

Blended learning model for higher education in geodesy and geoinformation. Students' perspective.

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Key words: blended learning, geodesy, geoinformation, university courses

SUMMARY

Blended learning, called also hybrid learning, is defined as the harmonic combination of face-to-face learning with online learning, which both are two important forms of learning activities. Blended learning has become very popular with the development of information technologies, particularly fast and freely accessible Internet. The idea of blended learning is perceived as a "new norm" in world higher education in the last two decades, hence the Military University of Technology in Warsaw introduced the possibility of distance learning a few years ago. The paper aims to present how blended learning is gauged by geodesy and geoinformation students. The results are based on an online survey conducted in December 2021 at the Faculty of Civil Engineering and Geodesy of the Military University of Technology. Students especially appreciate the flexible hybrid learning environment: access to educational materials, giving feedback and ideas and real time communication with students and lecturers in the borderless environment. Blended learning requires a change in the way knowledge is passed on to students, including the preparation of various teaching materials, e.g. presentations, videos, articles, discussion texts, quizzes and more. The main task of the teacher is not only to provide on and require knowledge, but also motivate the student to learn and maintain interest in the subject.

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1. INTRODUCTION

Blended learning (b-learning) is a modern method of learning, which combines traditional (synchronous) face-to-face contact with the instructor and on-line activities, primarily using (e-learning). Graham et al. (2003) pointed out different pedagogical methods and approaches, regardless of the technology used and a variety of media and tools used in different learning environments. An unquestionable advantage of b-learning is the possibility of free organisation of the learning time, adapted, inter alia, to the students' capabilities. Zwirowicz-Rutkowska and Chojka (2015b) noted that in times of ubiquitous computerisation, the Internet is very often used in distance education as a repository of information resources.

For at least twenty years, b-learning has been evolving from a new idea to a widespread, effective education approach. In the US, b-learning is gradually becoming the primary method used in higher education. The higher education survey conducted at North America universities (Bonk, Graham 2004) found that online collaboration, case learning, and problem-based learning were the preferred instructional methods during the coming decade for online instructors in colleges and universities. Many academics (Alammary et al. 2014, Białousz et al. 2010, Bronk et al. 2006, Vaughan 2007) showed that b-learning not only saves time and is convenient for students, but also provides excellent learning outcomes.

There are three approaches to blended learning courses (Alammary et al., 2014). Low b-learning which involves adding additional methods and techniques to an existing course, medium, where e-learning modules replace some modules and techniques in an existing course, and high b-learning, where a new course is created based on blended learning methods and techniques. Nonetheless, in any case, blended learning requires a different approach to imparting and enforcing knowledge, but also, and perhaps most importantly, motivating the student to learn and sustaining their interest in the coursework (Bielecka 2015). The multitude of widely available open-source applications makes it possible to plan and create distance courses, as well as to recall and repeat learning material or, finally, to test a student's knowledge through quizzes, puzzles, or tests (Zwirowicz-Rutkowska A., Chojka A. 2015a).

The last decade has seen a growing interest in distance learning in Polish university education. The rules for university education are regulated by the Law on Higher Education and Science (Journal of Laws of 2018, item 1668). Article 64, par. 1 reads as "Studies shall be conducted in a specific field of study, level and profile on the basis of a curriculum that specifies" and par. 4 adds "If the specificity of the studies in a particular field of study so allows, some of the learning outcomes included in the curriculum may be achieved through classes conducted with the use of distance learning methods and techniques as well as infrastructure and software ensuring

synchronous and asynchronous interaction between students and lecturers conducting the classes”. The provision of art. 64 provided the basis for the development of new curricula for many of the geoinformation courses taught at the studies in geodesy.

The Faculty of Civil Engineering and Geodesy at the Military University of Technology in Warsaw has several years of experience in b-learning, gained before the COVID pandemic. These courses were delivered as both compulsory and voluntary learning modules enabling students to broaden their knowledge, in particular in the field of geoinformation and geodesy. From previous research, it is clear that the main goal of b-learning is to enable students, or learners in general, to become self-sufficient, sustainable and developed throughout their lives, so that learning is more effective, efficient and interesting. Hence, this paper presents the students' opinion on b-learning and the desirability of such a way of learning within different forms, i.e. lectures, seminars, projects, laboratories and practical exercises.

