appears to be as effective as conventional classroom instruction, but no more so".
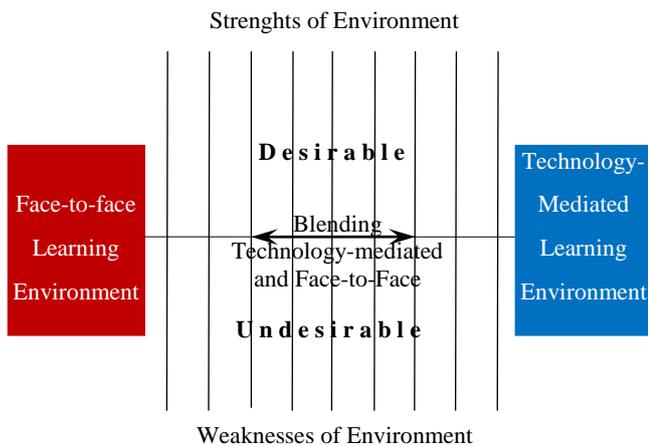

Fig. 3 *Challenges to choose strengths and to avoid weaknesses of each environment [5]*

2. Models and Levels of Blended Learning

The development of blended learning by combining two modes of learning, face-to-face and online may occur at different organizational levels. In [5], blended learning examples are presented that arise at four different levels: activity level, course level, program level, and institutional level. The blending occur powered either by the learner at institutional or program levels, or by the designer/instructor developing the blended learning at the course or activity levels.

Two ways to categorise models are given in [11]: by considering the amount of time spent online versus a time spent for face-to-face learning, and by evaluating the relative extent to which these two learning environments are integrated. Fig. 2 shows that each blended learning model is therefore represented as specific combination.

Some authors alert that blended course should be not viewed just through certain percentage of online and face-to-face

instruction, but primarily as integrated and complementary learning with certain implementation of two environments advantages [8, 11, 13].

In this paper the attention is paid to a course level blending that is very frequent and well elaborated in literature [2, 8, 11]. It encompasses separate face-to-face and online parts of the course that both, overlap in time or not.

The survey in the report by Clayton Christensen Institute [14] gives more detailed distribution of blended learning methods. In Fig. 4, blended learning methods are positioned related to the location that determines specific model of learning. Rotation Model and Flex Model are accomplished predominately on brick-and-mortar location, while A La Carte Model and Enriched Virtual Model represent entirely online learning. Starting from four models, the first one Rotation Model is subdivided into additional four models: Station Rotation, Lab Rotation, Flipped Classroom, and Individual Rotation.

Entirely online course is taken by A La Cart Model that can be accomplished either on the brick-and-mortar location or off-site. Students have the possibility to take some courses A La Carte and others face-to-face at a brick-and-mortar location. Enriched Virtual Model differs from the Flipped Classroom and fully online course because the students have seldom face-to-face learning every weekday and the face-to-face learning parts are required.

The engagement of new technologies and new pedagogical approaches for the development of blended learning are rapidly changing the blended learning models and the relationships among them.
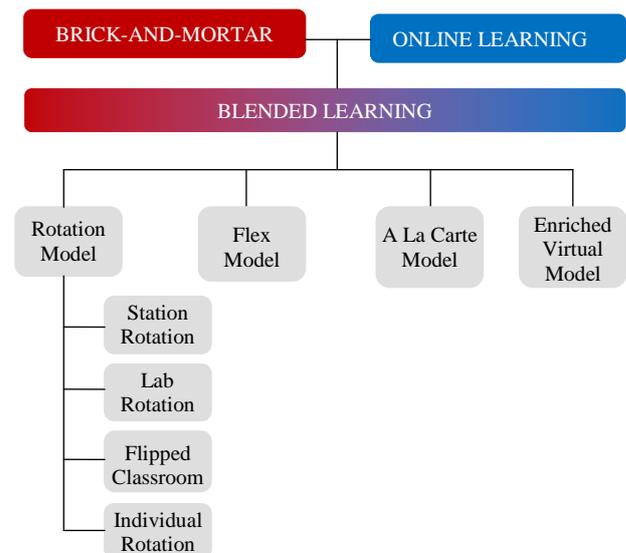

