

# Development of the Certification System of Educational Resources

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**Abstract:** The article is devoted to the coverage of research on the development of system of internal certification of e-learning courses (hereinafter - ELC), which was carried out for several years with the aim of modeling the system of internal certification of educational resources for mixed and electronic learning in higher education and the creation of quality educational resources for blended and e-learning in Higher education. The authors describe the prerequisites for the internal certification system modeling and the features of recent changes in the process of internal certification of educational resources, approved by the university regulations, which is related to the requirements of the situation with COVID-19. The article describes the current model of the system of internal certification of educational resources, which is based on the approbation of the pilot model of ELC certification. The key components of the internal certification system are three mandatory expertise (professional, resource and technical). Based on the results of which, the methodological commission decides on the quality of educational resources of the ELC and its certification. Expectations from the current system of internal certification of ELC implementation were justified to a high degree, in particular, we have the following ad-vantages of their use: the creation of quality educational resources, expanding access to various categories of participants in the educational process to educational content; ensuring the individualization of the educational process under the needs, characteristics and capabilities of learners; improving the quality and efficiency of the educational process through the use of digital and innovative educational technologies; ensuring systematic monitoring of the quality of education, implementation of blended and e-learning in higher education.

## 1 INTRODUCTION

Students and teachers of Ukrainian universities are in a situation of limited access to classrooms due to active hostilities, and before that in connection with the COVID-19 pandemic. For higher education, the transition to blended and e-learning is the best way to organize learning. Today, all teachers understand and support changes in many dimensions of higher education and the transformation not only of approaches to the educational process, but also of their consciousness, psychological attitude and motivation to actively use e-resources in the implementation of blended learning and e-learning (Morze et al., 2018; Velykodna, 2021).

Also, general global trends in education need a transformation of pedagogical approaches, because, on the one hand, generations of students who need modern quality resources and greater use of digi-

tal tools, on the other hand, the challenges of the COVID-19 pandemic and the war of February 24, 2022 do not leave our country has alternatives in choosing the form of education (Hrynevych et al., 2020b,a). The implementation of blended and e-learning further stimulates the development of a system of certification of educational resources for the creation of quality educational materials in various electronic formats by introducing quality assessment of educational materials used by students.

Higher education institutions try in different ways to solve the issue of ensuring the quality of e-learning, including e-courses and e-content through the development of standards and the creation of e-learning systems (Abdel-Haq and Asfoura, 2021), implementing many-sided evaluation of e-learning and digital competences of teachers (Al-Hunaiyyan et al., 2021). An important factor influencing the quality of educational e-resources is determined by their students' assessment both in the process of use and upon completion of work in e-courses through various surveys (Kaewsaiha and Chanchalor, 2021; Sultan et al.,

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2021).

To develop an internal certification system of educational resources, it is necessary to develop criteria for creating quality educational resources and their comprehensive evaluation, which includes evaluation of e-course students, examination of e-resources and determining the technological feasibility of e-course components.

From this point of view, the preparation of quality educational resources for higher education can be provided by the university internal certification system of educational resources. The study, aimed at studying the impact of the system of internal certification of educational resources for blended and e-learning at the university took place in several stages:

1. Creating an internal certification system of educational resources:
  - Creation of a pilot model for certification of e-learning courses (hereinafter – ELC).
  - Approbation of the pilot model of certification of electronic training courses
  - Development of an internal certification system of educational resources for blend-ed and e-learning in higher education institutions
2. Active promotion of criteria for the quality of educational resources in e-courses through training for the vast majority of university teachers, depending on the level of their digital competence. For this purpose, the curriculum of the course “Digital Module” and the corresponding e-course in the e-learning system of the university have been created.
3. Creation of the Corporate standard of digital competence of the university teachers. The approbation pilot model for e-course certification, those ELC which teachers created as an additional resource to support academic disciplines, was tested by collectively discussing the results of the implementation. At the same time, trainings were held for teachers who wanted to be at the forefront of promoting blended and e-learning at the University. The research was managed by IT in Education Laboratory together with institutes and faculties of Borys Grinchenko Kyiv University.