2. STUDENTS' SURVEY

The survey was conducted in November-December 2021. Thirty-seven students (16 master's students and 21 engineering students; 84% all students) of geodesy and geoengineering at the Faculty of Civil Engineering and Geodesy of the Military University of Technology participated in the survey. As b-learning has three main components, namely time spent in the classroom (face to face learning), online work involving both student and teacher interaction with each other and independent online learning (see Figure 1), a questionnaire was developed consisting of nine questions.

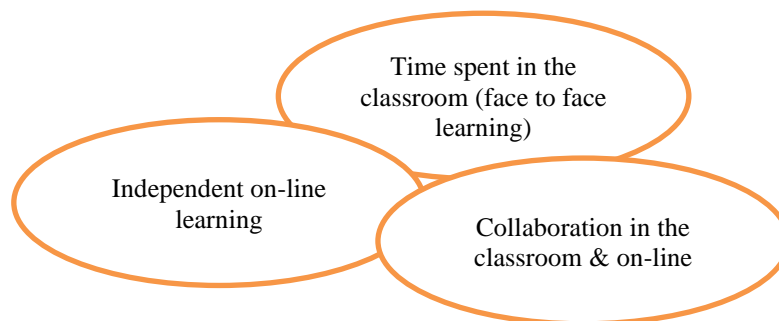


Fig. 1. Idea of b-learning.

The questionnaire included a query about the online platforms used during the study and eight questions about (1) motivation to study, (2) improving digital skills, (3) expanding knowledge independently, (4) time management, (5) discussion with the lecturer, (6) exchanging opinions with other students, (7) access to learning materials and (8) forms of teaching. Students were also asked to list the courses they thought should be provided using blended learning.

Students answered the questions according to a Likert scale, specifying their level of agreement or disagreement on a symmetric agree-disagree scale from strongly disagree to strongly agree. “Somewhat disagree” meant that student is not decided e.g. neither agree nor disagree (see Fig.2).

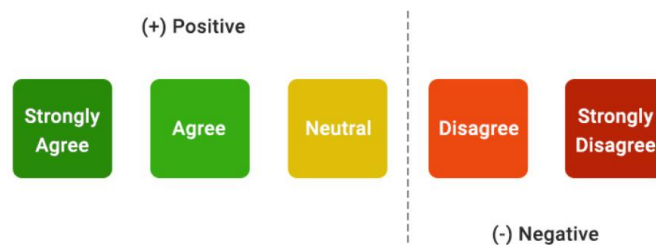


Fig.2. Liker scale of respondents' opinion

(Sources: [What is a Likert Scale - Definition, example, characteristics, & advantages | QuestionPro](#))

3. RESULTS AND DISCUSSION

Thirty seven out of 44 students (i.e. 84% of all students) participated in the questionnaire survey, including 21 students of engineering studies (100%) and 16 students of master's studies (70%). Each of them had some experience in blended learning, especially during the COVID pandemic. Furthermore, unsurprisingly, the majority of university students who participated in the survey had experience with e-learning technology, namely MS Teams, university e-learning platform and Navoica. The survey questions with percent answers presents Table 1.

Table 1. Questions and answers.

Question	Strongly disagree	Disagree	Somewhat disagree	Agree	Strongly agree
Q1- b-learning motivates to study	10.8%	8.%	18.92%	21.%	40.5%
Q2- b-learning increases digital skills	8.1%	5.4%	13.5%	27.0%	45.9%
Q3- b-learning motivates to self-learning	18.9%	2.7%	10.8%	27.0%	40.5%
Q4- b-learning enables better time management	10.8%	0%	8.1%	16.2%	64.9%
Q5- b-learning facilitates discussion with the lecturer	13.5%	18.9%	13.5%	10.8%	43.2%
Q6- b-learning facilitates discussion with other students	5.4%	8.1%	27.0%	21.6%	37.8%
Q7- b-learning gives full access to educational materials	2.7%	5.4%	8.1%	18.9%	64.8%
Q8- b-learning should include					
Q8a- lecture	0%	5.4%	5.4%	8.1%	81.1%
Q8b- seminar	2.7%	2.7%	24.3%	13.5%	56.8%
Q8c- computer project	24.3%	13.5%	18.9%	10.8%	32.4%
Q8d- computer laboratory	13.5%	10.8%	13.5%	18.9%	43.2%
Q8d- computational exercise	21.6%	2.7%	29.7%	16.2%	29.7%

