

# Blended Education: Patterns of Implementation at Sumy State University

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**Abstract:** Recent years have been marked by an increasing global trend in the implementation of blended learning techniques at tertiary level education. This tendency has been growing in Ukrainian universities. Although blended education in Ukraine seems nowadays to increase, the efficiency of using blended teaching is still unclear. Today most universities started using distance learning and transfer to the blended system of education in classes. The scholars argue about advantages and disadvantages of conventional and blended education as both methods have positive sides and drawbacks. The successful integration of blended education into the educational process was proved by numerous studies. The present study was designed to determine the effect of blended education on the learning process. The first question in the study was to identify the main spheres of blended education influencing the educational process. The second question sought to determine the readiness of Sumy State University students to transition to a blended educational process. At the first stage, a technical task was agreed, a program and tools were developed, a schedule of information gathering was developed. At the second stage, the collection of information, the collecting of questionnaires, their computer processing, the formed tables, and the reports were prepared. The responses obtained from the service of the students showed that most of the students clearly understand the system of blended learning, feel positively about it and are more motivated in their learning. This piloting experience launched the positive practice of implementation of blended education in the educational process, where it is highly recommended to use the elements of blended education in classroom activity as additional individual work in the virtual online environment as a widening effect of classroom work with the help of modern electronic devices and technologies.

**Keywords:** *blended learning; educational process; blended education; distance education.*

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## 1. Introduction

Recently the researchers have become increasingly interested in e-learning as one of the solutions of remote education in the globalized society. Today most universities started using distance learning and transfer to the blended system of education in classes. While scholars argue about advantages and disadvantages of conventional and blended education, our theory of action may increase student achievement. This is through improving the instructional system in teaching and updating the system of teaching according to the vital requirements of the modern academic environment.

Our theory of action draws on the research of the context of distance learning design and implementation, which makes the background of our study. Implementing blended learning in the process of tertiary education has become one of the essential educational concerns. The research follows the ideas of positive results of the implementation of blended education into the students' curriculum, which were proved by the experiments described in the empirical studies.

These findings are consistent with the study about the reasons for choosing BE in higher education and the successful integration of BE in higher education in their studies (Bliuc, Goodyear, & Ellis, 2007; Graham, 2006; Okaz, 2014; Rahman, Hussein, & Aluwi, 2015). The holistic approach in planning a blended course should be pursued.

In particular, applying the new teaching methods, which reflect the needs of our students, is very likely to be related to the raising motivation and therefore the students' performance in the educational process.

Several studies have examined the relationships between implementation BE and raising motivation (Fırat, Kılınc, & Yüzer, 2018; Kintu, Zhu, & Kagambe, 2017).

Building on this literature, using survey data from the experiment carried out in Sumy State University (SSU), we represent the analysis of the situation about readiness to provide BE system in SSU. This provides evidence for the validity of the experimental work in this study. This mixed research design helps us address the question at different levels and serve the theoretical perspective.

We find that blended education is a convenient and preferable way of education due to some factors. We examined a group of students after they completed short courses based on the blended education and analyzed their responses.

Furthermore, we examined the findings in the studies of other authors and find the relation between the results. This part helps determine the possible recommendations for implementing BE.

In this paper, we first discuss a theory of action, followed by a discussion of the relevant literature about the history of distance learning. Furthermore, we review some literature on blended education that demonstrates its positive influence on the learning process compared to distance and the conventional way of education. Then we give the outline of the development of distance learning in Ukraine. Then we present the research questions and our methodology. After that, we lay out the results, organized around the questions and we conclude with a discussion of the results and recommendations to the decision-makers and the implication for future research.

## **2. The theoretical backgrounds**

The pattern of distance learning was introduced back in 1728 when shorthand teacher Culebb Philippe invited students to study by mail once a week (Holmberg, 2005). The primary source of distance learning was Isaac Pitman, who did not only sent information on stenography to the students but also corrected their completed tasks, which allowed him to complete the communication scheme in the 'teacher-student-teacher' education model. This learning system began to gain popularity, and soon a whole network of colleges appeared (Dearnley, 2003).