The development of the system of internal certification of educational resources for blended and e-learning took place at the University level and resulted in the approval of the Regulations on the creation and certification of e-learning courses, which is the main tool for the internal certification of educational resources offer for University (Reg, 2020). It should be noted that until the approval of the internal certification system to ensure education at the University,

only 9% of certified ELC were used for bachelor’s degree, and 18% for master’s degree (Buinytska and Vasylenko, 2020).

The current model of the internal certification system of educational resources is described in the articles (Morze et al., 2016; Buinytska and Vasylenko, 2022).

Research and intermediate results of the process of development of the internal system of certification of educational resources are described in the article below.

## 2 THE ELC DESIGN IN THE E-LEARNING SYSTEM

The university e-learning system is a special educational portal built on the Moodle platform (modular object-oriented dynamic learning environment), which allows you to create learning material that is stored as a structured ELC and through which is implemented as blended and e-learning links. The e-learning system is designed to provide the educational process at the university.

For effective work of teachers and students in the e-learning system were created personal digital cabinets of users (students, teachers, administrators), which provide quick access to useful digital resources: class schedule, means of communication and cooperation with colleagues and students, libraries (scientific materials, access to scientometric databases, etc.), electronic portfolio systems, search for scientific publications and checking student work for plagiarism, questionnaires for students to assess ELC, catalog of courses of choice for university students and other useful links (Ogneviuk et al., 2020; Buinytska, 2016).

In the personal cabinet, teachers have the opportunity to use filters to show the ELCs they are currently working with, view their own workload, work with the automated module “Individual teacher plan” and so on.

ELC are formed automatically in accordance with the curricula of higher education students in the academic/educational professional program of the university. The ELC is developed by authors, which can be a teacher or a team of teachers, who are appointed by the decision of the department of the university from among the academic staff/professors/lecturers/employees of the university. In the future, teachers are enrolled in the ELC and their role is defined: author, author-teacher, teacher with appropriate levels of access.

The developed ELC is the property and intellectual property of the University and must have a unified structure and meet the following characteristics:

- structured teaching and methodical materials;
- logical configuration of the discipline studies;
- a clear schedule for students to complete the curriculum;
- the system of interactive interaction of participants of educational process among themselves, means of resources of ELC and technologies of distance learning, during all time of studying of discipline is adjusted;
- high-quality training materials that allow the form of competencies declared in the working program of the academic discipline;
- system of control and evaluation of all types of educational activities of students.

Electronic resources included in the ELC have two types according to the level of student activity. Resources are designed to provide students with the content of educational material, such as structured electronic lecture notes, multimedia lecture presentations, audio and video materials (podcasts, videocasts, webcasts, etc.). And methodical recommendations, resources that ensure the development of the studied material, the formation of skills, acquisition of general and special (professional) competencies, self-assessment and evaluation of educational achievements of applicants, for example: tasks, testing, questionnaires, forums, etc. including the use of digital technologies. The digital learning technologies encourage the development of cognitive, creative, communicative and collaborative skills (Leshchenko et al., 2020; Buinytska and Vasylenko, 2019) using ELCs, which are developed for each discipline of the curriculum.

### 3 UNIFICATION OF THE ELC STRUCTURE

The structure of the ELC is unified for easy use by students. The structure of the ELC needs obligatory components of the ELC, approved by the Regulations on the procedure for creating e-learning courses, their certification and use in the e-learning system of Borys Grinchenko Kyiv University (Sultan et al., 2021):

1. The section with the description of ELC contains an indication of the Academic/Education Professional Program with title and educational level;

contains the reference to the actual working program of educational discipline in the Institutional repository; general information about the discipline through resources: working program - syllabus; evaluation criteria; printed and Internet sources; glossary; announcements; information about the author (figure 1);

2. Teaching and methodical materials from each content module (figure 2):

- theoretical material (structured electronic learning materials, manual in the form of resources Lecture or Book, multimedia presentations of lectures, audio, video, animation learning resources, a list of printed and Internet sources);
- practical/seminars/laboratory works (content, methodical instructions on their performance, list of tasks, form of presentation of results of performance, terms of performance, evaluation criteria);
- tasks for individual work of applicants (content, guidelines for their implementation, list of tasks, form of submission of results, deadlines, evaluation criteria);
- module control (control questions, tasks, form of work submission, deadlines, evaluation criteria);

3. Materials for the final control in the form of an examination (description of the procedure, examination program or references, indicative list of questions, evaluation criteria); in the resource Exam give a brief description indicating the procedure for the exam and evaluation criteria.