Over 60% of all surveyed students agreed that b-learning motivates them more to learn and self-educate than conventional classroom learning. Almost 65% expressed a very positive opinion (strong consent) for better time management, but as many as 10% doubted it. Students' opinions on facilitating discussions with both the lecturer and colleagues were different, but as many as 43.2 and 37.8%, respectively, assessed it very positively. Most of the students

confirmed that b-learning offers full access to educational materials (18.9% agreed and 64.8% strongly agreed). Over 80% of students believed that lectures should be conducted on-line, a little more than half that seminars. However, as for the other modules, i.e. seminars, project and exercises, students' opinions were very diversified (Fig.3).

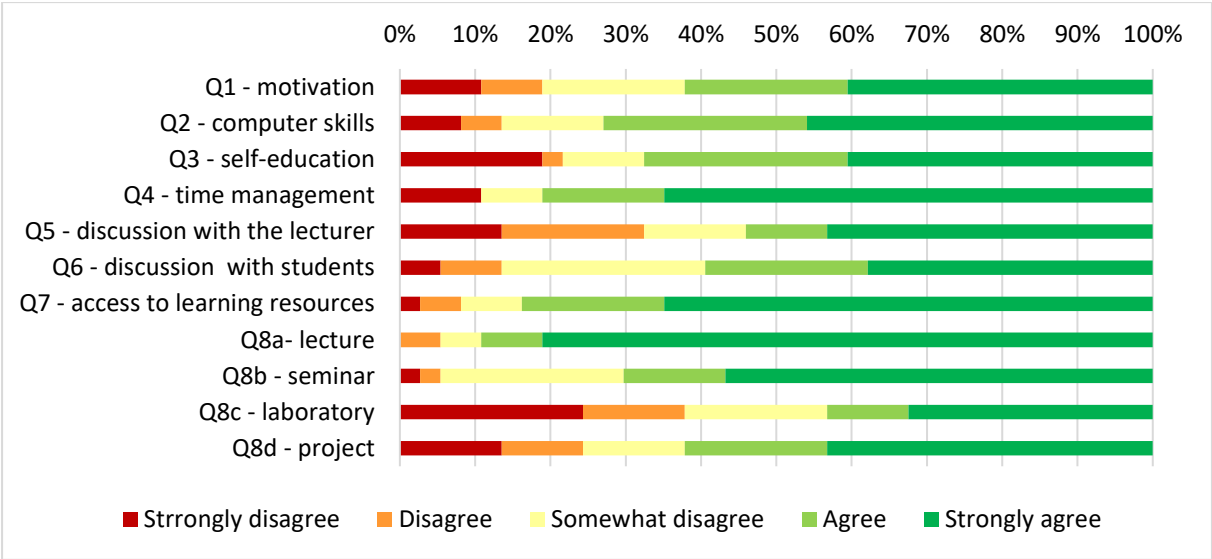


Fig. 3. B-learning student assessment

The analysis of the questionnaires showed a clear inequality in the approach to the assessment of blended learning. Engineering students showed greater reserve by frequently ticking neutral, "Somewhat disagree" responses (see Fig. 4).