Distance learning has been defined as a mode of learning that frees a student from having to travel to a "permanent place, at a certain time, to meet with a fixed person for training because of a technological separation between a teacher and a student". In the case of distance learning, students can be separated by space, but not necessarily be tied to a specific time (Keegan, 1995).

One of the characteristic features of distance learning is its fast development and flexible ability to take new forms adaptable for various ways of education.

Another definition of distance learning suggests that distance learning is a kind of training which enables educators to create organization of modern educational process as a full-fledged one, with the explanation, clarification of the teaching material by the teacher, communication with the teacher and students among themselves during the entire period of study; taking discussions, progress and final tests, implementation of joint tasks, carrying out the research and developing the creative character, etc. That is,

all the factors that determine distance learning as an educational process (the possibility of organizing an active cognitive activity of each student, providing effective feedback, interactivity, individualization and differentiation of the learning process, the formation of a sustainable motivation for educational and cognitive activity) take place (Shunevich, 2008)

Distance learning presupposes a specific pedagogical system, which can be characterized by the presence of many ways to organize the interaction of the agents of the learning process, have the form of a dialogue. The effectiveness of the organization of the pedagogical interaction of the agents in such a communicative act is conditioned by a number of factors, namely: the content of the discipline (the content and purpose of instruction), background factors (the size of the training group, the level of intellectual development, ethnicity, etc.), means of communication, the form and quality of communication), the form of control.

Although the significant amount of research is devoted to the advantages of Distance Learning (DL), a considerable number of researchers stand out for traditional face-to-face class education, stating the drawbacks of DL in studies. Thus, there have been three major factors for difficult adaptation of students to DL identified: 1) the psychological unpreparedness to the individual work, 2) lack of IT literacy and 3) high education intensity resulting from a bulk of individual tasks and tests compared to the traditional forms of learning. Moreover, another organizational barrier of applying DL education is mentioned. This is the necessity to change the syllabi and DL methodological and electronic teachware, which greatly exceeds the usual pedagogical load (Galiy & Seropian, 2017).

These facts demonstrate the unpreparedness of the universities to transfer to completely electronic learning, which nevertheless has its advantages for modern society. It proves the necessity of the transitional way of education on this stage.

### ***2.1. Relevant literature on blended education implementation***

The most commonly mentioned definitions of BL reflect the debate on the relations between media and method on learning and are defined as 1) combining instructional modalities, 2) combining instructional methods and 3) combining online and face-to-face teaching (Graham, 2006).

The successful completion of a blended education course to prove its efficiency in acquiring more qualitative knowledge has been discussed in the studies of many researchers. Much of the current literature on blended

education pays particular attention to the successful output of the students who are involved in blended education. The successful outcomes in blended learning are also related on the regular supervision and intervision as the main factors in the educational process in blended learning (Clement, Vandeput, & Osaer, 2016).

The review of literature from the period from 2000 observed the history and ongoing process of blended education and concluded that this form of learning has the prospects to get involved widely in the educational process. The authors characterized the periods of development of blended education and stated that this form of learning is gaining interest in studying and applying in different areas.

The relationship between blended education and the modern educational environment is proved by today's research. This study reveals the connection between individual factors and students' satisfaction with blended learning. Four hypotheses laid out by the researchers are correlated with the students' satisfaction on blended learning. According to their study, the main factors are: simplicity in use, perceived value, comfortable learning climate, and efficient and easy student-instructor interaction. Based on the results, the most significant influence on students' satisfaction was caused by the perceived value. Furthermore, the other factors which are notable to consider are: ease of use, learning climate and student-instructor interaction (Rahman et al., 2015).

Consequently, the challenges in blended education are connected with the comparison with the teacher-group, or class education, which has been considered traditional. In recent research, the main difficulties in combined learning are related to motivation, which may depend on the teacher's professionalism, an administrative and academic policy should be the background for successful implementation of BE in the curriculum (Nazarenko, 2015). We also agree on the fact that the education both in blended mode or generic one should be balanced.