4. Additional materials.

Special conditions: if the course is practical, it is advisable to present theoretical information in at least one general resource Lecture or Book; for courses where listening, speaking, etc is obligatory, the form of submission of the completed work in the form of audio or video file, communication/interview in voice or video chat is allowed.

## 4 THE ELC INTERNAL CERTIFICATION SYSTEM

### 4.1 Model of the ELC Internal Certification System

The process of testing the pilot model lead to its significant modeling and design of a qualitatively new

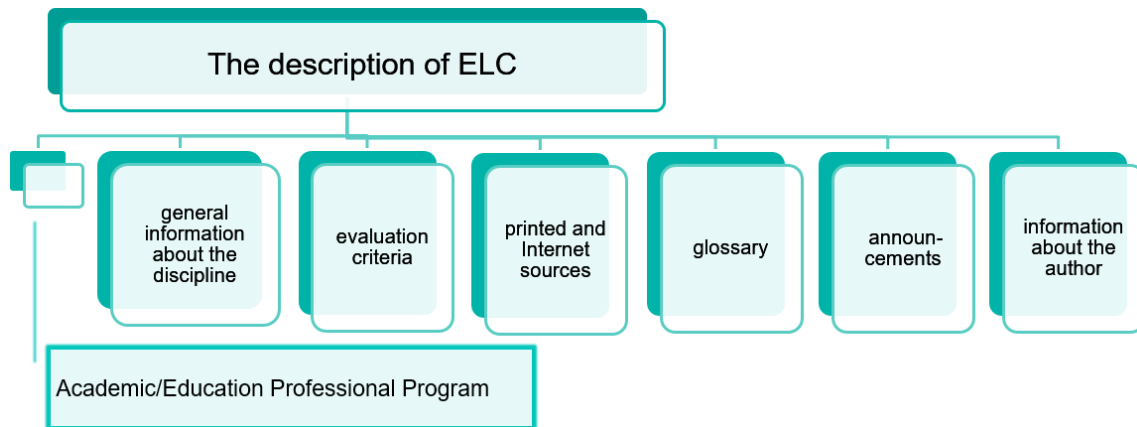


Figure 1: Description of ELC section.

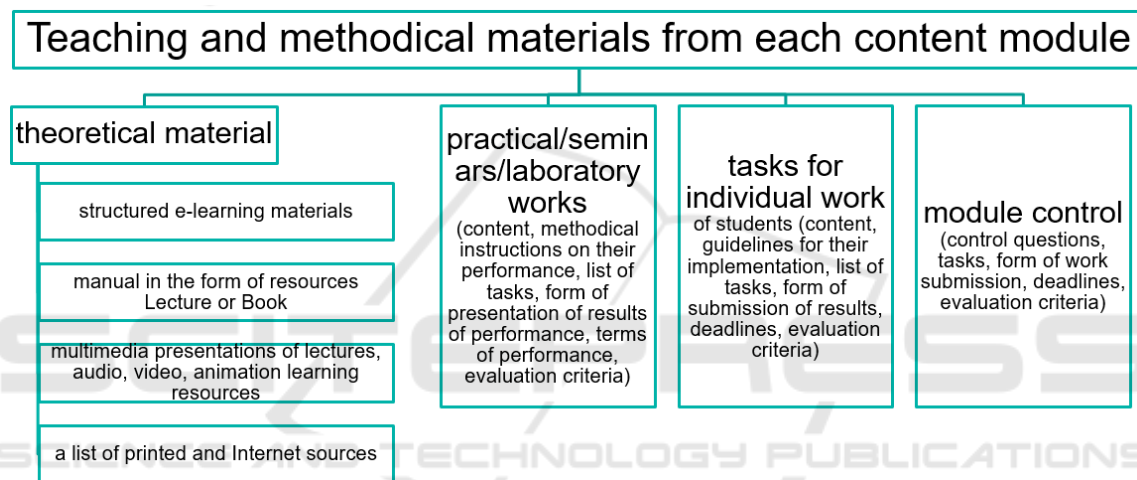


Figure 2: The module content.

integrated system of internal certification of educational resources for blended and e-learning (figure 3).

