Blended Learning in Building Engineering Education

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Abstract

The building engineering education at Mid Sweden University has been committed to be a pilot case for blended learning [2] [3] [4]. All courses in the building engineering program are from the autumn 2012 adapted to a blended learning concept. That means that all courses are available in an integrated mix of ordinary campus and online distance education in real time. The basic online tools are a course platform (Moodle) together with a communication tool (Adobe connect) [4] [5]. It is up to the student to decide how he or she will use the online distance tools and the campus education and form a mixture between these forms.

Blended learning is a way of taking in account different needs concerning student study situation. Adult students, bound with house and families, often prefer more distance education while younger students need more campus education [3].

Traditional lecturing [1] [3] is usually based on the concept "one size fits all". In blended learning the learning process is adapted to the needs of different student groups in one concept.

Adapting traditional classroom courses for blended learning involves a range of different adjustments and actions. In blended learning the focus is shifted from traditional lecturing towards creating high-quality learning activities for the students [3].

So far, the results of the project demonstrate that integration of campus-based courses with distance courses functions well [2]. The quality of the education has improved due to adjustment to different students' conditions and demands. The attraction of the program has raised since many high qualified motivated students who can´t move to the university campus, can do their studies from home and still participate in a campus classroom situation. Even the study situation of the campus students has improved since all online tools are available also for them.

The pilot case referred here is the first case of blended learning in a whole engineering education program. Since the building engineering education is integrated to other engineering programs the next step in the development is to involve the other engineering programs and courses in the process.

1. Introduction

Building engineering education at university level started in Sweden in the beginning of 1990. Earlier education of building engineers were made at high school level. At present there are building engineering education at 13 universities in Sweden. There are different profiles and curriculums but there is a common regulated base structure and the labor market is about the same.

The building engineering education in Östersund is one of the oldest but still the smallest in numbers. There are only 20 new students every year. One reason to the size is that Östersund is located in an area with low density of people. Since there are long distances to the campus many potential students chose universities in more high populated areas.

One way to make the education in Östersund more attractive is to make the education more flexible due to distance and time. At Mid Sweden University there is long experience and high competence in distant learning. The building engineering education has also gradually been adapted to distant learning concepts but the main focus is still traditional campus education.

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The first efforts in blended learning at the building engineering education were made some years ago when a single optional course in indoor environment were developed in a combined campus and distance concept. A large number of students in that course were already working as engineers and were not able to attend campus education. [3]

Blended learning is a concept that combines traditional face-to-face teaching with online learning that has been evolved over the years. [2] [4] The concept can be in different forms and what is actually blended may vary. As a basic form of blended learning offline denotes conventional class room teaching and online denotes teaching through internet or intranet. [2]

2. Blended Learning as a pilot-project

In 2011 Mid Sweden University formulated an overall university strategy within five areas concerning education. One of the top two prioritized areas was e-learning. The university formulated the vision for 2015 to be recognized as successful in e-learning, both among students and staff, in comparison with other universities in Sweden and in an international perspective. E-learning should be considered an approach for education both off and on campus. [2]

From the department Ecotechnology and Sustainable Building Engineering at the university there was an ambition to develop different aspects of blended learning in the teaching and learning. The overall objective of the project that was initiated in 2011 was to develop a consistent approach for the development of courses and programs that are structured according to the principle of blended learning. [2]

The building engineering education at Mid Sweden University has thus been committed to be a pilot case for blended learning [2] [3] [4]. All courses in the building engineering program were from the autumn 2012 adapted to a blended learning concept. That means that all courses are available in an integrated mix of ordinary campus and online distance education in real time. The basic online tools are a course platform (Moodle) together with a communication tool (Adobe connect) [4] [5]. It is up to the student to decide how he or she will use the online distance tools and the campus education and form a mixture between these forms.

3. Aims, limits and methods

The aim of the pilot case is to transform the building engineering program from a traditional campus based education program to an education based on a blended learning concept. Included in the concept is an objective to develop quality aspects of blended learning from a process perspective.

The pilot case is limited to the building engineering program but in a next stage the concept is planned to be spread to other engineering programs and in the long run other education programs at Mid Sweden University.

This paper is a case study built on the practical and theoretical experiences from the staff involved in the pilot case. Since the case is a change project managed and carried through by the staff board the basic method is based on an action research approach [6].Theoretically the paper builds on a case-study design. This implies coming to understand the particularity and complexity within one single case, and for this purpose building on data gathered in different ways [2]. The paper is also to a high extent based on two previous papers at Mid Sweden concerning blended and flexible learning namely *Experiences on Blended Learning as an approach in higher education* (Barthelson, Myringer and Lindberg, 2013) [2] and *Flexible Engineering Education* (Mikaelsson and Nykvist, 2004) [3].

4. Results and analysis

During the initial stages of the project a basic structure of the content, pedagogy and presentation of the courses was created. Materials from the previously established campus-based courses were adapted for distance delivery.