Another research which suggests the factors of successful outcome of the blended learning process is about well-designed and effective course. The students' satisfaction and successful completion of the course also depends on the resources, goals and setting, professional instruction, evaluation and motivation, efficient communication and high satisfaction as 'positive learning experience' (Sen, 2011: 103). This research is in agreement with findings which suggest that the students on a blended learning course showed better results than those who were taught in face-to-face instruction mode. The success is considered to be in the correct implementation of this

way of learning depends on the professionally chosen variety of methods, which can make the classes more interesting (Aslam, 2015).

Blended education research is supported by the number of advantages and disadvantages. It also relates on the course design, teaching strategies and role of students. The increasing IT literacy is suggested as an advantage of blended education, whereas the challenges are mainly connected with the organizational part of the implementation of blended learning (Billigmeier, 2011).

In addition, the drawbacks of blended education are connected with a decrease in motivation and self-organization. The other problems are pertained to the organizational structure of the process of implementing BE (Okaz, 2015).

Recent attention has accented the provision of the fact that blended education is a convenient transitional option from traditional education to the qualitative education and improvement of the learning process.

The output of the experimental part of studies was not only positive but also the range of problems related to the organizational teaching sphere, such as effective teaching practices and communication between teachers and students in the online process. The other important factor as a student teachers' perception: as the students are used to constantly feeling the teacher's influence, some of them state that it is quite difficult for them to produce the positive results in the e-learning without teacher's control. In this way, the platform for distance learning should be as attractive as possible to create a sense of interactivensess.

Along with raising motivation and excitement from using the modern technologies in the learning, there are also a number of challenges for students in the blended education, related to the application of online learning in the educational process (Fincham, 2013; Veale, Krause, & Sewry, 2017).

Some studies prove the effectiveness of blended education courses if they are of medium and high intensity of blend, which positively increases the students' motivation in learning (Owston & York, 2018).

The other reasons for the successful use of blended education are the self-organization of learners and their responsibility (Billigmeier, 2011; Hubackova & Semradova, 2016). As blended education is mostly regulated by the individual planning and possibilities, the important factor in this process is motivation.

The issues of intrinsic motivation are closely related to the successful outcomes in blended learning. The effectiveness of blended learning

depends on the blended course design and student characteristics (Kintu et al., 2017; Firat et al., 2018).

The correlation between blended learning and increasing students' motivation is proved by the modern research. Moreover, the individual pace in blended education influences the autonomy in the positive way (Kofar, 2016).

As the today's research suggests, the structure of proper blended learning is based on three pillars: intentions and principles, scope and development, and assessment (Billigmeier, 2011; Soler, Soler, & Araya, 2017).

The important components in the design of blended education is outlined as a combination of five components: live events, online content, collaboration, assessment, reference materials (Clark, 2003). Together they create the holistic system of education which is able to replace the main goals of modern dynamic education.

Some researchers suggest that blended education is used as a methodological tool in obtaining the new skills in the disciplines and proved its efficiency in students' achievements along with the traditional learning (Garrison & Kanuka, 2004; Yigit, Koyun, Yuksel, & Cankaya, 2014; Tosun, 2015). To transform the technological process of education into a highly-motivating and coherent system of education the educators and organizers should always be in trend with new technology and apply all possible interactive assignments to motivate the communication and possibility to get a feedback from the students.

Having analyzed the studies of implementation of the blended learning process in other higher educational institutions, we researched the current situation with the implementation of distance or blended education in Ukraine and in Sumy State University in particular.

## ***2.2. Development of distance learning in Ukraine***

The development of distance education in Ukraine is gaining momentum. Guided by the basic principles of the development of modern education in the program for the development of open and distance learning from UNESCO for teachers (Perraton, Creed, & Robinson, 2002), relying on the rapid development of the market and communication processes in the world, focusing on the need to create new professions and satisfying the desire to develop and live at the same pace with world progress, distance learning is becoming more popular and effective in Ukraine.