The ELC internal certification system is regulated by the approved Regulations and, accordingly, is carried out monthly following the decisions of the Academic Councils of the institutes and faculties of the university.

The main processes of the certification system presented in the model are: ELC design; organization and conduct of expertise; analysis of expertise results and certification decision-making.

During the professional expertise the scientific level of the course materials is determined, the correspondence of all created resources to the working programs, goals and objectives of the discipline. The relevance of the content, novelty of the submitted material, its completeness and logical consistency, content and methodological expediency of the created resources, methodological aspects of the course organization, pedagogical and psychological bases of organization of students' and pedagogical staffs' educa-

tional activity, their interaction, organization of control system are analyzed.

The procedure for managing a professional expertise includes the following steps:

- appointment of experts by the director dean of the structural unit;
- online expertise by appointed experts with conclusion;
- discussion of the results of the expertise at the meeting of the department.

The expertise of ELC resources is carried out by the ICT Assistant Director/Dean and involves the analysis of the availability of obligatory ELC components and the determination of the level of compliance of each component with the requirements specified in the regulation. The passing score for the expertise of ELC resources for further submission for technical examination is 70 (out of 130 possible).

The professional expertise and expertise of resources takes place in the first two weeks of the cur-

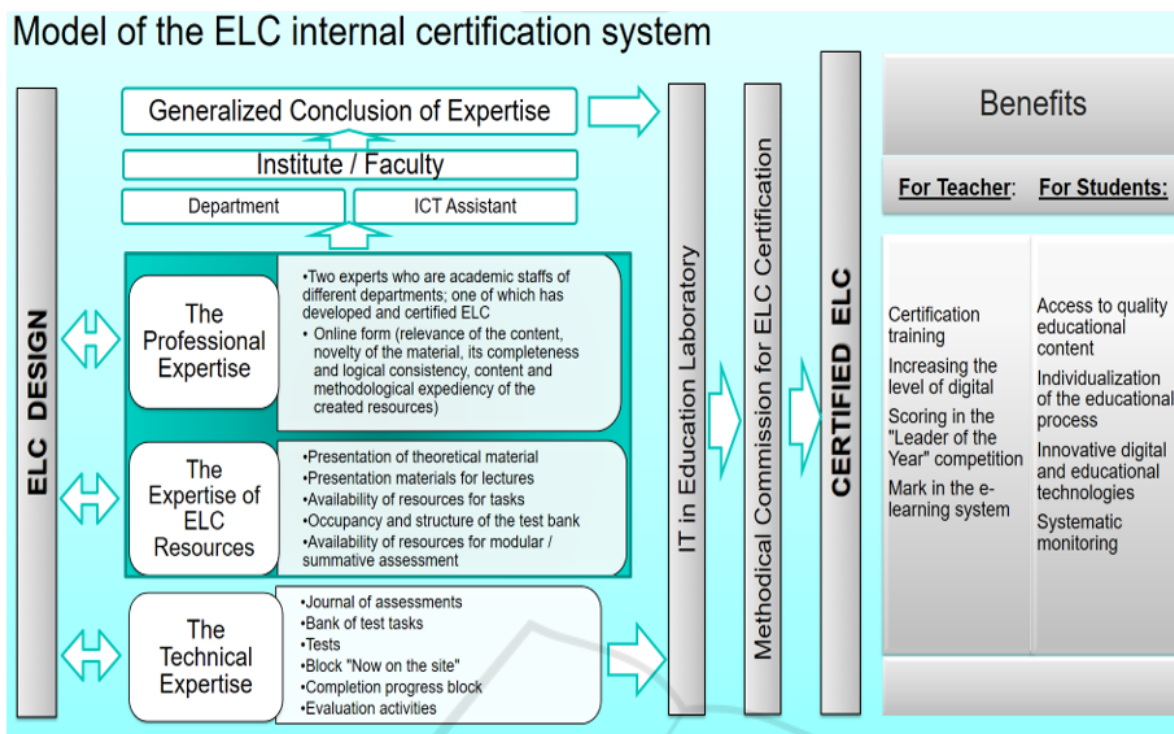


Figure 3: Model of the ELC internal certification system.

