



















Step 1. For the compared samples, the authors calculated the temporal-empirical value of the Cramer-Welch criterion using the (Eq. 1):

$$T_{emp} = \frac{\sqrt{mn} |x - y|}{\sqrt{ms_x^2 + ns_y^2}}, \quad (1)$$

where  $m, n$  are sample sizes;  $x, y$  are average values of samples;  $s_x^2, s_y^2$  are variances of comparative samples.

Verification of the level of educational achievements of students in the control and experimental groups was performed per the average score of the certificate of basic secondary education of students. Thus, for this study, the authors have the following results (Table 3).

**Table 3. Statistical data of the results of the average score of the certificate**

	CG	EG
Average value	39.14	38.7
Sample size	189	200
Dispersion	10.408867	7.278325123
Cramer-Welch test value		Critical value
1.472348071	<	1.96

Step 2. The authors compared the obtained criterion value with the critical value  $T_{0.05} = 1.96$ : the obtained value of  $T_{emp} < 1.96$ , hence the hypothesis that the characteristics of the control and experimental groups are equal before the start of the experiment is accepted at a significance level of 0.05.

#### 4. Discussion

Measuring the efficiency of using a web-based training course can be challenging. There are various approaches, although there is no standard, generally accepted approaches and recommendations for assessing the course as of now. An example of an approach to making online courses effective is Quality Matters. As part of the performance verification process, proposed online courses are reviewed using a standardised section. The section proposes to evaluate the structure of the course, approaches to the control of knowledge, learning objectives, the content of educational materials, the organisation of interaction of participants in the educational process, teaching technology, user support and accessibility. According to T. Batane and A. Ngwako (2017), pedagogically balanced use of the developed web-oriented courses has a positive effect on improving the level of knowledge, skills, and abilities.

The use of modern ICT in academic activities in educational institutions enables teachers to transform their practice, create, edit, and expand the content of educational material. The use of ICT in the educational process facilitates the increase in the level of motivation for the educational and cognitive activities of the applicant for education and helps to master basic knowledge, skills. ICT is a system of modern methods and means of activity, the use of which provides an opportunity to improve training. Recently, the term “blended learning” has been spreading in world science. It is the integration of conventional forms of teaching with teaching using distance learning technologies. On the basis of an analysis of the scientific literature and practical experience of the pedagogical community, the content and characteristics of the concept of “blended learning” are refined, blended learning models are classified, and the strategic stages of its implementation in pedagogical activity in higher education institutions are proposed.

D. Chambers and A. Coffey (2019) note the artificiality of the term “blended learning”, proceeding from the position that the use of ICT in the educational process is not an innovation, but a demand of the present. It may be inappropriate to distinguish such forms of training as learning using electronic learning tools, mobile or distance – currently there are training tools that the teacher must use in their activities, and teach students to do the same. Blended learning combines the conventional classroom system with web-based learning

using the appropriate content management system. Some researchers believe that blended learning is an effective option for obtaining education in a general educational institution (Grimaldi et al., 2019)

Blended learning approaches turned out to be one of the most popular technologies of today, because the flexibility and convenience of a distance course can be added to the advantages of the conventional classroom. The content of a mixed (hybrid) course is proposed as a result of the integration of online courses (30%-70% of the educational process) with conventional classroom pedagogically-reasoned measures. Blended learning models that were researched and identified on the basis of experience with their use in higher education institutions became widespread and include the following (Kaban 2021):

- a model where online learning is supplemented by classroom instruction and access to electronic resources is provided from a computer classroom, laboratory, home (Model 1: face-to-face Driver). For example, the “flipped classroom” model;
- a model where online learning and conventional teaching alternate in accordance with the schedule (Model 2: Rotation). For example, the “rotation groups” model;
- a model where most of the learning process takes place in the learning environment with full-time support from the teacher (Model 3: Flex);
- a model where training is conducted in an online laboratory, which is equipped as a special classroom, where education seekers can receive online teacher advice and technical support is provided by laboratory staff (Model 4: Online lab);
- a model where education applicants choose online courses as additional materials for studying subjects in full-time mode (Model 5: Self-blend). For example, preparation for the academic competitions;
- a model where education seekers study remotely using the digital environment online, and pass on-site certification (Model 6: Online driver). For example, training during a long illness.

The combination of the conventional teaching in the classroom under the guidance of a teacher and independent work using information resources online facilitates the individualisation of the educational process and its approximation to the real needs of students of various levels of training.

## 5. Conclusions

The learning ecosystem is related to an integrated environment where all actors: students, teachers, administrators, parents interact with each other, and also use a large number of innovative products, technologies, teaching methods, and other elements of the learning ecosystem, using which the conditions of education are identified. Instead of exchanging energy between the components of the natural ecosystem in the learning ecosystem, data is exchanged. It is assumed that such an ecosystem may be in continuous development.

A study of the issue of introducing a synthetic learning environment for educational institutions was conducted. The synthetic environment is considered in two aspects – as artificial and as formed through a combination of the use of objects of the real physical world and the results of simulation and modelling. Criteria for using web-based technologies to create learning content have been formulated. In addition, traditional and blended learning approaches have been compared. The authors concluded regarding the acquisition of the level of the subject of education by the synthetic learning environment due to the expansion of its substantial and didactic potential, the transformation of the individual as a knowledge seeker into a synthesising factor of the educational process.

## Recommendations

Based on the results of the study, several recommendations are drawn as follows:

1. Further study may include wider participants.
2. Further study may include the use of distance learning technology in higher education institutions.

3. Blended learning models are also worthy of being explored further.

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