Thus, the public project of mass open online courses Prometheus, which allows the universities, organizations, and companies to get free

access to its platform to place and conduct online classes on a wide range of disciplines, is becoming popular. Most of the courses are taught free of charge from the leading universities of the country: Kyiv National University, Kyiv-Mohyla Academy, National Technical University of Ukraine – Kyiv Polytechnic Institute.

Courses are created in accordance with the latest methods of global learning, considering the requirements for distance learning. The main directions of training are Entrepreneurship, a practical cycle of courses on how to create your own business or technological start-up in Ukraine, Data Analysis, the course which allows to identify invisible patterns and implement the decision-making process in almost all areas of human activity. Civic education is a cycle of courses for all who stand out for the development of Ukraine. The process of reviewing for the state exams is for those who are preparing for the successful surrender of Independent External Testing. The student gets a certificate upon the completion of the training.

In addition to this platform, in accordance with the Regulation on Distance Learning, adopted by the Ministry of Education, general education schools, vocational, higher and postgraduate educational institutions have their own base for distance courses and distance learning as a separate type of training. The purpose of distance learning is to provide educational services by using modern information and communication technologies in training at certain educational levels in accordance with state educational standards. This also is aimed to provide instructions for the preparation of citizens for admission to educational institutions, for foreigners' training and for the improvement of workers' skills.

The goal of distance learning is to give the Ukrainians the opportunity to exercise their constitutional right to receive education and professional qualifications, to improve their qualifications regardless of gender, race, nationality, social and property status, type and nature of occupation, ideological convictions, membership of parties, attitudes towards religion, religion, state of health, residence in accordance with their abilities (Ukrainian Ministry of Education and Science, 2013).

Distance learning is organized for students (pupils) who 1) cannot attend training sessions in the schools for the reasons of health, residence outside the walking accessibility of the schools, emergency situations of natural or man-made nature, military conflict, residence abroad (for citizens of Ukraine) or on the temporarily occupied territory of Ukraine or in settlements in the territory of which bodies of state power do not temporarily exercise or exercise their full powers, etc.; 2) mastered a high



level (10, 11, 12 points) according to the results of the last annual evaluation of educational achievements (Ukrainean Ministry of Education and Science, 2013).

### ***2.3. Development of distance and blended education at Sumy State University***

At Sumy State University, the distance learning system is developed in accordance with the program and the national policy. The structure of the university includes a Regional Distance Learning Center and a Center for Correspondence, Distance and Evening forms of training which offer Bachelor, Specialist, and Master degree programs in the distance and online forms. The training extends not only to the students of the Sumy State University, but it is also conducted in the territorial centers of distance learning in 14 regions of Ukraine and the Autonomous Republic of Crimea and the Pridnestrovian Moldavian Republic. This kind of training saves time, as the training schedule can be flexible depending on the student's capabilities. The training on such a system is two times cheaper, while the student is fully provided with the necessary educational materials. At the end of the course, the student receives a diploma of a Junior specialist, a Bachelor or a Specialist of the state standard, as well as on daytime education.

Along with conventional and distance forms of education, the university starts to practice blended education in the classroom and individual work.

According to the research which proves the idea that blended education is a type of learning which has the transitional potential from the traditional one to more qualitative, which allows changing the students' performance into efficient and satisfying (Garrison & Kanuka, 2004), education nowadays requires more flexible and convenient forms of learning according to a large variety of types of students.

Because of the potential importance of researching the climate and the readiness of the students to accept blended education in Sumy State University, this article examines the background for the ability to introduce blended education in the structure of classes.

The analysis below addresses the following research questions:

1. Are the students aware of the system of blended education?
2. Can blended education improve the students' performance?
3. Are the students ready to accept blended education in their education?

Therefore, the series of experiments on the implication of blended education were started at Sumy State University to probate the advantages of blended education in the educational process.

The volunteer teachers from different departments and of different subjects developed courses with the elements of blended education and offered them to the groups of students.

### **3. Research Methods**

To achieve the goal, confirmation of the hypothesis and fulfillment of the research tasks, a complex of modern theoretical methods of research and approaches was used. Qualitative methods offer an effective way of research with data interpretation, literature review, and analysis, synthesis, induction, deduction, systematization, comparison, generalization, which allowed us to develop scientific sources, to determine the essence and features of distance learning, to justify the advantages and shortcomings.