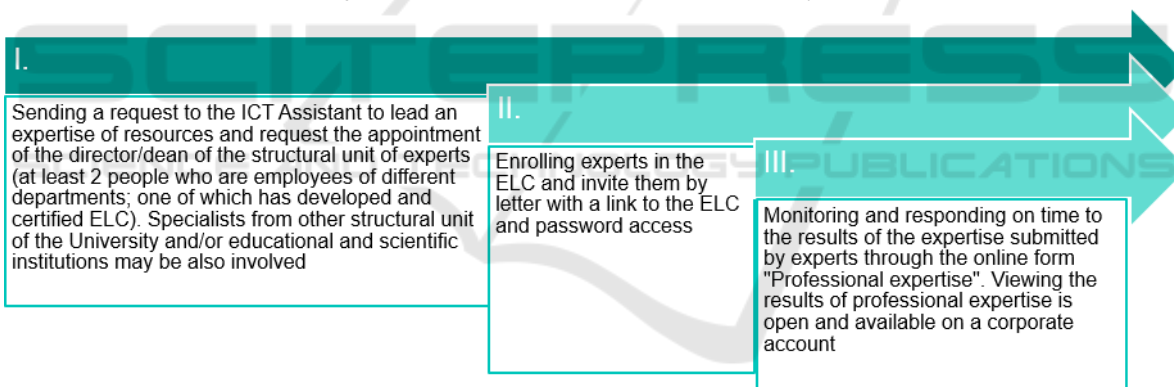


Figure 4: Key-steps of the ELC Internal Certification.

rent month, after which the ICT assistant can acquaint the author/authors with the conclusions of the expertise.

The generalized conclusion of the ELC examination is signed by the director/dean and submitted by the ICT assistant to IT in Education Laboratory.

The technical expertise of the ELC is carried out by the IT in Education Laboratory at the request of structural units with obligatory monitoring in an online document, which is set up open access for viewing to all participants in the educational process. Technical expertise provides an analysis of the implementation of system-wide requirements: the correct operation of the Journal of Assessments; optimal fill-

ing of the test bank; correct test setup; availability and settings of blocks "Now on the site", "Progress of completion"; setting deadlines for tasks.

#### 4.2 Key-steps of the ELC Internal Certification

The ELC certification decision is made by the methodical commission for ELC certification, the composition of which is approved by the order, is adopted collectively based on the generalized conclusion of the head of structural division based on conclusions of expertise.

Authors should initiate ELC certification and take

the following steps (figure 4):

- I. Send a request to the ICT Assistant to lead an expertise of resources and request the appointment of the director/dean of the structural unit of experts.
- II. Enroll experts in the ELC and invite them by letter with a link to the ELC and password access.
- III. Monitor and respond on time to the results of the expertise.

The results of each stage of certification are reflected in a free-to-view document, which allows authors to make adjustments to the submitted ELC in accordance with the submitted recommendations.

## 5 THE IMPACT OF THE ELC INTERNAL CERTIFICATION ON THE QUALITY OF LEARNING RESOURCES FOR BLENDED AND E-LEARNING

In a pandemic, the university's educational process was organized using e-learning, to ensure which the university's e-learning system was used quite actively in combination with online communication and collaboration tools (Buinytska and Vasylenko, 2020).

The number of activities by both teachers and students of higher education has increased many times, which confirms a significant increase in the use of ELC. The number of actions of students in 2020 exceeded 9 million and, compared to 2019, increased more than 3 times, teachers – exceeded 2,5 million, an increase of 4 times, due to the processing of educational material, performance and loading of tasks applicants, checking the downloaded tasks, as well as filling the ELC with educational content and keeping a journal of assessment by teachers.

Ensuring the quality of educational resources with which students work has become an important task for the University teachers.