Fig. 4 *Models of blended learning [14].*

In [15], blended learning is defined as a big concept that comprises four models (Fig.5): Flipped Classroom, Station Rotation Model, Lab Rotation Model, and Flex Model. In Station Rotation Model, students rotate through different learning stations where face-to-face learning might include various forms (small group or full-class instruction, group projects, individual, tutoring, pencil-
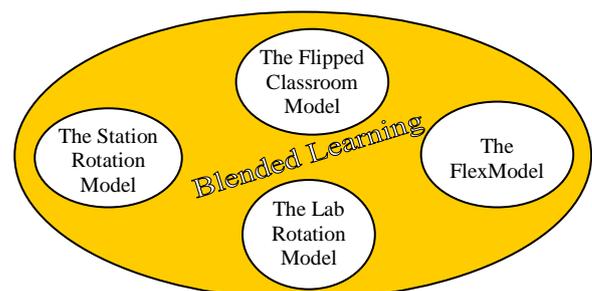

Fig. 5 *Models of blended learning [15].*

and - paper assignments). The definition of Lab Rotation model differs from the previous Online Lab model as students rotate between the classroom and computer lab. The meaning of Flex Model is the same for the citied authors regardless of temporal distance. One of the most implemented and recent blended learning Online Driver model, is widely known as Flipped Classroom Model and the learning method as "flipping" [2, 14]. The students learn online delivered course material at their own pace, and in the classroom the emphasis is given to learning that provides individual help and improves student-lecturer interaction.

3. Blended Learning in Higher Education

The challenges of blended learning in higher education are numerous and their emergence is encouraged permanently based upon the innovative technological developments and interaction through traditional learning environments, which emphasises blended learning transformational force.

For higher education courses blended learning has become the reality characterized by continuous investigation and debates of the benefits, potential and effectiveness to transform and improve the learning process. New, highly interactive, meaningful and student-centred blended learning environments have been developed fostered by the current and advanced technologies. The convergence of traditional face-to-face and distributed learning environment that were sharply separated in the past has been in progress by developing blended learning environment. Different media/method combinations and the needs of different audiences have enabled the approach of face-to-face practiced in a lecturer-centred environment and person-to-person classroom activities, and distance learning system based on self-paced learning.

Numerical indicators cited by the authors, support the fact that blended learning has been embedded through higher education. In 2005 [16], was found that 93% of doctoral programs and 89% of master´s programs, but only 50% of baccalaureate programs offered blended learning classes. In [6], a short section is given considering online course frequency and going from 2003 when roughly 10% students in higher education took an online course, to 2014, when was projected that 50% of all post-secondary students would take at least one class online.

Christensen et al. [17] predicted that by 2019, 50% of all high school courses would be delivered online.

Dzuiban et al. [8] believe that "the transformational nature of blended courses creates complicated interactions among many components of the university similar to those found in the literature regarding complex and social system theories." The primary changes in the roles and expectations of faculty, students, and administrators are presumed. As regards the student population, the learning environment drastically differs from face-to-face one. The student is forced to approach with more responsibility towards blended courses with continuous and active involvement.

The presented results of research into blended learning in undergraduate studies have considered different methods of teaching and the applied recent technology. In the authors' opinion [4], the use of new information and communication technologies along with face-to-face learning and the developed new learning environment, demand serious and intensive examination of the effect upon student´s learning. The research was performed in two steps. First step dealt with the effect of involved blended learning on the obtained outcomes that was examined based on the dropout rate and the proportion of exam passes in the considered classes. Secondly, the students´ experience of the process was analysed through three aspects of their perception: the gained benefits, the effect on their learning experience and the derived satisfaction degree. Therefore, two outcome measures were combined, an objective measure regarding the final exam, and a subjective measure expressing perception of the applied blending learning. The conclusion was that the implementation of blended learning positively effects on both, students' final course success and positive attitude towards learning.

4. Blended Learning Model of Engineering Graphics Course

At the University of Rijeka Faculty of Engineering, Croatia (afterwards Faculty of Engineering) considerable progress has been obvious in the first decade of this century as regards the acquisition and utilization of recent hardware and software. These intentions and possibilities have been crucial for the development of up-to-date engineering curriculum, as this necessity was recognised earlier but the realisation was limited by the circumstances. The favourable environment coincided with the transformation of studies through the Bologna process and the development of new curricula.