In this study we focused on the students of Sumy State University. The reason behind this focus was to check our hypothesis on the necessity to include the blended learning into the educational process.

The subjects of this study were the students from Sumy State University who took part in the experiment on probation of blended education in the 2017 - 2018 Fall term. There were 5 groups of students of different faculties and years of training, in a total of 100 students. The groups were provided with a specially designed experimental course which included the elements of distance and individual learning apart from the traditional one.

The study was conducted at the end of the term in December 2017 in two stages. At the first stage, a technical task was agreed, a program and tools were developed, a schedule of information gathering was developed. At the second stage, the collection of information, the collecting of questionnaires, their computer processing, the formed tables, and the report were prepared.

The first sample student group was offered different kinds of individual and e-learning tasks apart from their traditional classroom training. This included the preliminary individual tasks like e-lectures, tests, videos of laboratory experiments and research from the university distance and mixed educational resources platform.

Another group of students dealt with preliminary preparations for the case methods via distance learning platform of the university. The students had to investigate a problem and find the rational ways of its

solution and improvement. The results of their work were discussed in the class.

One more group of students created intellect cards, making questionnaires on Facebook. This project had several stages in preparation, both on their own – the students prepared some tasks themselves, and they discussed the results and they also had the further steps of the project at class.

The academic curriculum of other groups of students included the individual work with theoretical material and electronic tests for the current assessment.

After completion of the experimental course, the students were asked to complete the closed form questionnaires, answering the questions about the blended learning process, as it was a simple and easy way for the responded and for responders and was direct and relevant to the objective of the study.

1. Which disciplines in the Fall Term 2017-2018 did you take in blended form?

2. Did you like this form of study?

3. Did you understand the essence of blended learning?

4. Which form of learning is more efficient for you: traditional or blended?

5. Which form of learning motivates you to study more?

6. If you could choose the way of learning, which one would you prefer: traditional or blended?

7. Did you have any difficulties with the blended learning form compared to the traditional one?

At the first stage we conducted an analysis of the readiness of the students at Sumy State University for the acceptance of blended learning education in the form of survey. The survey was aimed at increasing the efficiency of combining the classical conventional methods of education and e-learning technologies. The qualitative descriptions are laid out below.

Moreover, to prove the validity of our assumptions statistically, we surveyed the students, who took part in this experiment in different groups after completion the course, which made the second stage of our research. The total number of the surveyed students was 17. The students were asked to complete the closed form questionnaires, answering the questions for giving feedback about the blended learning process, as it was simple and easy way for the responded and for responders and was direct and relevant to the objective of the study. This analysis focused on a set of 20 survey items (Table 1) that were designed to measure students' perceptions of the

various aspects of the blended course: level of student contribution to the study process, level of expectations of the course, level of initial knowledge, level of knowledge after the course, total value of the course, practical value of the course, level of student load during the course, level of materials publicity, levels of sufficiency of materials on the specific topics, importance of developing more these skills: self-control, motivation, critical thinking, reflection, IT literacy. The survey items were on a Likert scale ranging from 1 to 5 (Table 1, Appendix 1).

#### 4. Results

According to our theory of action, the aim of this study was to follow the positive results from the implementation of blended learning into the educational process, so we have laid out the results of the questionnaire to prove our thesis.

The responses obtained from the service of the students are shown below and evaluate the positive perception of the students of blended learning.

Question 1 showed the disciplines which the surveyed defined as the disciplines which were in experiment flow. The choice of the disciplines was proved by the possibility to provide individual work and which did not involve the practical skills. Thus, the range of disciplines was chosen to make the transition to the blended form of learning easier and smoother.