The number of ELCs created in 2020 has almost doubled compared to 2019, which made it possible to provide ELCs to almost 90% of disciplines, of which 60% of ELC are fully developed and fully used in the study of disciplines, others are gradually filled with educational content and used for keeping a log of assessments.

Analysis of ELC that are actively used in the educational process confirms an increase in active ELC by 1,5 times compared to 2019 (figure 5).

Students rated the ELC on a five-point scale from 0 to 5, according to the proposed criteria: Clarity;

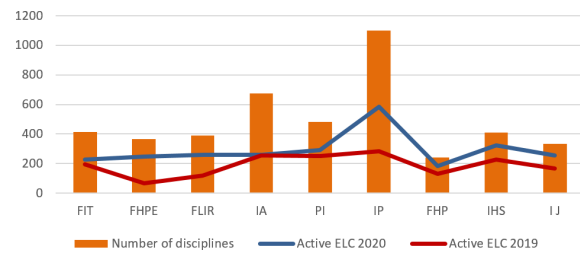


Figure 5: Comparison of the number of Active ELC.

Accessibility; Relevant; Creativity; Expediency. The evaluation of the ELC in 2020 compared to 2019 remained almost at the same high level of evaluation.

The ELC score in 2021 has significantly increased compared to 2020. The 2020 and 2019 estimates were almost at the same high valuation level. This is a confirmation of the development of the internal certification system of ELC, the effectiveness of conducting systematic trainings for teachers and the implementation of the Corporate Standard of Digital Competence of University teachers (figure 6).

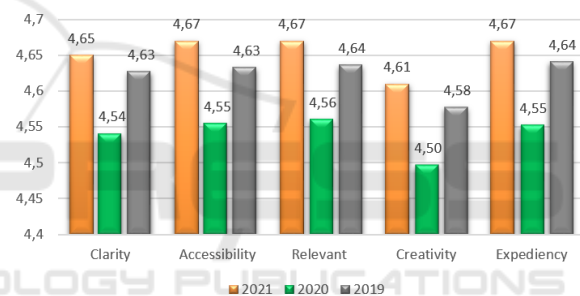


Figure 6: The results of ELC assessment by students.

The observed decrease in the assessment of ELC exhibited by students is caused by the creation and simultaneous use of them during a pandemic, in the mode of full distance learning. Among the reasons are: during the transition to distance learning teachers and students experienced technical difficulties (the need to create activities quickly; insufficient level of digital competence of teachers, psychological barriers to using e-learning, sometimes poor access to the Internet). In 2020, teachers began to use the e-learning system in extreme conditions, not all were fully created ELC, some ELC contained only checkpoints for scoring to form a journal of grades, so students objectively more rigorously assessed ELC in the e-learning system already having a large number of ELC for comparison.

The analysis of the evaluated ELCs confirms the use of ELCs that were filled with content at the same time as the classes, as only 22% of the evaluated ELCs were certified and, accordingly, the level of evaluation of such ELCs averages 4,6 out of 5,0, which remains at levels of 2019.

According to the results of student assessment, certified ELCs are qualitatively developed, the resources presented to them are clear, accessibility; relevant; creativity; expediency and they are sufficient to master the discipline (figure 7). This study was conducted until 2021, and based on its results, it was decided that students will only evaluate certified ELCs.

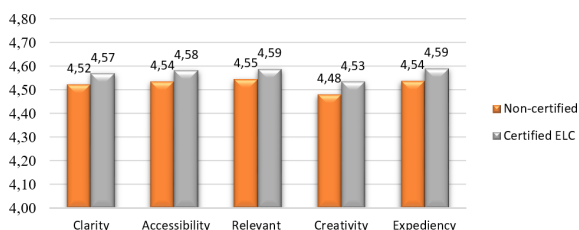


Figure 7: Comparison of assessment of certified and non-certified ELC.

In 2021 and 2020, the percentage of ELC certification remains at a high level of 93%, which is an increase of 20% compared to 2019 (72%) and indicates a positive trend in providing disciplines with certified ELC (figure 8).