The studies of Mechanical Engineering and Naval Architecture as well as newer study of Computer Engineering at the Faculty of Engineering, all included the course dealing with engineering graphics, although not covered with equal course hours. Until the year 2008 when the curricula according to the Bologna process were implemented, engineering graphics course involved traditional teaching form where the classroom face-to-face teaching was combined with exercises based upon the use of computer and adequate commercial engineering software. The efforts were made primarily to keep this basic hardware and software always up to date, and to include new contents too, in spite of the inability to accordingly redesign the course.

Along with available resources progress, engineering graphics course redesign has occurred going towards student-centred environment. The changes embraced the method and media for delivery followed by adequate modification of course content and starting from the course goals/objectives consistent with Blooom´s taxonomy.

The course management system MudRI [18] was adopted at the University level that allows certain course designer to choose the range of possibilities offered by the system that best corresponds to the course nature and objectives.

The students approach the system by the allotted electronic identity [19] and the corresponding course password. A blended learning sequence consists of face-to-face lectures and laboratory exercises complemented by available on line resources that are not limited to the course management system.

Through the course management system students can access to general information about the course, the course content, and the additional text guides and examples related to the assignments and all forms of assessment (home works, projects, final exam). The created environment with the course content on-line gives the opportunity to make insight into the content that will be the coming one through face-to-face learning, and enables the self-paced learning. A certain content regarding the development of engineering graphics documentation is completely delivered on line and removed from the classroom.

The final student's scores cover the results of different assessment forms that are performed during the semester (attendance and activities at lecture and laboratory classes, homework, projects) and the exam at the end of semester.

The course management system has considerably improved the communication and the interaction velocity relating both, lecturer-student(s) and student(s)-student(s), by means of forum and/or e-mail.

As engineering graphics courses run through the first year of study that is characterised by high student numbers, a blended course facilitates the delivery of course material and improves the communication. In the same time huge student population requires an extra effort to adopt proper ratio of face-to-face and on line instruction through the course management system in order to develop balanced and effective blended course.

The intended future efforts would be small steps in the course redesign firstly towards more effective communication and interaction based upon the increase of on line instruction and

possibility for more face-to-face activities, and secondly the implementation of emerging technology possibilities. In [5] some of complementary strengths and weaknesses are separated that impact class discussions as mostly used instructional method. As the strengths of computer mediated environment, the flexibility regarding the time and place, the possibility of 100% participation and depth of reflection are mentioned, versus human connection and spontaneity of class discussions. The absence of spontaneity and human connection are in the same time disadvantages of computer mediated environment, and for face-to-face environment these are the decreased participation and the lack of flexibility.

Some factors of influence are to be more weighted than others that are set without the possibility of intervention and regulation. First of all it is the number of students that are engaged at the courses under consideration and the corresponding number of classes needed. As the courses belong to the first year of study, the question of student's motivation and the achieved final success is crucial for both, the courses reputation and studies credibility.

Today's environment is promising for the acquisition and engagement of new technologies that are essential driver for the course redesign which can certainly redraw students attention and improve their motivation. In order to benefit from, the required resources have to be provided.

Another issue that is not less important concerns the reconsidering of course management system possibilities in relation to additional or other ways of student's assessment.

The intention is to evaluate possible expected improvement of learning efficiency obtained through redesigned blended course by collecting data that concern variety of aspects.

5. Conclusion

The strength of blended learning built in its basic and mostly used definitions comes out of the combined face-to-face and online teaching methods into one integrated instructional approach.

Numerous benefits of blended learning have been reported based on its possibility to take advantage of certain environment strength and to avoid less effective elements.

Osguthorpe and Graham [3] listed and described six goals that might be expected when developing blended environments: pedagogical richness, access to knowledge, social interaction, personal agency, cost effectiveness and ease of revision.

In [5] three reasons are extracted and elaborated that foster the attractiveness of blended learning spreading: improved pedagogy, increased access/flexibility and increased cost effectiveness.

Many works explicitly indicate the benefits of blended learning, such as: class goals that can be easily met, redesigned courses with easily measured educational outcomes, students can collaborate on their own time, enhanced computer literacy of students and lecturers, temporal independence of student, improved communication, the reduced rates of drop, fail and withdraw.

The achieved benefits of blended learning model and its impact on the learning effectiveness improvement, depend on how are face-to-face and computer mediated instructions blended, i.e. how successfully the peculiarities of actual environment through which blended learning is developed are taken into consideration.

5. Literature

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