In response to question 2 “Did you like the blended course?” almost 2/3 of the participants (63%) answered positively, just around one third (32%) reported that they liked the particular elements and a very small percentage of the students (5%) did not define what the answer was or did not like it. These results are consistent with those of other studies on the implementation of blended learning and suggest that the youth is open to new forms of learning which make education interesting and thus more encouraging. The changes in the education process in off-routine and an exciting way of learning always stimulates a positive acceptance (Firat et al., 2018; Kintu et al., 2017; Kofar, 2016).

Answering question 3 “Did you understand the essence of the blended course?”, the majority (73%) of the students indicated that they understood the system of blended learning. Another part (22%) said that they liked it partially, and 5% answered negatively.

Table 2 shows a cross tabulation between students’ answers and results. The percentage indicate that more than two thirds of the respondents are in favor of blended learning.

**Table 2.** Cross-tabulation of students' answers and results, % (n=100)

Questions	Yes	Partially	No	Total
Did you like the blended course?	63	32	5	100
Did you understand the essence of blended learning?	73	22	5	100

The data indicate the correct flow of the experiment, which proves the fact that the participants realize the environment they study in. In this way they could have the proper attitude to the task, doing their best with the responsibility and self-organization. In this way, this study confirms that one of the blended learning components is intrinsic motivation and self-organization. This finding supports the previous research into this brain area which relates to the positive effect of blended learning on students' motivation and responsibility (Hubackova & Semradova, 2016; Kintu et al., 2017; Owston & York, 2018).

The answers to question 4 “Which form of learning is more efficient for you: traditional or blended?” show that 83 % of the participants of the survey reported that it was blended, the rest indicated the traditional one. These results agree with the findings in other studies in which the similar experiments have been made. They also correlate with the previous answers which defined the consciousness readiness of the students today.

In response to question 5 “Which form of learning motivates you more to study?” about half of the responses of the respondents 52% indicated that blended form motivates more, 15% of the participants said it was traditional and around one-third of the surveyed said it was no different to them. These results mirror the results of other studies about the positive implication of blended learning (Aslam, 2015; Clement et al., 2016; Kofar, 2016; Soler et al., 2017; Veale et al., 2017) and are consistent with similar attitude of the participants to experimental course.

Anyway, the overall response (82%) to question 6 “Which form of learning would you choose: traditional or blended?” was in favor of blended learning, which is shown in Figure 5. These data are in agreement with other studies, which show the prevailing results in blended education among students. (Billigmeier, 2011; Clement et al., 2016; Garrison & Kanuka, 2004; Kofar, 2016).

Table 3 shows students' preferences about the way of learning. More than three-fourths stand out for blended learning.

**Table 3.** Cross-tabulation of students’ preferences about blended course, % (n=100)

Questions	Blended	Traditional	No difference	Total
Which form of learning is more efficient for you: traditional or blended?	83	17	n/a	100
Which form of learning motivates you more to study?	52	15	33	100
If you could choose the way of learning, which one would you prefer: traditional or blended?	82	18	n/a	100

Reporting the results of question 7 “Did you have any difficulties with blended learning form compared to the traditional one?”, over a half (55%) of the participants said they did not have any difficulties with the blended learning system compared to the traditional one. However, the other 45% of the responders indicated that they had some problems.

A possible explanation for this is that most of the students feel excited about using the new forms in the learning process, especially if they are connected with IT devices. Another part of the answers shows the preference for the traditional way of learning. We can find the support of this idea in a range of studies which deal with the probable problems and challenges in blended learning (Billigmeier, 2011; Fincham, 2013; Okaz, 2015).

Having computed the results from the Stage 2, we obtained the results below.

This model identified 20 factors with all indicators significantly loading onto the factors according to the Likert scale statements. The first eight items and the last five were labeled ranging from 1 to 5, where item 1 (‘Level of student contribution to study process’) has the scale points ranked from 1 as ‘Poorly’ to 5 as ‘Very diligent’; items 3-5 ranked from 1 (‘Very Low’) to 5 (‘Excellent’); item 6 (‘Practical value of the course’) was labeled from 1 (‘Not useful at all’) to 5 (‘Very useful’); items 2, 7, 8, 16-20 were numbered ranging from 1 (‘Definitely So’) to 5 (‘Definitely Not’). Items 9-15, which represented students’ perception of the structural components of

the course were labeled ranging from 1 ('Insufficient Content') to 3 ('The Content Was Sufficient'). This table is a matrix of points (Table 1).