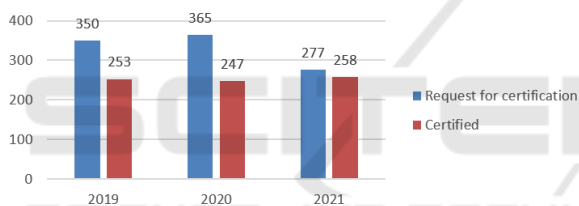


Figure 8: Dynamics of ELC certification.

The positive trend of increasing the number of certified ELCs confirms the need for them by students and teachers. That is why the introduction of the internal certification system justifies an important role in the preparation of quality educational resources and in general in the modernization of the e-learning system of the University now and in the future.

In particular, the opportunity has already been realized for students in a separate ELC not only to have access to educational materials 24/7/365, but also to monitor the progress of personal educational activities. The introduction of the ELC internal certification system has prompted the creation of academic/educational professional programs in the e-learning system, the main advantages of which are the student's ability to see a list of all disciplines to study during semesters and scores in disciplines (figure 9).

The implementation of Academic/Educational Professional Programs in the e-learning system has provided the structuring of the e-learning system, access to educational resources of all disciplines of the curriculum; made it possible to carry out constant

monitoring of the provision of academic disciplines with the relevant ELC, the level of their development and certification. It is due to the functioning of the internal certification system that there is an increase in the percentage of quality ELCs that have the status of certified. In the future, it is expected that 100% of all educational programs will be certified by ELC.

Part of the ELC internal certification system is the automated control "Report by the department", which reflects the percentage of certified ELC, provided by the curriculum in graphical form (figure 10).

When deploying such a report, the e-learning system displays a complete list of names of disciplines for which ELC are developed and used and which of them are certified, which encourages teachers to improve the ELC used and initiate their certification. The analysis of the results of the implementation of the ELC internal certification system shows its positive impact on the quality of educational resources and the provision of educational services in general.

## 6 DEVELOPMENT OF THE ELC INTERNAL CERTIFICATION SYSTEM AND ITS IMPACT ON TEACHERS' USE OF THE E-LEARNING SYSTEM FOR BLENDED AND E-LEARNING

The certification process is a formal procedure and is mandatory for those teachers who wish to extend their employment contract at Grinchenko University. But without a detailed model of the system and the requirements for ELC resources without additional training, it is difficult for teachers to create materials in accordance with the declared quality criteria. Therefore, for the development of ELC Internal Certification System there is a system of increasing digital competence in several schemes. One of them is the involvement of teachers to participate in mastering the Digital Module (figure 11), which aims to increase the level of digital competence of scientific and pedagogical, scientific and pedagogical staff of the university, their ability to effectively use digital technologies in the educational process. The program of the module involves the study of the following topics:

1. Modern educational trends and ways of introduction into the educational process of innovative technologies. 21st century skills and digital skills.
2. Blended and e-learning. E-learning technologies. Resources for creating e-content and criteria for its evaluation.

**011.00.03 Corporate education and staff development (2020). Master's degree**

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News

- Educational and professional program
- Curriculum

**Semester 1**

- Sociology of educational needs (credit)
- Andragogy (exam)
- Leadership in education (credit)
- Personnel management (credit)
- Foreign language for professional purposes (without final control)
  - Final control in the 2nd semester
  - Course link
- Organizational psychology and psychology of work (exam)
- Monitoring the educational needs of the corporation (credit)
- Internet and applied information technologies in education (exam)
- Corporate pedagogy and staff development (without final control)
  - Final control in the 2nd semester
  - Course link
- Production practice (methodical) (without final control)
  - Final control in the 2nd semester
  - Course link

**Semester 2**

- Foreign language for professional purposes (exam)
- Corporate pedagogy and staff development (exam)
- Corporate culture and ethics (credit)

Figure 9: Academic/Educational Professional Programs in the e-learning system.

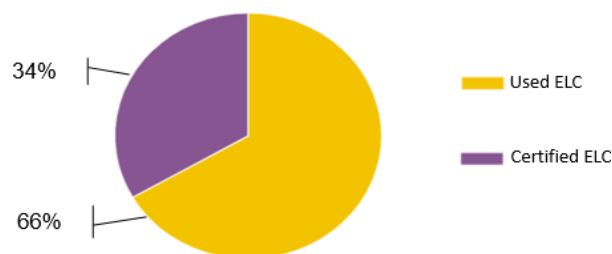


Figure 10: Representation ELC in "Report by the department".