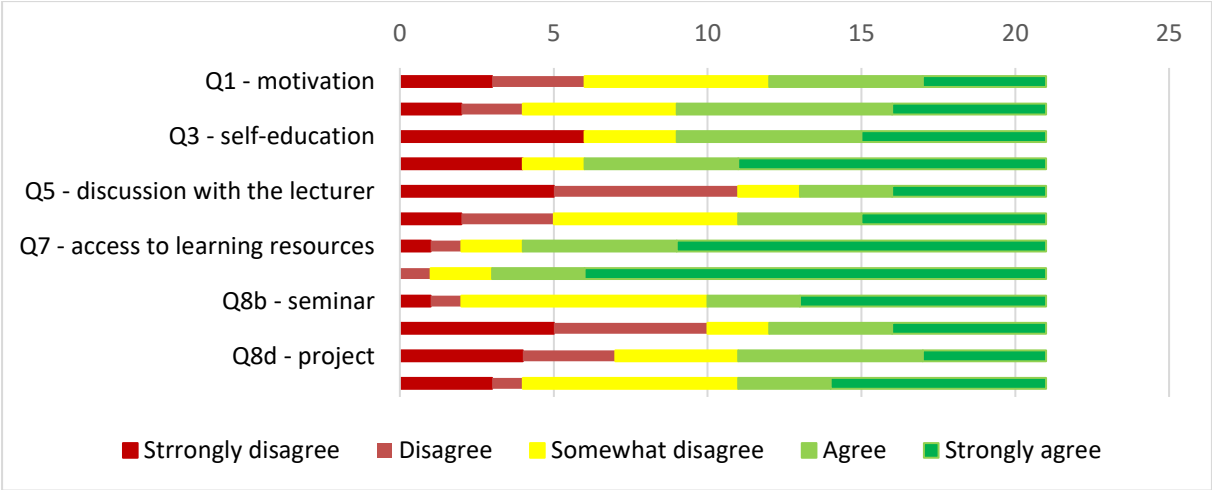


Fig.4. B-learning engineering students' assessment

Master's students appreciated good time management and unlimited access to materials and data. They believed that lectures and laboratories should be conducted online. Regarding other forms of classes, their opinions differed.

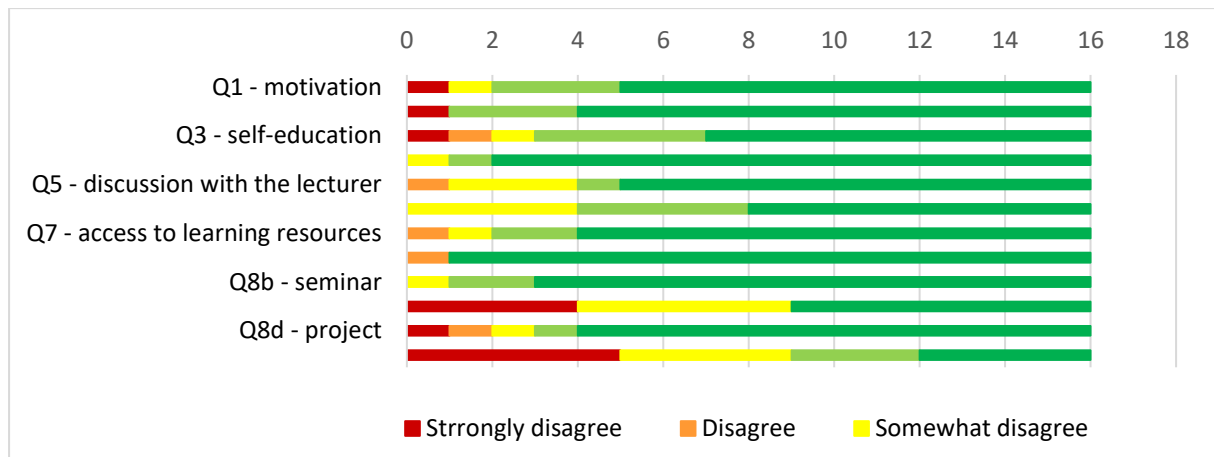


Fig. 5. B-learning master students' assessment

4. CONCLUSIONS

Blended learning uses both synchronous teaching (where knowledge is transmitted and received at the same time) and asynchronous teaching (various times of knowledge transfer and receipt). The idea behind this method of education is to combine lectures, project, seminars, exercises, laboratories, consultations, tests, etc., where some of them are implemented in distance learning mode.

Students especially appreciate the flexible hybrid learning environment: access to educational materials, giving feedback and ideas and real time communication with students and lecturers in the borderless environment. Blended learning requires a change in the way knowledge is passed on to students, including the preparation of various teaching materials, e.g. presentations, videos, articles, discussion texts, quizzes and more. The main task of the teacher is not only to provide on and require knowledge, but also motivate the student to learn and maintain interest in the subject.

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BIOGRAPHICAL NOTES

Prof. Elzbieta BIELECKA, full professor at the Faculty of Civil Engineering and Geodesy at the Military University of Technology. Scientific research focuses on the theoretical issues of GIS, especially data quality and uncertainty, spatial modeling as well as national SDI.

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