In order to conduct further analysis of this survey, we needed to convert it into the matrix of rank by applying a rank correlation method (Table 4, Appendix A).

To do this, the data obtained in the points was reordered as we reduced and assigned a serial number that determined the location of each factor in the aggregate, that is, to assign a rank.

If an expert assigns the same number of points to several factors, they are assigned a standardized rank, that is, the proportion of the division of the sum of places occupied by factors of equal rank into the total number of such alternatives.

On the basis of the matrix of ranks, we constructed a matrix of advantages, the essence of which was to estimate how many experts preferred this factor in comparison with others, or the number of cases where the factor  $j$  was defined as more important in the  $z$  direction (Table 5, Appendix A).

To determine the element  $ab$  (cell at the intersection of the line and column  $b$ ) matrix benefits analyzed the lines  $a$  and  $b$  matrix ranks and were determined by how many times ranks factor and higher compared with the ranks factor  $b$ , or how many times the line item and the smaller items line  $b$ .

To assess the importance of factors, it was necessary to calculate a number of indicators:

- 1) Sum of ranks assigned to the  $j$  factor:

$$S_j = \sum_{i=1}^m R_{ij}$$

where:  $S_j$  - the sum of ranks assigned to the  $j$  factor;

$m$  - the number of experts who participated in the study;

$n$  - the number of factors of research;

$R_{ij}$  is the rank of an  $i$ -th expert of the  $j$ -th factor.

- 2) The average rank for each factor:

$$\bar{S}_j = \frac{\sum_{i=1}^m R_{ij}}{m} = \frac{S_j}{m}$$

- 3) The average value in points:

where: with  $c_{ij}$  - an estimate of the relative weight (in balls), the data and-th expert of the  $j$  factor;

- 3) The average value in points:

$$M_j = \frac{\sum_{i=1}^m c_{ij}}{m_j}$$

where: with  $c_{ij}$  - an estimate of the relative weight (in balls), the data and-th expert of the  $j$  factor;

$m_j$  - the number of experts who participated in the  $j$ -th factor study.

- 4) The average weight of each factor (normalized score):

$$W_j = \frac{\sum_{i=1}^m w_{ij}}{\sum_{j=1}^n \sum_{i=1}^m w_{ij}}$$

where:

where:

$$w_{ij} = \frac{c_{ij}}{\sum_{j=1}^n c_{ij}}$$

The results of the calculations are given in the table (Table 6, Appendix A).

The average weight of each factor indicates that the most important and promising are factors 4-8, which is confirmed by the high values of this indicator and in relation to the values for other factors.

Factors 4-8 'Level of knowledge after the course', 'Total value of the course', 'Practical value of the course', 'Level of student load during the course' and 'The level of materials publicity' state the students' perception of the meaningfulness of the blended course in their activities.

To assess the generalized degree of consistency of opinion on all factors we calculated a number of indicators:



1) Concordance coefficient:

$$Ccon = \frac{\sum_{j=1}^n d_j^2}{\frac{1}{12} [m^2 (n^3 - n) - m \sum_{i=1}^m T_i]}$$

where:

$$d_j = S_j - \frac{\sum_{j=1}^n S_j}{n}$$

$$S_j = \sum_{i=1}^m R_{ij}$$

$$T_i = \sum_{l=1}^L (t_l^3 - t_l)$$

where:

L - the number of groups of related (identical) rank;

tl - the number of bound ranks in each group.

2) Pearson Fitting Criterion:

$$\chi_p^2 = \frac{\sum_{j=1}^n d^2}{\frac{1}{12} \left[ mn \times (n + 1) - \frac{1}{n - 1} \sum_{i=1}^m T_i \right]}$$

For this survey, the coefficient of concordance is 0.60.