### What are the most relevant resources of the module

221 Response

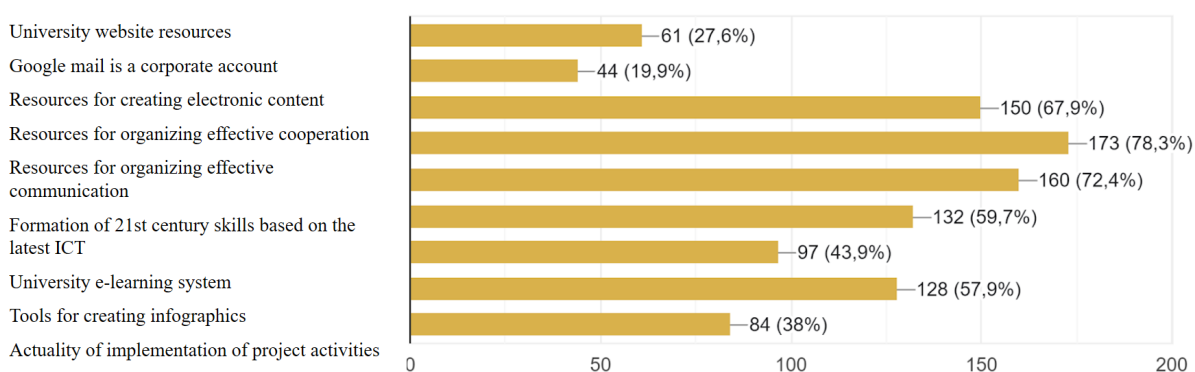


Figure 11: Representation about relevant resources in the Digital Module.

3. Online services and digital technologies of effective communication.
4. Online services and digital technologies of effective collaboration.
5. Online services and digital technologies for formative assessment.

Answering the question about the most relevant resources, the majority chose resources for creating e-content, Resources for organizing effective collaboration, re-sources for organizing effective communication, University e-learning system, Tools for creating infographics.

The developed and approved Corporate Standard of Grinchenko University Teacher Digital Competence (Corporate Standard of Digital Competence, 2021) describes the use of digital skills in the main areas of activity of the teacher, in particular research, educational activities, digital self-management, professional communication and cooperation. The standard defines five levels of digital competence: Research Analyst – A, Integrator – B1, Expert – B2, Leader – C1, Innovator – C2. In accordance with these levels, detailed descriptors were developed, which are the basis of the newly created adaptive system for the development of the teacher’s digital competence, access to which is implemented in the personal office of the University teacher.

## 7 CONCLUSIONS

The development of the system of internal certification of educational resources after the approval of the pilot model of ELC certification confirms the effectiveness of its use and the expediency of further work.

A system of internal certification of educational resources for blended and e-learning can be recom-

mended for implementation in higher education institutions.

The three independent and diverse expertise (professional, resource and technical) that underlie the system of internal certification and evaluation of ELC by students ensure high quality educational resources and, as a result, the quality of educational services. In the future, it is planned to achieve 100% ELC certification for all educational programs that train professionals with a sufficient level of digital and professional competence and are competitive in the labor market.

The development of the internal certification system encourages teachers to increase the level of technical and professional competence, allows you to increase your rating among university teachers; expand the use of digital technologies in the educational process; the creation of modern educational digital resources taking into account the peculiarities of the styles of material perception and the design of criteria for assessing their quality; using digital tools for effective communication and collaboration in blended and e-learning; development of abilities and a sense of the need for constant self-development and self-improvement. On the other hand, teachers, having tools and opportunities for self-development, create high-quality e-content for teaching students.

According to the purpose of the research, we have achieved very important results and have the following advantages:

- quality educational resources,
- expanding access to educational content;
- the individualization,
- improving the quality and efficiency of education through the use of digital and innovative educational technologies;

- monitoring the quality of education.

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