Adapting traditional classroom courses for delivery as flexible distance courses involves a range of different adjustments and actions. In traditional education the focus often lies upon giving good presentations and lectures. In blended learning the focus is shifted towards creating high-quality learning activities for the students. That means that the focus shifts from teaching to learning. [3]

A good lecture is often based on a large degree of improvisation, founded on the interplay between the lecturer and the students. In blended learning such improvisations are not possible to the same extent. Instead, the material must be presented in such a way that the students are able to choose how they "take in" the information. This requires careful planning and a very clear course structure. [3]

Traditional education often consists of solitary work for the teacher, whereas blended learning involves teamwork. The group can consist of subject-specialists and media-specialists who prepare the course materials, editors who compile and present the material and tutors to assist the students with their studies. [3]

In blended learning the focus is on the learning objectives of the course or program and not so much on the method by which it is delivered. Blended learning provides an opportunity to optimize the learning outcome and the cost of course or program delivery [7] since blended learning helps to reach a wider audience compared to class-room settings. Blended learning thereby implies taking advantage of face-to-face as well as online teaching methods. [2]

To reach good quality in higher education it is important to provide the students with both theoretical and real practice in a given field. Field visits offer different advantages to the students which include opportunity to connect theoretical knowledge with the real world situations. In a blended learning setting, all these requirements may be blended into the educational mix. [2]

Using a SWOT analysis data and experiences from the pilot study can be categorized as strengths, weaknesses, opportunities, or threats. [2] [3]

Strengths

Blended learning attracts more students, and allows students with different backgrounds to study and gives a more solid base of students for the program. It also allows a more flexible way of allocating resources by integrating two previous modes of delivery for the same program. The concept provides students with better possibilities to succeed with their studies by offering more flexible conditions. In the project, students on campus had full access to materials and teaching that was simultaneously provided for online students. Blended learning gives a richer environment to all students, regardless of face-to-face or online teaching. It requires a good and sound pedagogical idea, which is anchored within the entire staff. This provides an education with a well thought through quality assurance. Another strength of blended learning is the possibility to connect individual students to a larger collective of students, making it possible for them to relate to and learn with and from others by social interactions which are difficult to achieve in solely online education. [2] [3]

Weaknesses

If the technology and the support are poor, teaching often fails to meet the expectations of the students of flexibility. Timing is both more flexible and more rigid. Blended learning diverts the attention for the teacher if students participate simultaneously in the classroom and online. The concept provides a dilemma for the course management in giving priority to different groups of students. If focus is on the student that follow a blended learning course at campus, those not present might get neglected. If focus is on those following the course through online teaching, those present at campus might feel neglected. A good mix might be difficult to achieve. Blended learning relies on a well thought trough leadership at the department level giving the right conditions for teachers to develop new practices and not just mixing existing. [2] [3]

Opportunities

New practices are developed that benefit both campus and online groups. Students have the possibility to choose learning conditions more flexible and study more on their own premises. Entire staff of teachers gets involved in the teaching and develop both the mode of delivery as well as the pedagogy behind their teaching. Students learn more and better when they are provided with more flexible forms of studying. A lean or light version of blended learning is in some cases enough, and students and staff have good opportunities to develop the approach from a more modest point of departure. Opportunities are also given to provide more field experience, connecting theoretical aspects of the education to more practical applications. Students at field trips and doing field studies have possibilities to connect to each other and to the teacher through the use of videoconferencing systems available in hand-held devices. [2] [3]

Threats

Infrastructure in terms of technology and support needed for the delivery might be too weak. Teachers' pedagogy is not always adequate for a blended learning approach, nor is the teachers technological skills needed for coping with the new environment. If the integration between face-to-face and online practices fails, teachers as well as students might be disappointed when expectations on flexibility are not met. Student expectations are not always in accordance with the pedagogical model chosen. If enough resources for planning and delivering education are not provided, the teachers end up with working conditions in which workload increases out of control. [2] [3]

5. Discussion and conclusions

So far, the results of the project demonstrate that integration of campus-based courses with distance courses functions well. The quality of the education has improved due to adjustment to different students' conditions and demands. The attraction of the program has raised since many high qualified motivated students who can´t move to the university campus, can do their studies from home and still participate in a campus classroom situation. Even the study situation of the campus students has improved since all online tools are available also for them. [2] [3]

There are some aspects of blended learning that stand out as important experiences in which new lessons are learnt and new understandings of blended learning could be formulated. For instance, the strengths and opportunities lie to a high degree in the development of new pedagogical practices and not just new ways of using technology. Providing the right kind of material with the right kind of complexity and technological standard is not easy, and often the effective practice builds on the idea that less is more. Leadership on the department or even on university level is important to provide the right conditions, technological standards and support that benefits the teachers to develop their practices to fit their different subject needs. [2]

Due to the extensive contact and discussions with students in the change process a good foundation has been laid for quality assurance. The teachers who developed the original campus-based courses have been deeply involved in developing the new, flexible courses, which also guarantees high quality course content. The participant-controlled testing of the courses has further improved quality. [3]

There are many points to be taken into consideration when designing courses in a blended learning concept for a whole program. All courses must be adapted for distance education and all course materials must be available online. Campus students, however, still expect to meet their teachers face-to –face on a regular basis, despite the fact that all course materials are available on the Web. All meetings must contain meaningful activities for both the students and the teachers. Such meetings may contain, for example, math workshops, in-depth studies of difficult topics, presentation of group assignments, revision and of course the opportunity to ask questions. [3]

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