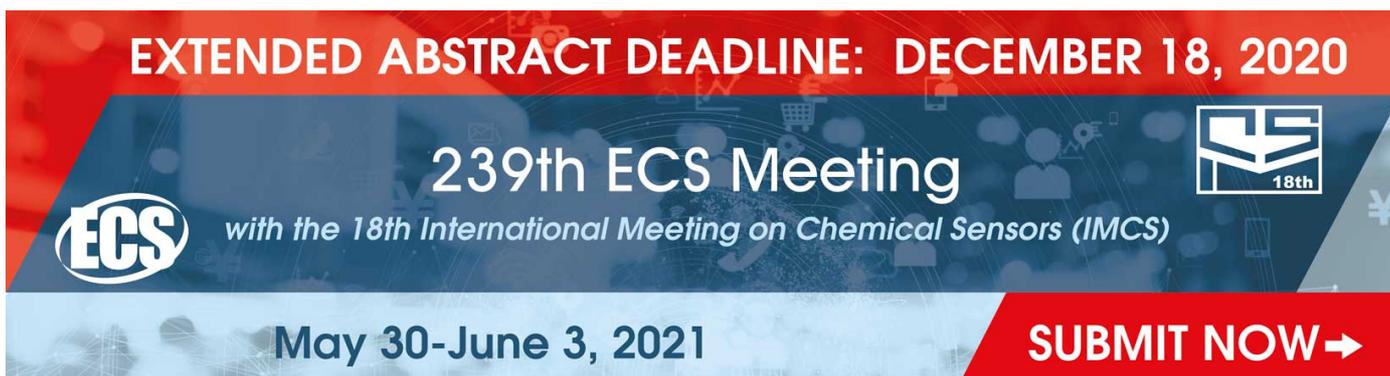


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SUSTAINABLE BUILDING ENGINEERING BY BLENDED LEARNING

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Abstract

The sustainable building engineering education at Mid Sweden University has since it started 1994 a strong focus on sustainable building. It is also committed to be a pilot case for blended learning. 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.

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.

The results of the case study show that 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. 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 that are difficult to achieve in solely online education.

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

Background

The building engineering program at Mid Sweden University in Östersund was established in the early 1990s and already from 1994 it had a clear profile towards eco-building and sustainable construction. This profile is and has been attractive to many potential students. Since Östersund is located in an area with low population density and long distances, it has nevertheless been difficult to fill the educational places with traditional campus education.

The building engineering program at Mid Sweden University was commissioned in 2011 to be a pilot case for how an entire education program can be adapted to a concept for blended learning [2] [3] [4]. From the autumn of 2012, all courses in the program have been adapted to such a concept. This means that all courses are available in an integrated mix of traditional campus and distance education in real time. The basic tools are a course platform (Moodle) together with a communication tool (Adobe connect / ZOOM) [4] [5]. It is up to the student to decide from their



own study situation how he or she will use the distance tools and campus education to find an optimal mix between these forms.

Description of the concept of Blended Learning in the Building Engineering program

Blended learning is a way to take into account various needs regarding the student's social situation. Adult students, bonded with homes and families, often prefer more distance education, while younger students need more campus education. [3]

Sustainability is integrated into all courses in the program. Through blended learning, more students can stay in their place of residence and the need for travel decreases. Contact with the construction industry can be established through direct contact with companies in the locality, which can spread competence on sustainable construction and even capture the companies that already have high competence in the area and use them as good examples.

The concept is based on pedagogical thinking that focuses on the individual's own learning. Traditional lectures [1] [3] are usually based on the concept of "one size fits all". In blended learning, the learning process is adapted to the conditions and needs of different students and student groups.

In blended learning, the focus is on the learning objectives of the course or program and not so much on the teaching methods. Blended learning provides an opportunity to optimize learning outcomes and the cost of course or program delivery. Blended learning means that you can reach a wider target group compared to traditional campus education. [2]

In order to achieve good quality in education, it is important to give the students both theoretical starting points and practical applications in a certain area. Study visits and internships give students the opportunity to link theoretical knowledge to real-life situations. [2]

Results and analysis

In terms of pedagogy, a basic structure has been created from the content and pedagogy of the courses and based on the previously established campus-based courses. These have then been adapted for distance delivery. The communicative tools were initially the course platform Moodle combined with the video link system Adobe Connect. The latter is replaced with Zoom from 2019.

These technical systems, which have enabled distance studies, might also cause the biggest problems. For the distance students, it is very important that these systems work. If not it might put stress on both teachers and students. On the other hand, the results of the study show that when the systems work as planned, the concept of blended learning provides a very good study situation for both students and teachers.

Blended learning attracts more students and provides a more solid base of students for the program. It also allows a more flexible way to allocate resources by integrating two study forms

for the same program. The concept gives students better opportunities to succeed with their studies by offering flexible conditions. Students on campus and distance have the same access to materials and teaching. Blended learning thus provides a better study environment for all students. However, it requires an educational idea that is rooted in the entire teacher's college. Another strength of blended learning is the ability to connect individual distance students to a larger student collective. It creates opportunities to learn with and from others through social interactions in a way that is difficult to achieve in online education alone. [2] [3] [4] [5]

New educational methods are developed that benefit both campus and distance students. The students have the opportunity to get flexible individualized learning environments. It is easier, more cost effective and more environmentally friendly to employ high quality external guest lecturers. This also applies to opportunities for work-integrated learning that link theoretical aspects of education to more practical applications. Students on study visits and field studies also have opportunities to communicate with each other and with teachers by video conferencing systems available in mobile devices. [2] [3] [4] [5]

In the course of time, teaching methods have become increasingly integrated thanks to experience, as well as educational and technological development. Now it is common for group work with mixed student groups in most courses. When campus teaching was closed due to the corona virus, it became relatively easy to remotely adapt all teaching in a short period of time.

Discussion and conclusions

So far, the results of the blended learning concept show that integration of campus-based courses with distance courses works well. The quality of the education has improved by adapting to different students' conditions and requirements. The attraction for the program has increased and many well-qualified motivated students who do not have the opportunity to move to campus can do their studies from home and still be involved in the classroom. The proportion of female students has increased and now accounts for almost half of the higher grades. The study situation for campus students has also improved since all distance tools are also available to them. [2] [3]

Blended learning involves the development of new educational methods and not just new ways of using technology. Leadership at the institutional or even university level is important in providing the right conditions, technology and support to the teachers to develop themselves and their teaching. [2]

The teachers who developed the original campus-based courses have been deeply involved in the development of the new, flexible courses, which also guarantees high-quality course content [3].

There are many points to consider when designing courses in a blended learning concept for an entire program. All courses must be adapted for distance education and all course material must be available online. However, campus students still expect to meet their teachers face to face regularly, even though all course material is available on the Web. All meetings must include meaningful activities for both students and teachers. Such meetings may include, for example,

math workshops, in-depth studies of difficult topics, presentation of group assignments, auditing and of course the opportunity to ask questions. [3] [4] [5]

The conclusion of the case study is that with the right conditions, investing in blended learning for an entire educational program can be very successful.

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