Since the coefficient of concordance takes values from 0 to 1, we can conclude that in our example there is a moderate degree of coherence between experts, that is, 1 or 2 experts have found the opposite to other opinions regarding the quality of the course. It may be explained by the fact, when the students took the final achievement exam, some of them were not very successful, so it might their negative feelings about the course due to their lack of conscientiousness.

Let's check the coefficient of concordance on the statistical significance, for which we calculate the Pearson Fitting Criterion.

The estimated value of the Pearson Fitting Criterion is 194.65.

We found for our data the table value of the Pearson Fitting Criterion.

With a probability of 0.95, it equals 30.14.

The actual value of the criterion exceeds the table and therefore it can be concluded that the calculated coefficient of concordance is statistically significant, that is, the coefficient of concordance adequately reflects the consistency of experts in the survey.

## 5. Discussion

The present study was designed to determine the effect of blended learning on the educational process. The first question in the study was to identify the main spheres of blended learning influencing the educational process. The second question sought to determine the readiness of Sumy State University students to transition to blended learning.

This research contributes to blended learning literature by demonstrating the main factors, which show the readiness of the students to accept blended learning. The results of the study indicate that this form of learning motivates more, and the whole educational process is accepted in a more positive way, so the results demonstrated that this kind of learning is of a higher quality. This is in line with previous studies on blended learning implication context stating that this way of learning favorably increases the positive outcome of the students. (Aslam, 2015; Clement et al., 2016; Sen, 2011; Soler et al., 2017; Kofar, 2016; Tosun, 2015).

What is surprising in this research is that nearly half of the participants 45% had difficulties with blended learning in comparison with the traditional education. There are several possible explanations for this result. We may connect this with the unpreparedness of the students to organize themselves at this stage, as blended learning requires more responsibility and reliability as well as it gives more autonomy and flexibility in acquiring the educational material. Blended learning, which also means the relationship between the supposed result in e-learning and intrinsic motivation of students, is also a tool for getting new skills (Kofar, 2016). This theory proves the fact that online education should be very attractive and interactive. Another possible reason for the challenges in online learning is the level of students' computer literacy. In this case, additional computer learning should be designed to solve this problem.

## 6. Conclusion

The experiment proved a positive background for implementing blended education into the learning process. The courses with blending elements raised students' excitement and motivation. The classes became more various, thus, more attractive. Moreover, using the elements of distance and blended education for individual work allowed better coverage of additional material during the course.

This piloting experience launched the positive practice of implementation of blended learning in the educational process - the Rector issued the regulation which highly recommends to use the elements of

blended learning in classroom activity as additional individual work in a virtual online environment as a widening the effect of classroom work with the help of modern electronic devices and technologies. It also recommends students using the collections of online and distance courses from the educational platforms of the university as well as other MOOC resources (SSU, 2018). This experiment involved the subsequent series of experiments in further contests of blended learning among the teachers of the university with defining the nominations in applying blended learning in the educational process.

To make the process of implementation of blended learning more qualitative, we would recommend taking into account some aspects described in other studies. Thus, for successful implementation of BE, such as defining a correct students' needs analysis for designing the right blended course, should be taken in account while selecting the appropriate blended learning model, providing lasting instructions for the teachers, encouraging the staff to work collaboratively, creating the continuous technological support (Maarop & Embi, 2016).

There are some potential limitations in this study. First, the number of students surveyed for this study should be larger to provide a more definite guarantee for credible results. Another potential shortcoming in the study is a simple questionnaire, which does not measure all concepts of the experiment. For example, the questionnaire should specify the detailed possible problems in blended learning, which could clarify the exact solution in further research. Therefore, the results of the study may be somewhat inflated.

A third potential limitation is related to the measurements of positive implication motivation in blended learning, which was based on students' self-reports. This part requires a more detailed components assessment and research.

The credibility of our results could be strengthened by numerous similar studies and experiments in different specialism and with a different number of students. The recognized shortcomings could be inspiring for further research in this area.

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## Appendix A

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Supplementary data is available online at this link:  
<https://drive.google.com/file/d/1FwNEoPGol-BFL3WUoAXXUDFHLqaQbyGp/view?usp=sharing>

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